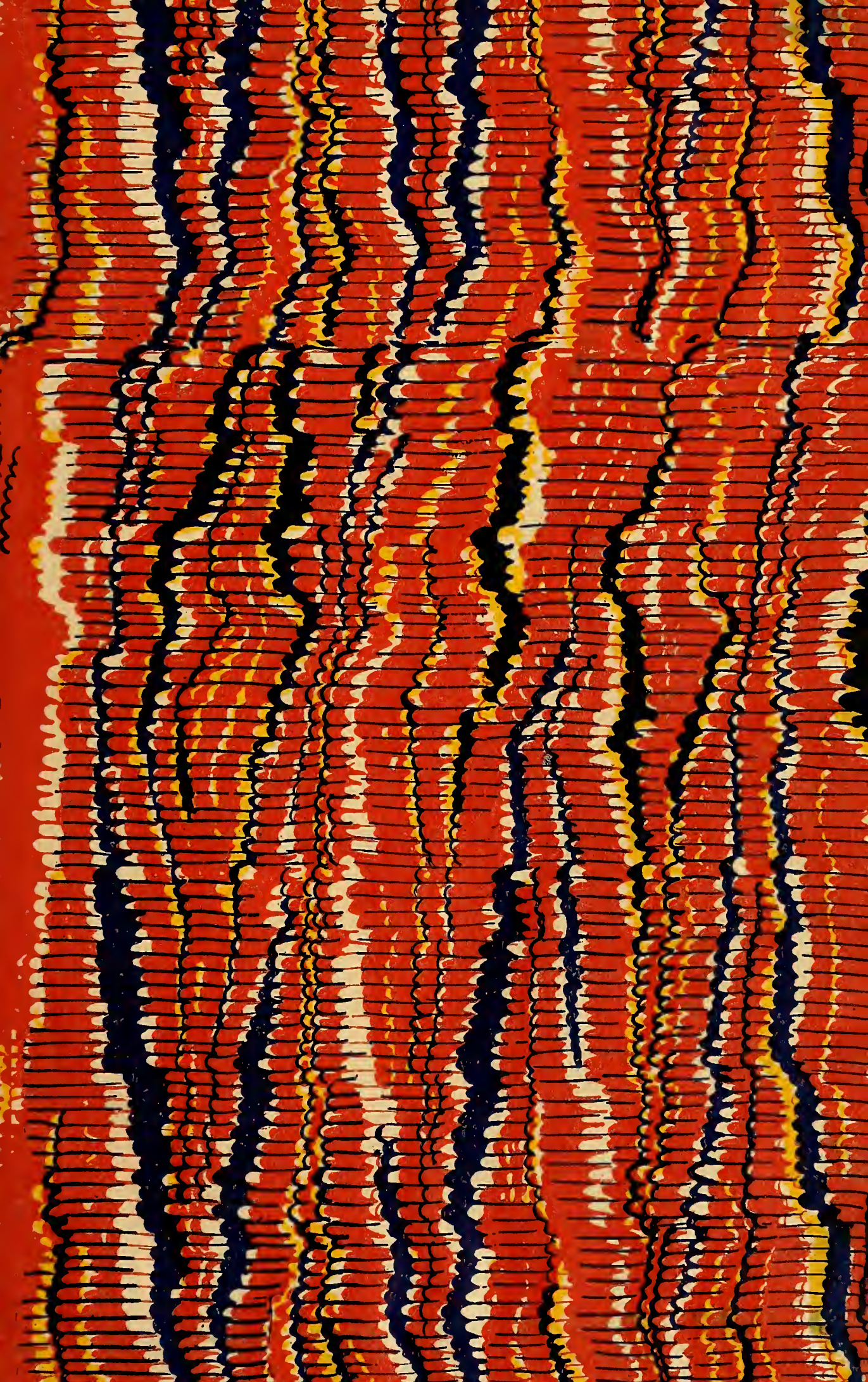

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II APRIL 1900 No. 1

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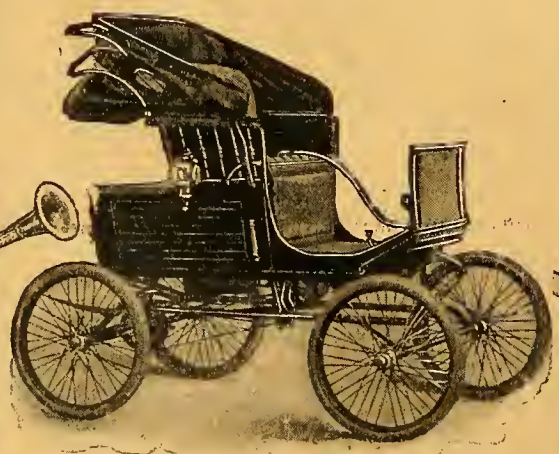

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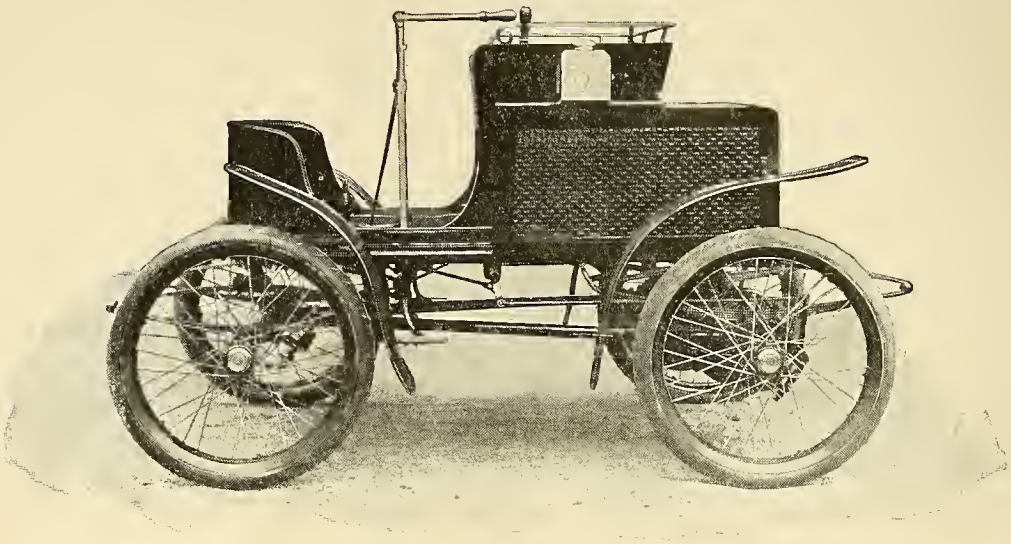

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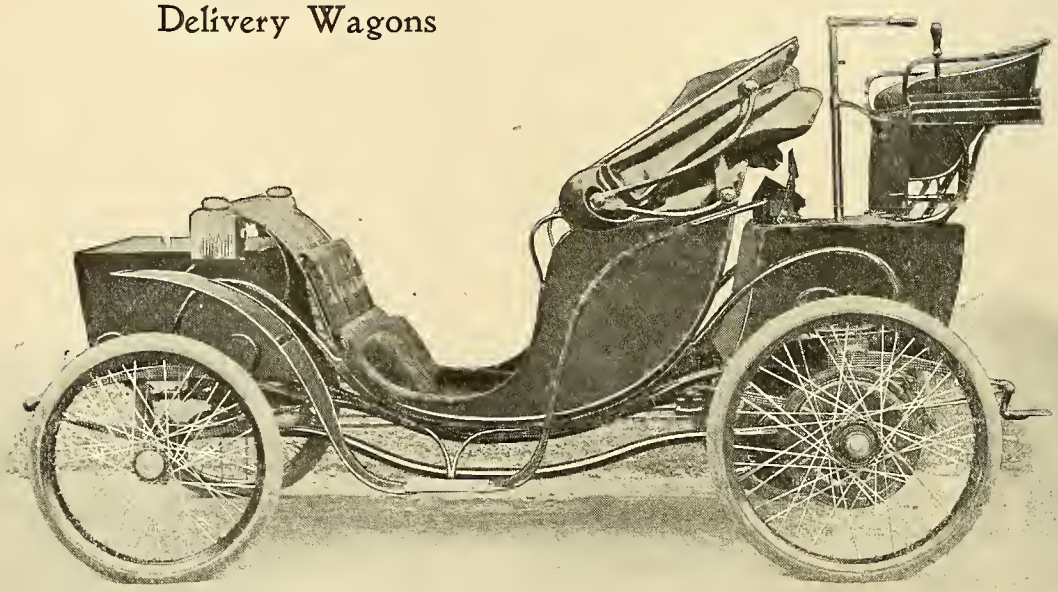

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It will give full and free discussion to all sides of the question of Commercial Wagons, and will be of value to business men and manufacturers.

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AN INDEX.....

such as an index should be, will accompany the January issue of....

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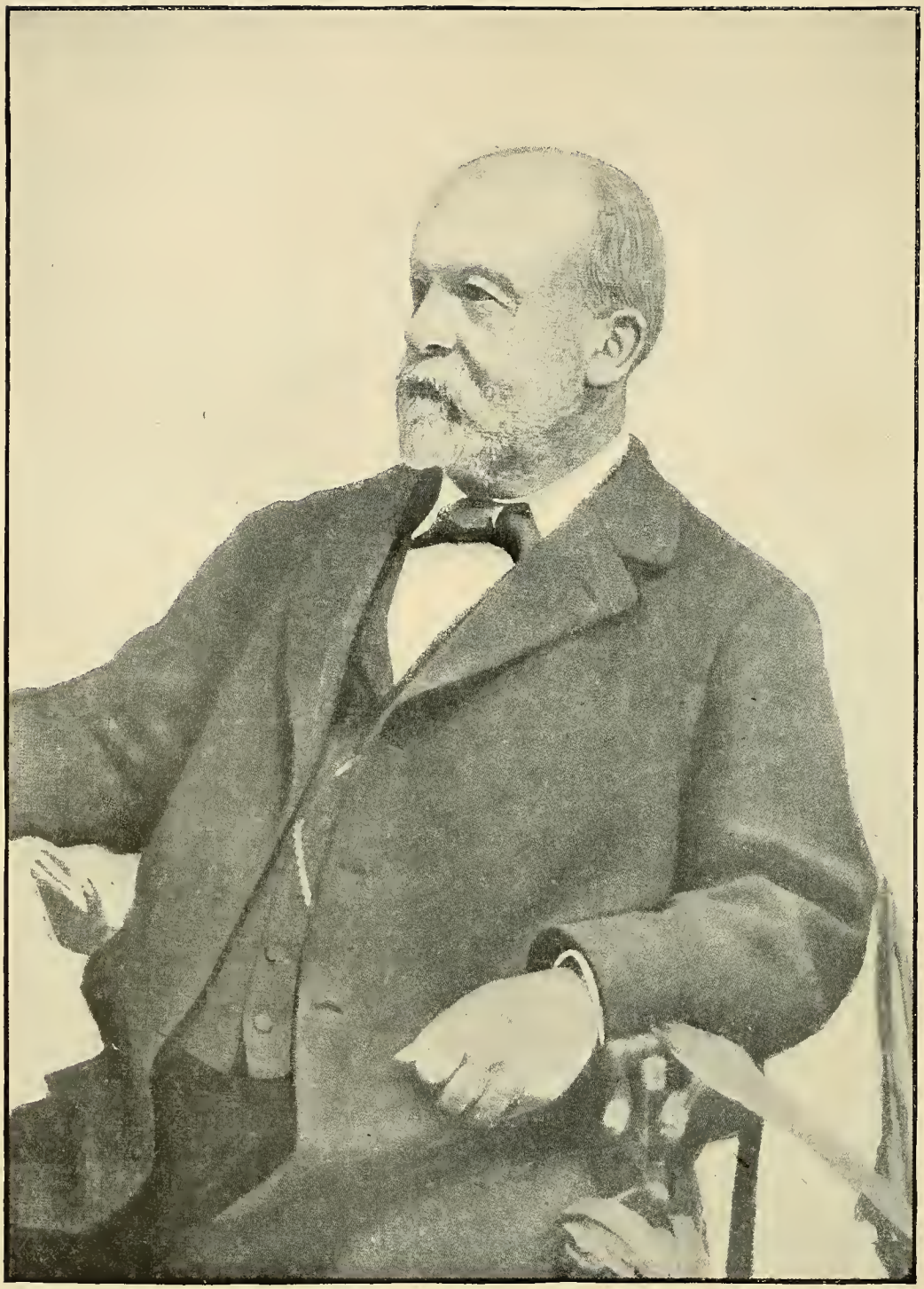
It is cross indexed for easy reference, and gives a very complete record of all of value that has been published in the past fifteen months. Every one interested should have one for reference . . . . . .



Gottlieb Daimler

(Obiit March 6, 1900)

The Automobile
MAGAZINE

VOL. 11 APRIL 1900 NO. 1

The Father of the Automobile

By Edwin Emerson, Jr.

BY the death of Gottlieb Daimler, the celebrated German inventor and engineer, last month, the world has lost the guiding spirit and creator of modern automobilism. Daimler was a man who resurrected the crude principles employed in the earliest horseless carriages and infused into them a new life. Thus he is in truth the father of the modern automobile.

Daimler's great achievement was the invention of the gasoline and petroleum explosion motor, which, fifteen years ago, revolutionized the construction and industry of light mechanical motors. His cylindrical motor in upright V form immediately became known as the celebrated Daimler Motor. In various modified forms it has been applied to a great majority of all the various gasoline motors now in use in Europe and in America. Later, as a result of the collaboration of Europe's most famous automobile inventors, Daimler and Levassor, a new motor was devised, the so-called "Phœnix Daimler" which has achieved such startling success in French racing machines. Levassor adopted the sprocket and chain, but Daimler insisted upon the use of pulleys and belts for the speed changing gear, and of gearing in the transmission of power. Before the death of Levassor, it was agreed that the system which gave the best results would be adopted. Daimler's system carried the day.

Gottlieb Daimler began his career as a common mechanic. He was born at Schorndorf in Wurtemberg, on March 17, 1834. After leaving school, he worked as a mechanic in a tool factory

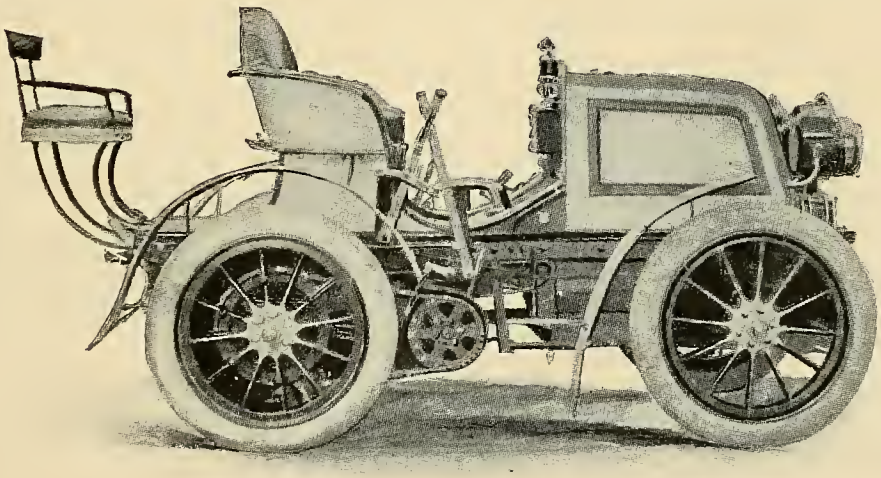
at Grafenstaden, in Alsace. In 1857 he had earned enough money to attend the Polytechnic Institute at Stuttgart. After his graduation there he went to England and France and there continued his studies for two years at several of the best known factories. On his return to Germany, he was employed as an assistant foreman in Geislingen and Reutlingen, but soon left these machine shops to become the foreman of a large machine factory at Carlsruhe. In 1872 he was entrusted with the installation and management of a new factory for the construction of gas motors at Deutz. Within the space of ten years Daimler transformed this factory into a huge establishment of world-wide renown. In conjunction with Dr. Otto he constructed the first gas motor of one hundred horse-power, which has since become celebrated as "Otto's Motor." In 1882 he left this concern and established a factory of his own. It was at this time that he aided the well-known Messrs. Crossley, in Manchester, in their first construction of gas motors which have since then achieved so prominent a place in England.

The first product of Daimler's new factory was a motor with a horizontal cylinder in which the gas was compressed before ignition. By means of a so-called amorce, ignition was produced in such a manner that the motor continued to work, even after the extinction of the amorce. The cylinder was cooled by air flanges. Next year Daimler constructed his first upright motor with a cylinder where all the constructive parts were contained in a tight case. In 1885 Daimler patented the first motor cycle with a motor on the rear wheel. By the end of the same year he was able to turn out his first practical motor carriage. The inventor's genius next turned to a construction of vertical motors for gas or petroleum to be used in launches. This invention achieved instant favor and soon became one of the most profitable products of the Daimler works. In 1887 Daimler patented a motor street car propelled over steel tracks by means of a single cylinder. Change of speed was provided by three pairs of interlocking wheels which could be shifted at will. This invention was exhibited by MM. Panhard and Levassor at the Paris Exposition of 1889, where it excited universal attention.

In all Gottlieb Daimler invented no less than fifteen different motors, all of which were patented by himself, and were turned to immediate practical use. In his personal character the German inventor was one of the most kindly and generous of men. This serves to explain the great friendship that sprang up between him and so many French automobilists. As Baudry de Saunier has told in his Petites Annales, Daimler's factory and private

laboratory at Cannstadt, during the last few years, came to be considered as the true Mecca of all the most progressive *chauffeurs,* and they drove there on their motor wagons from all parts of the continent.

The Hon. Evelyn Ellis, the pioneer of British automobilism, not long ago related this interesting episode of his personal relations with the German inventor. Herr Daimler came to visit him at Malvern, in England. Mr. Ellis' automobile, fitted, of course, with the Daimler engine, carried the inventor over a long drive from the station to the house. After luncheon a more extensive country drive was undertaken, but at the first hill the machine stopped. The combined experience of the inventor and the owner failed to make the motor start. Every known expedient having been tried in turn, Mr. Ellis turned away disgusted, but Herr Daimler gave his motor a slap with his open hand, as if to say, " Now, will you be good?" This slap shook off some soot which had settled on the inhalation pipe, and in a moment the motor was running perfectly. Subsequently Mr. Ellis purchased from Mr. Daimler two of his most perfected motor carriages and no less than six motor tricycles. He did this impelled solely by the personal magnetism of Gottlieb Daimler.



Daimler Fast Speed Autocar

Automobilism in Warfare

(From the British *Automotor Journal*)

EVERYONE knows how and where thirteen horses out of eighteen were killed at Tugela River. There are certain kinds of work for which horses will probably always be superior to engines of any kind; but in an incident like that of the loss of the guns at the battle of Tugela River, supposing the ground to allow of its use, a traction-engine and a wire rope would be invaluable.

Now that the marksman with the rifle has shown himself to be, in suitable country, so much more important a factor in war than had been supposed, it is the more necessary to use mechanical power in military operations whenever possible. The horse is an easy mark to hit and cannot easily be equipped with defensive armor. A train of armored wagons, or one armored wagon, pulled along the veldt by an armored traction-engine might be used in the same way as an armored railway train, and with much greater possibilities. In the case of a quick retreat being necessary the engine might abandon the wagons and carry off the men at its best pace; in case of a slow retreat or reconnaissance the armored truck would be of very great value, as has been proved on the railways in the present war.

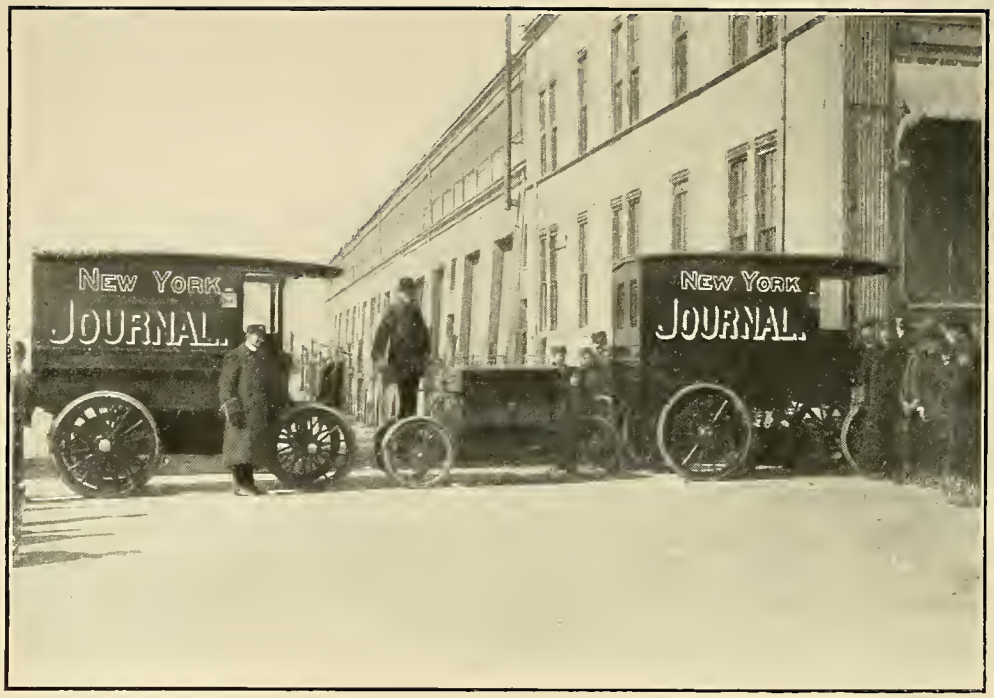
It is a truism that in modern warfare the advantage lies greatly with the defence, and any arrangement which permits of a *defensive attack* being made is worth carrying out, even at great cost and with great trouble.

The value of the traction-engine for transport in war has already been recognized even by our own military authorities, and a few have been sent out to South Africa; its possible value for moving guns and ammunition under fire seems to have been overlooked. "The guns then dashed across the zone of fire at great risk to men and horses and took up on a slight eminence a position which became a commanding one as soon as they got to work." The circumstance is ordinary enough, but suffices to indicate the usefulness of mechanical power in a battle.

A traction-engine might have to be abandoned in various emergencies, but it can go anywhere that heavy baggage trains can go. It is easily "spiked," if it has to be abandoned. It is not easily stampeded; does not suffer from "pink-eye." The cost of keeping an army in the field is so great that anything which expedites a victory is likely to be well worth paying for.

The motor field gun, with a certain amount of protective armor, has considerable possibilities before it—for scouting where there are roads, for pushing forward just before an infantry attack; in the last case the motor to be a powerful one, even if the gun is only a Maxim of small calibre, and the man or men to be as much protected as possible. This last point is an important one. It is frequently urged in the technical and professional Press—urged soberly and logically—that there is not sufficient protection in warships for the crews of our lighter guns, our machine guns and Maxims. The present war seems to indicate that more consideration ought to be paid to defensive armor in battles on land, especially for the side whose organization and resources are superior to that of the enemy, while their marksmanship and mobility are superior. The automobile is recognized on the Continent as of importance in war; the traction-engine also. The latter is being tried by our War Office. It is not too much to say that, in a modern form, the new century will see the revival of the war-chariot.

Auto Traction in the Transvaal



Automobiles for Newspaper Delivery

THE automobile is being used for carrying purposes in nearly all branches of business at the present time, but New York is the first city to use the electric wagon for the delivery of newspapers.

The New York *Journal* has now in use six electric wagons of the carrying capacity of 10,000 papers each, and more wagons will be added to its circulation department as they are built.

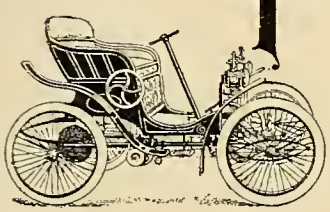
Circulation managers of the various American daily papers have struggled for years with the problem of "making" trains with their enormous quantities of mail and express matter each morning. On Sundays especially this problem is made twice difficult by the fact that there is no movement of mails and that express trains do not wait.

The hustle and bustle attending the issue of a great Sunday newspaper and the subsequent efforts of the circulation department to make, for example, the fast newspaper trains in twelve minutes from Park Row, is interesting.

The Electric Vehicle Company, of New York, are the manufacturers of the electric newspaper delivery wagons.

The Light Road Carriage

By Edward de Nôreme

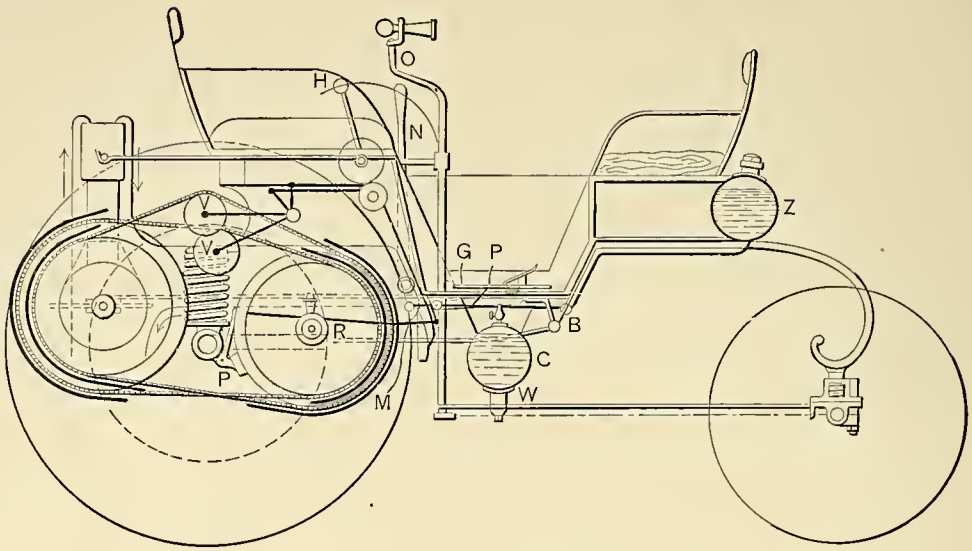


THE endless stream of bicyclists that once giddily flashed by on our avenues has gone to join the brimming river which leads to the ocean of forgotten things. In place of the high-pitched, tinkling cycle-bell we now hear the deep-sounding clang of the automobile-gong. The bicycle maker, through some unaccountable whim of Dame Fashion, has been compelled to convert his cycle factory into an automobile plant. Instead of a two-wheeled machine, limited in its scope by the physical endurance of its driver, he has turned his attention to the making of a four-wheeled machine dependent for its power not upon its occupant but upon some mechanical agency. It is the type of vehicle that has thus supplanted the bicycle which it is our purpose to study in the present article.

The vehicle which most nearly approaches the bicycle in form is the motocycle. Driven partly by human, partly by mechanical power, it is the connecting link between the bicycle and the automobile. And, in truth, we find that in France many a bicycle rider has cast aside his wheel and adopted the motor-driven bicycle or tricycle. Popular as the motocycle is abroad, it is rarely indeed that we find it used in the United States. It may be that in time its cheapness, in comparison with the four-wheeled carriage, will find for it a ready sale, and will induce Americans to manufacture it more extensively than at present. But, now in the infancy of automobilism, the light, two-seated carriage which the Frenchman terms a "voiturette," is the type of motor-vehicle which, in America at least, has begun to supersede the bicycle.

Voiturettes may be divided into three general classes: petroleum, steam, and electric carriages. True it is that there are other mechanical means of propulsion, that vehicles have been driven by compressed air, acetylene gas, carbon dioxid gas, and the like; but the carriage in general use the world over derives its power from one of the three sources mentioned.

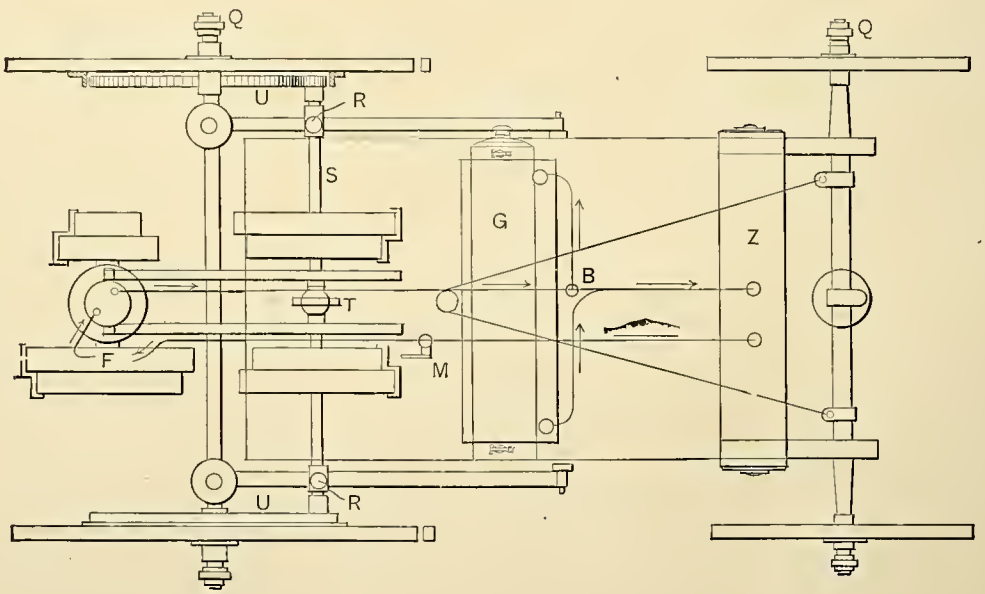
The petroleum voiturette is primarily an European invention; and to Europe we must go to study its development. The rise of the petroleum-carriage began with the advent of the Daimler



Daimler Carriage in Side Elevation

motor; for, before Daimler's time, there was no engine in existence compact and light enough for carriage use. Although a German invention, the Daimler motor was first generally introduced in France, for the very good reason that it found no encouragement in the land of its birth. The Daimler carriage may therefore be regarded as the first successful modern voiturette. To this very day it is one of the most widely used light carriages in the world. In its general features it has not been essentially changed from the time of its first appearance.

In the Daimler voiturette the power is transmitted by means of belts running over tightening pulleys, by the use of which any



of the speeds due to the different sizes of the pulleys can be used. Cooling is effected by directing the heated water into the annular channel of a wheel similar to the water-channel used in friction-brake dynamometers. The warm water is whirled at the speed of the engine flywheel and is taken back by a tubular offtake of the type used in milk separators. The whirling and the evaporation together effect a considerable reduction of the temperature. A carbureter of a novel form is used, in which no air regulation valve is required.

When the Daimler autocar proved a success, other manufacturers immediately sprang up. Not many years passed before the petrol-automobiles of De Dion, Peugeot, Benz, Mors, Bollée, Renault, Turgan-Foy, Underberg, Bouquet-Garcin-Schrive, Dietrich, Delahaye, and Hurtu, sprang into prominence. It

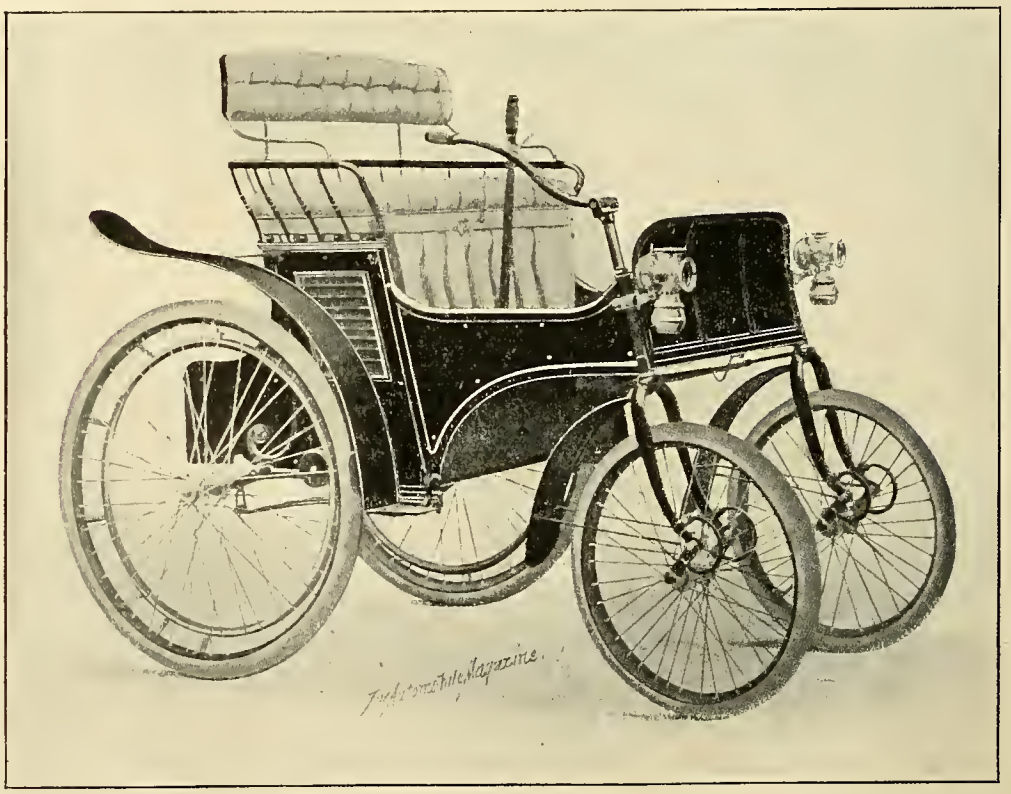
American Gasoline Buggy

would evidently be impossible, with the limited space at our disposal to describe all the voiturettes made by these firms; and we shall, therefore, confine ourselves to a description of a typical carriage in which are included the general features of the vehicles now in use abroad.

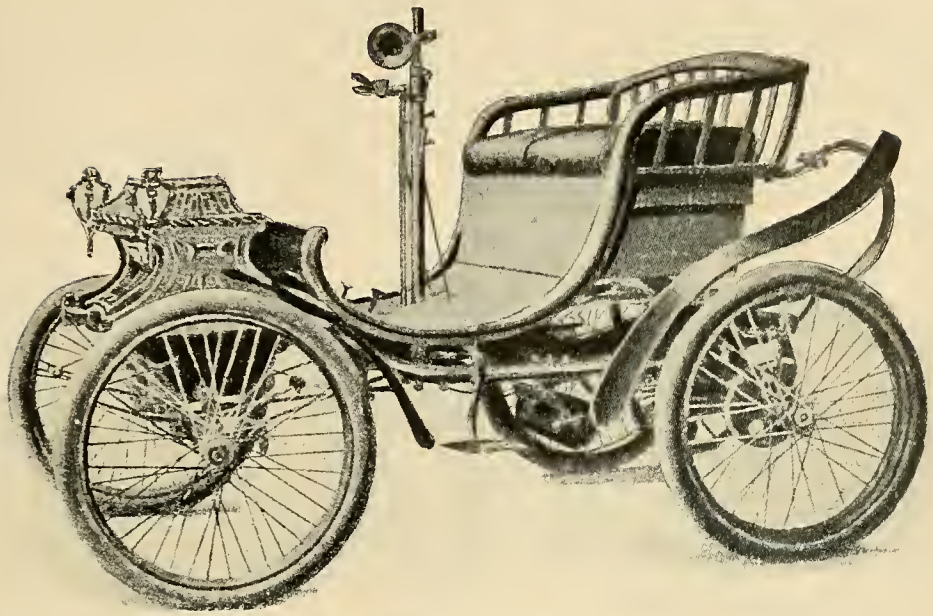
The petroleum voiturette consists usually of a light but strong tubular steel frame, upon which the carriage-body, motor and driving mechanism are mounted. The carriage-body is essentially similar to that of a horse-drawn vehicle, although it is designed to contain various apparatus not found in ordinary carriages. The motor is driven either by petroleum or by petroleum-spirit; and its cylinders are cooled either by flanges, whereby a great heat-radiating surface is obtained, or by means of a more complicated water-jacket, in which a constant circulation of water is maintained. The vaporized, carbureted petroleum is

admitted to the cylinder by special valves, and is exploded by means of an electric spark, or a burner. The successive explosions reciprocate the pistons within the cylinders, causing them to turn a driving shaft connected with the driving-wheels of the carriage by gearing, by chain and sprocket, or by belt and pulley. A speed changing gear is provided by which the velocity of the motor shaft is reduced to the speed required of the driving wheels. Many petroleum voiturettes differ from one another merely in the form of speed-changing gear used; indeed, the hunt for a good, variable speed gear has not yet ended. Within reach of the driver's hand are a crank-wheel to start the motor, handles to control the ignition and admission of gas; levers to command the speed-changing gear and the brakes; and a handle-bar or wheel for steering. These in brief are the characteristic features of most voiturettes.

From a mechanical point of view the petroleum voiturette leaves much to be desired. Gas and oil engines, if the truth must be told, are still but crude contrivances; inventive ingenuity has not been lavished upon them as upon the steam-engine. There is much room for improvement in the means for feeding a given quantity of gasoline into a given quantity of air; and



Oakman Gasoline Buggy



Dalifol and Thomas' "Jack"

for having little more than enough of the explosive mixture in reserve than is necessary to charge the cylinder at the next inspiration. The reduction of the vibration is another problem that has been but imperfectly solved. Although two opposed cylinders with a flywheel of moderate weight have worked fairly well, it will perhaps be found that three or four cylinders set in any convenient manner will better answer the purpose of lessening the vibration.

Lightness—a prime requisite in a voiturette—prevents the adoption of any heavy mechanism for cooling the engine. If water be used, as in many French carriages, water-cooling tubes provided with fins for radiation should be employed, the whole contrivance being arranged in coils. As a general rule motors of small horse-power usually employed for voiturettes are provided with no other cooling means than thin flanges for increasing the heat-radiating surface of the cylinder.

One of the troublesome features of the petroleum voiturette is the necessity for starting the engine by hand. Some automatic device, simple and practicable, should be devised, which would dispense with the necessity of twisting one's arm out of its socket in frantic attempts to start up an engine.

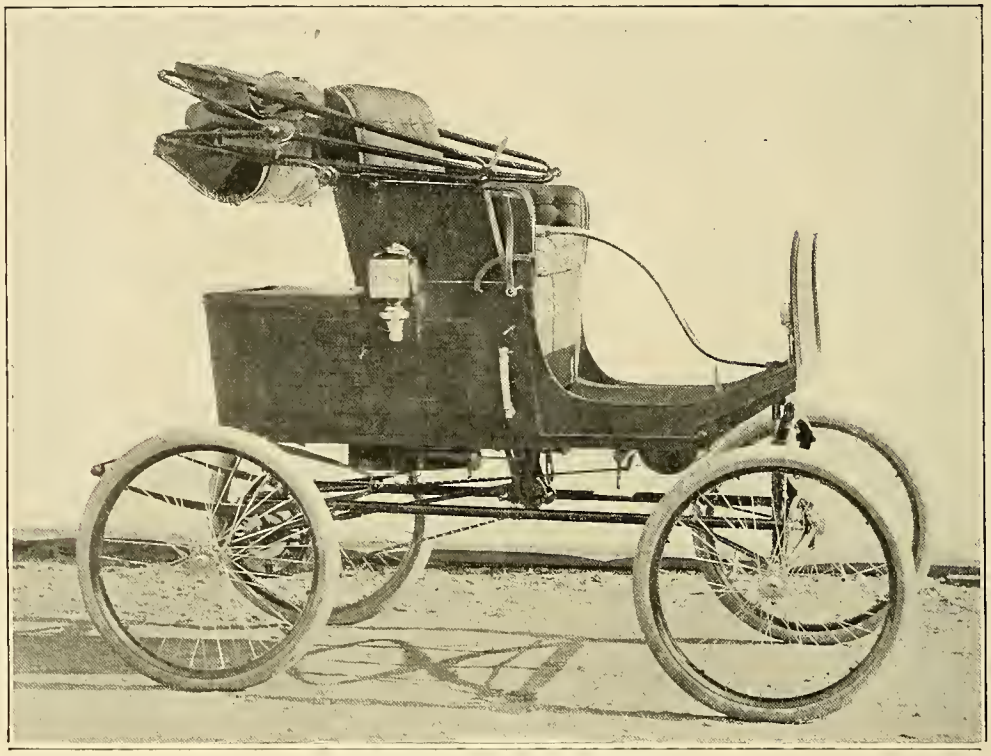
A good, practicable reversible petroleum motor would be a boon to the *chauffeur*. It would do much to simplify the mechanism of the voiturette; for it would dispense with complicated reversing gears.

To be sure we have not enumerated all the evils of the petroleum voiturette; but those which have been mentioned are the

most important and the most difficult of remedy. It remains to be seen whether American ingenuity and American inventive genius can solve the problems which have baffled French and German engineers, whether foreign designers cannot be excelled in their own special department of thought and labor.

II.

The steam voiturette with the introduction of the "Locomobile" has of late assumed a rank even higher than its most ardent champions hoped. Although steam was the earliest source of motive power in the first mechanical road carriages ever devised,



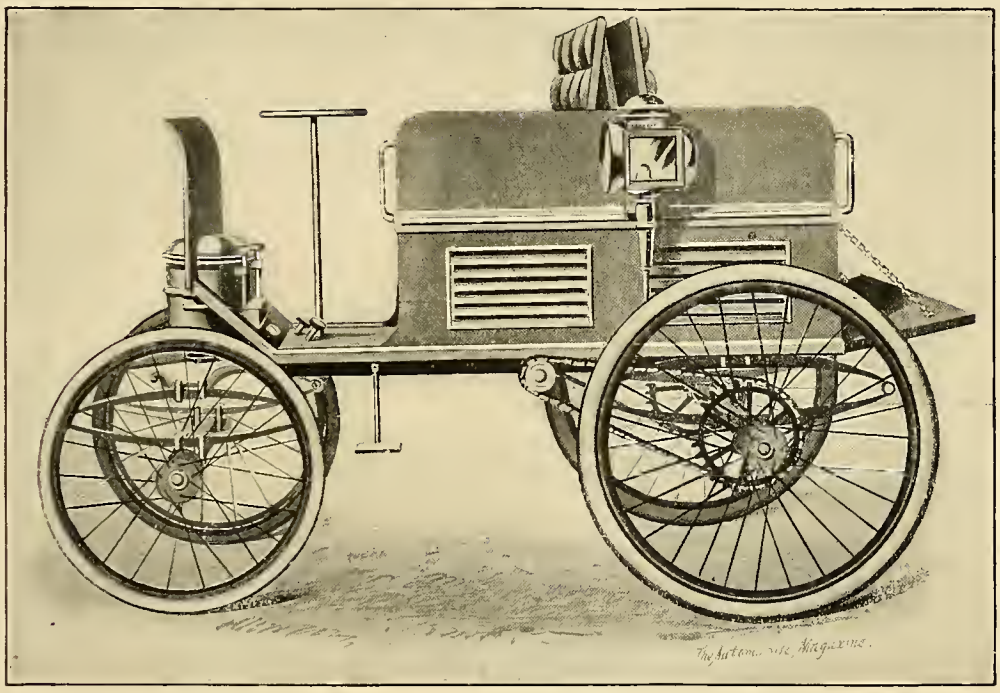
Locomobile Road Wagon

no truly successful steam vehicle appeared until very recent years. The development of the steam voiturette, like that of the petroleum carriage, is connected with the development of a suitable motor; and it was not until Serpollet invented the boiler which bears his name that the prospects of steam automobilism assumed their present rosy hue.

Serpollet's generator is a capillary water-tube boiler, the tubes of which are made in crescent form and cast in an iron casing. It is an instantaneous generator into which the feed-water is forced as steam is required. The tubes must be capable of withstanding heat whether they contain water or not. The boiler as used in the Serpollet voiturette carries a pressure of 300

pounds. The engine employed comprises a pair of cylinders with the crank shaft connected with the driving-wheel by chain and sprocket. The exhaust steam passes into the chamber above the fire-space, thence into the chimney in a superheated condition, and out beneath the carriage. Sufficient fuel is carried for a trip of forty miles; but the water-tank during that distance must be replenished from time to time.

From the pioneer steam voiturette of Serpollet to the modern, light and graceful automobile is a far cry. But the vehicles which followed the appearance of Serpollet's carriage early in the nineties, are of such trifling importance, compared with the two



French Steam Carriage

carriages mentioned, that their omission may well be pardoned in a brief review of the voiturette.

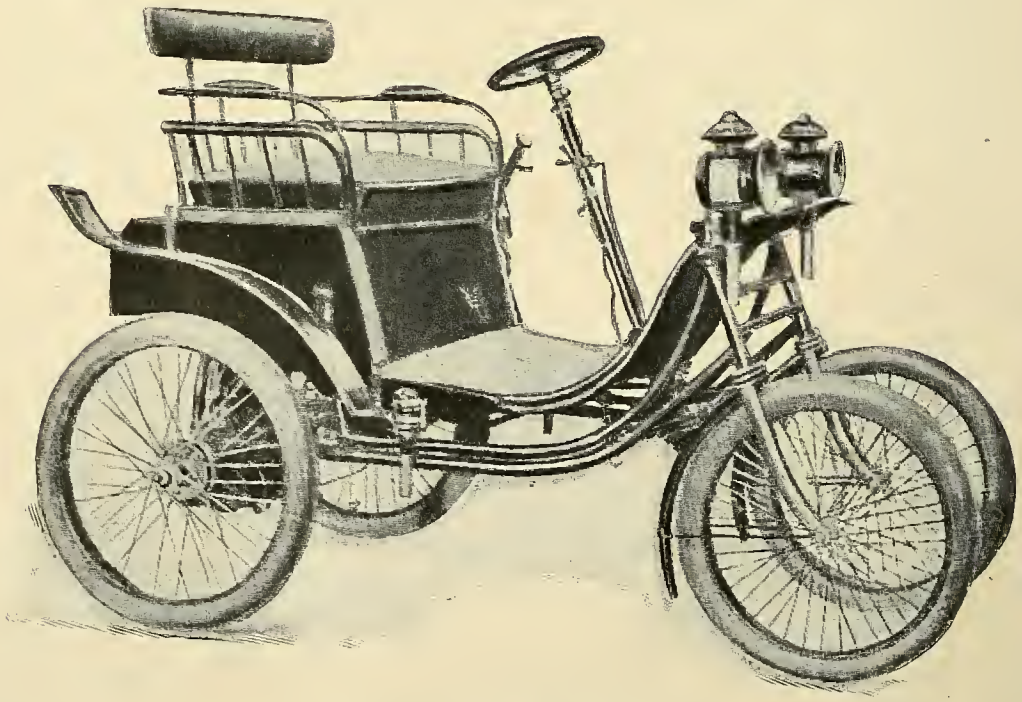
The distinguishing feature of the "Locomobile," as in the Serpollet carriage, is the steam-generator. The boiler used is composed of a cylindrical, wire-wound, sheet-copper body, at each end of which is a steel plate pierced with 300 holes to receive as many copper tubes providing flues for the hot gases coming from the hydrocarbon burner beneath the boiler. A second, interior, cylindrical casing receives the hydrocarbon, already vaporized by its passage through a feed-tube extending to the boiler and connecting with the burners. The second cylindrical casing contains 114 short copper tubes forming as many air flues,

about which are located 20 capillary orifices through which the flames of the burning oil escape to heat the vertical tubes of the boiler.

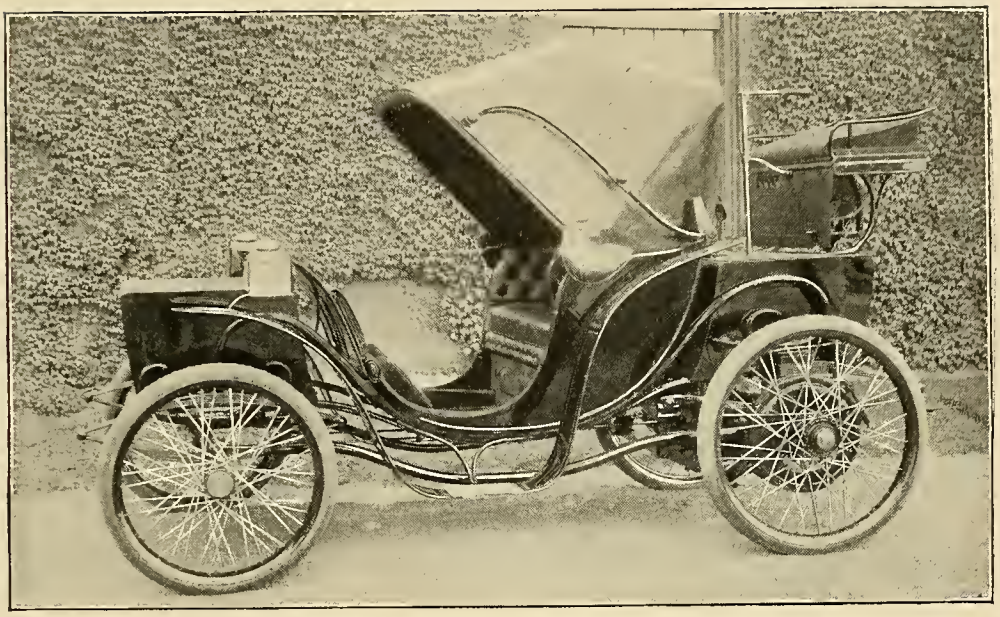
The motor used is a miniature double-cylinder marine engine, the reciprocating motion of the pistons being converted into rotary motion by the usual connecting-rods and cranks. Sprocket and chain are used to transmit this motion to the driving-wheels.

From the engineer's standpoint the steam voiturette of the most recent type is perhaps a more satisfactory vehicle than the petroleum carriage. The steam-engine has certain indisputable advantages over other motors. It can be stopped and started at any instant and made to give any power from a few foot-pounds up to its full capacity. It has more latitude than any form of motor in use.

It is somewhat astonishing that a rotary engine of the turbine type has not yet been applied to the voiturette. The power developed within an incredibly small amount of space, and the great saving in weight would render the turbine particularly adaptable to the automobile. The problem to be solved is the provision of a gear which will reduce the very high speed of the steam turbine down to the speed of the driving wheels. When such a gear is devised, the rotary engine will prove itself a far more economical and efficient source of power than the high-speed reciprocating engine.



Gallet Hasse's Gazelle



Electric Vehicle Co.'s Victoria

III.

Wellnigh countless is the number of electric voiturettes. Their name is legion. It would be a task of no mean proportions, even with unlimited space at one's disposal, to describe all the various forms of the light electromobile; for which reason following the course already pursued we shall confine ourselves to a description of the general type.

The electric voiturette includes in its driving mechanism a storage battery, one or more motors, and a compound switch or controller. Within reach of the driver's hand are a controlling handle, a reversing handle, by which the direction of the vehicle can be reversed, a brake-lever, various switches, and instruments of electrical measurement. The accumulators are capable of yielding a certain amount of power—an amount which varies with the manner with which it is applied.

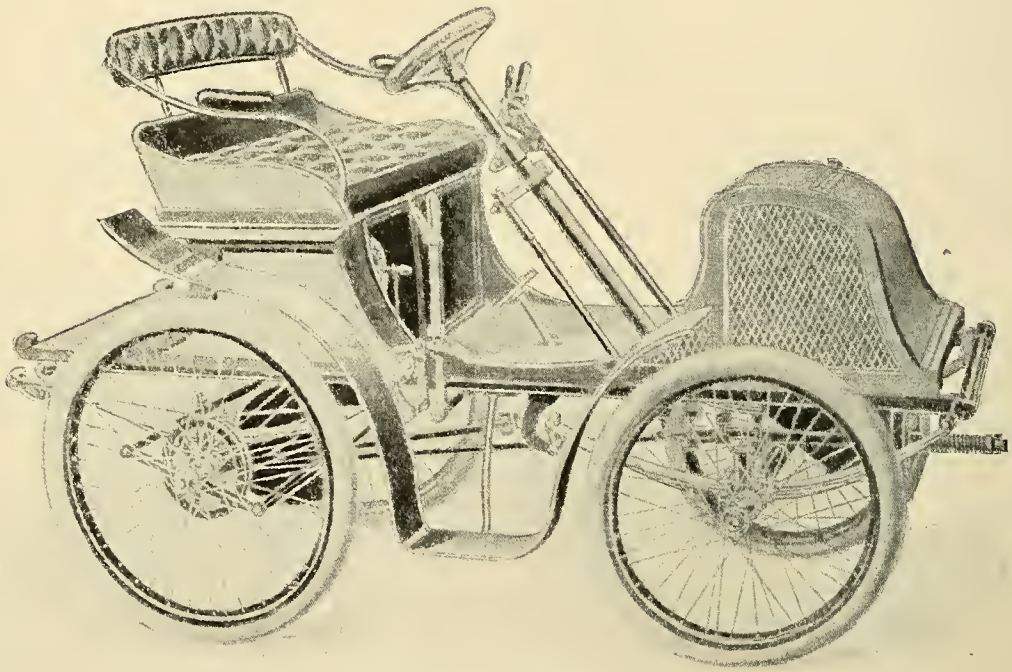
In certain respects the electric voiturette is the simplest form of mechanical carriage at present in use; but its advantage of simplicity is offset by defects which are very generally known and which have been very exhaustively discussed. The *bête noire* of the electromobile is the storage battery. Its weight is out of all proportion to the energy which it yields. Its limited capacity restricts the carriage in its sphere of action. It often short-circuits; its plates buckle and disintegrate; its cells deteriorate. But with all its deficiencies, the electric voiturette is the speediest

automobile built, the carriage most popular in this country, the vehicle generally chosen for racing purposes.

IV.

What will be the voiturette of the future? Will petroleum, steam, or electricity triumph? It is doubtful whether power alone will determine the type of the coming light road-carriage. The vehicle which will be most widely used, will undoubtedly be that which is the simplest, that which can be most readily operated by men of little mechanical sympathy. Little or no skill must be necessary; otherwise the automobile will find as scant favor with "the man in the street" as a complicated airship.

The subject of speed will receive more attention as the voiturette will be more generally used. Beyond a doubt many of our manufacturers are at present sacrificing too much to speed. Are great speeds at all necessary in ordinary voiturettes? It is manifestly useless to build carriages for very high speeds; for they will not be permitted to run beyond a certain maximum point. Even if the law do not restrict the swift automobile, it is doubtful if the more sober-minded *chauffeurs* will buy carriages with powerful engines, the full energy of which will rarely be used. Lightness, as well as simplicity, is one of the prime requisites of a voiturette; and lightness can be obtained only by motors and gears of small weight.



Barré Voiturette

The Practical Automobile of the Future

By E. E. Schwarzkopf

TO judge properly the state of affairs in automobilism, we have to elevate ourselves above the general opinion of the automobilist. Ignorant of what is going on in the factories and laboratories he is naturally a partisan of the automobile *en vogue,* moreover he becomes a fanatic defender of the machine he has bought, the one which causes him no end of trouble.

A review of the development of the automobile shows us the locomotive descending from its rails to the ordinary highways giving thereby the first impulse to the automobile, but the heavy weight makes the road locomotive impossible.

All efforts were directed to diminish the weight of the boiler, the engine and all other mechanical parts. The outcome of these attempts were the Serpollet steam motor with instantaneous vaporization, and the light locomobile invented by the Stanley Brothers.

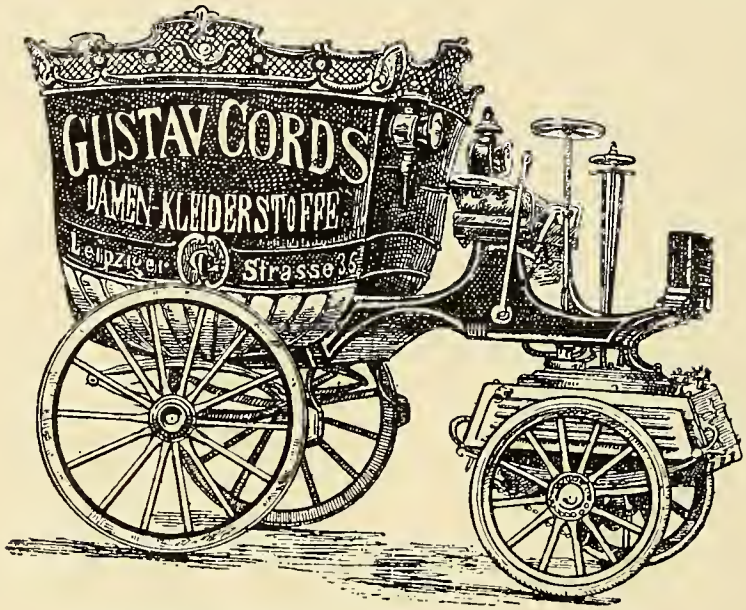
In the meantime, new horizons opened up to mechanical propulsion and traction in consequence of the application of electric accumulators.

The simplification of electric control and the possibility of placing its mechanism upon any carriage arrangement whatever caused the excessive weight of accumulators required by the use of electric motors to be overlooked, and placed electric force in the very front rank of such forces as had as yet been employed for actuating vehicles mechanically.

The cherished dream of a motor driven by a force that should be supplied without any visible source than that produced in the form of carbureted air (gas, gasoline and alcohol) was realized. But that motor, apparently so simple, which was to give so great an impetus to automobilism, seems at present to have become a pitfall. In fact, far from accommodating itself, like the electric motor, to the most advantageous arrangement of the structure of vehicles, it occupied the latter entirely, with the result that, by taking the place of the passenger, it relegated him to the front of the carriage. This inconvenience would

have been of but secondary importance had it not been accompanied with that of requiring a rigid general arrangement, causing the disappearance of the very practical steering forecarriage, and the substitution therefor of pivoted wheels, which, on account of their turning about in steering, are very dangerous.

In whatever state of progress automobilism may be, and however perfect the automobiles upon the road to-day may seem to the inexperienced, disinterested professionals know that this industry has not as yet finished its travail. Far from having gotten beyond the period of transformation, in order to enter that of improvement, automobilism is giving rise to experiments of which the object is to create new combinations that will have the result of allowing the carriage to retain its true character,



Vollmer's Commercial Delivery Wagon

and of abandoning to lovers of sport those vehicles of unnamable forms—those species of hearses, in which it is difficult for the vehicle to afford even one compartment amid the mechanical parts, which make a workshop out of what should be a carriage.

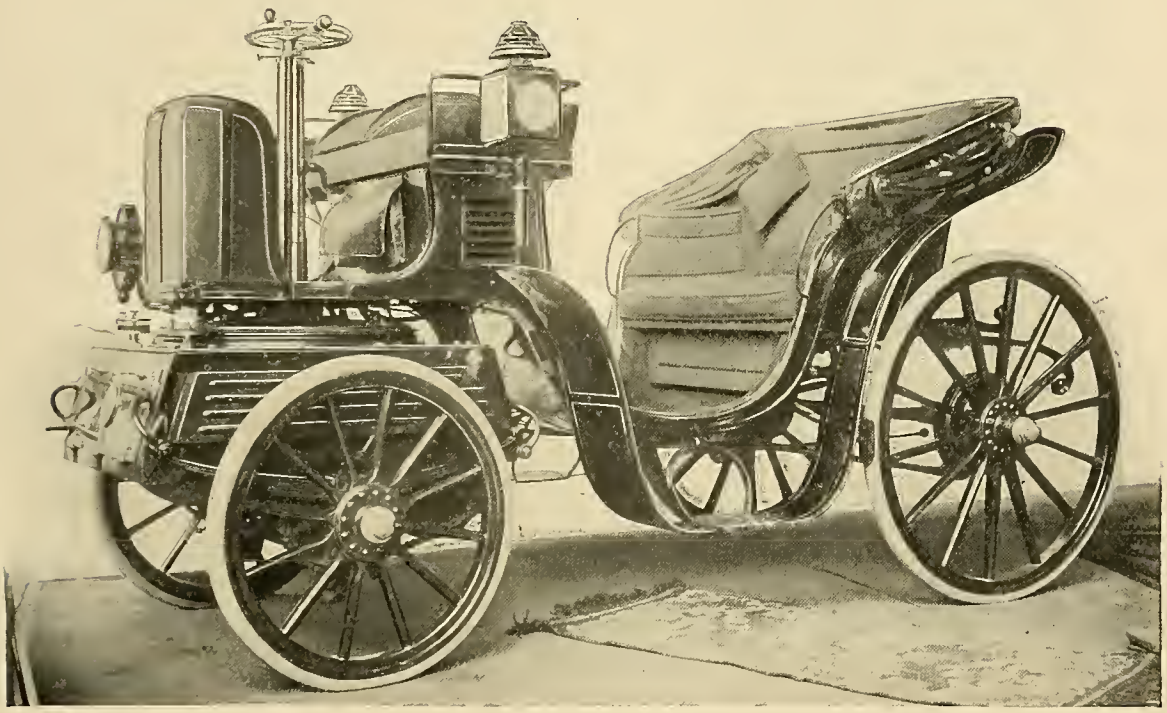
We do not care to attach any importance to those improvements in details that abound, since what exists, being defective at the foundation, is not perfectible.

What the world of automobilists regards with admiration at present is certainly not the mechanical carriage of the future, that which our children will improve, and that which will cease to be the preference of lovers of sport.

In order that the automobile may enter the practical period, front traction must be substituted for rear propulsion, and the

vehicle must be disburdened of wheels turning around a pivot. These two improvements will go hand in hand with the suppression of the four-cycle gas motor with a flywheel. This latter improvement will involve all the others. The association of the said motor and all the accessories requires too much space to allow them to be placed advantageously in front.

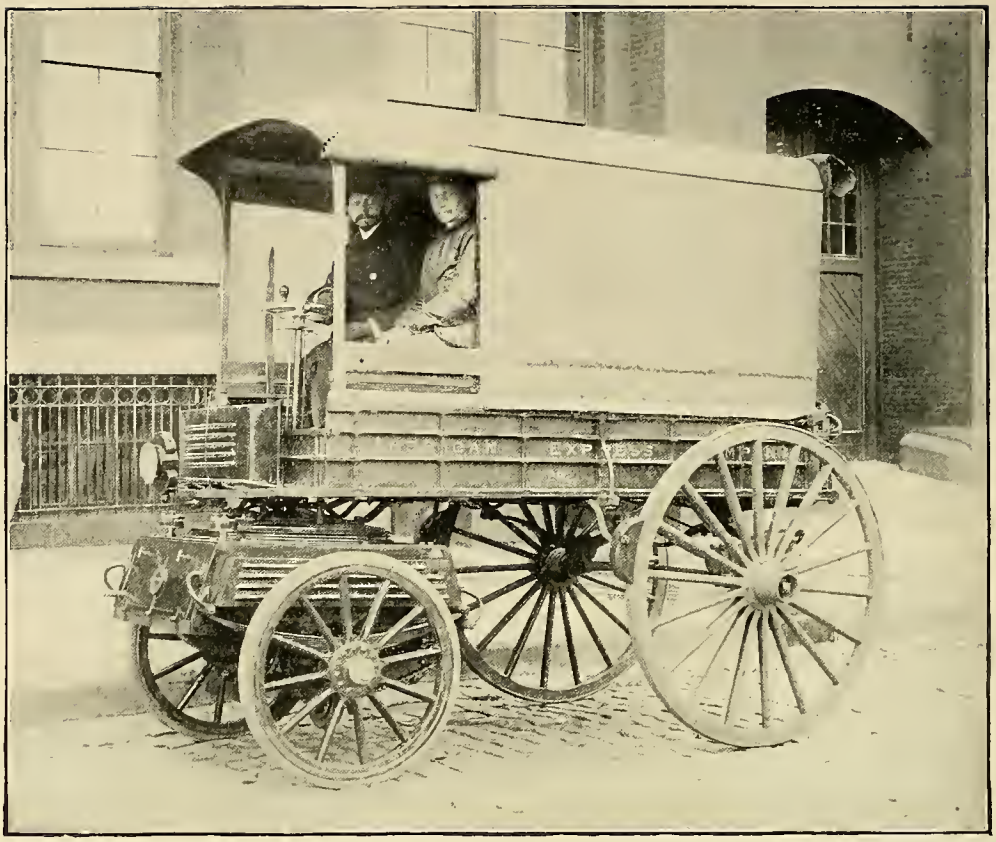
Taking such requirements into consideration many French and German engineers, like Vollmer, Blot, Pretot, Darracq, Doré, de Riancey, Krieger and Ponsard Lucie Marzia, have been led to invent an automobile actuated by its fore-carriage.



Vollmer Victoria

But most of these experiments, of which several indeed seem as if they were to be put to practical use, encountered difficulties connected with steering and controlling. Such difficulties, however, the German engineer, Vollmer, in connection with a hydrocarbon motor, and the French engineer Blot, in connection with a rotary steam engine with conjugate helices, have triumphantly overcome.

We have said that the mounting of steam and gasoline motors upon fore-carriages, in view of the complication involved, not only by their installation, but also and more especially by their control, presents great difficulties; while electric motors, on the



Vollmer Forecarriage, hitched under a Delivery Wagon of the American Express Co.

contrary, naturally find their place upon this part of a vehicle, since they necessitate no rigid controlling parts. We find that a number of experiments are being made in this direction, and observe numerous front-hauled electric automobiles already running in the streets, while the number of front-hauled vehicles actuated by steam or gas motors is very limited. And yet the application of gas and steam motors to automobiles is rendered peculiarly easy by the cheapness at which automobilism obtains its force.

But it is toward the lightness of the parts of the engine, and toward their grouping that all the efforts of inventors seem as yet to be directed, and the question of economy is relegated by them to the background.

Engineer Vollmer and also Engineer Blot have taken such observations into consideration, and the following is a sketch of their conceptions.

In both devices the entire mechanism is placed upon the forecarriage. This latter is a tractor, a steerer and a controller, in

other words, it serves at the same time to haul the vehicle, to steer it and to control it, as required by the driver.

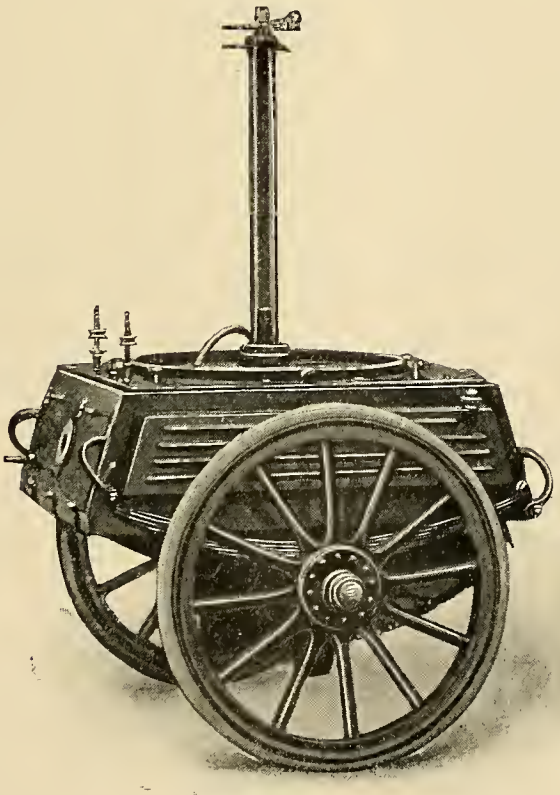
The fore-carriage embraces within itself the whole mechanism, the controlling apparatus which stands in front of the driver, so that when the fore-carriage is separated from its vehicle, it carries with it its entire controlling mechanism and may be immediately coupled to another vehicle.

It is in the combination of the motor with the vehicle that lies the problem of the automobile of the future. The combinations made up to the present have, as we have said already, had the effect of disforming the vehicle.

The fore-carriage system unites extreme simplicity with great strength, and has that essentially practical character that immediately attracts attention and permits, so to speak, to fill a public want.

The fore-carriage fully justifies the high estimation in which it is held, since it is the mechanical device par excellence that is to start automobilism upon a truly practical and economical path.

To answer the numerous inquiries we are daily receiving about the Vollmer Fore-carriage, we are authorized to state that the Automobile Fore-carriage Co., Astor Court Building, New York-have not secured the Vollmer Patent, and that they are not authorized to make the Vollmer Fore carriage —Ed.



Vollmer Vorspann

A False Alarm

By E. Y. H.

THE two brown mares, Lady Fay and Lady Gay, had their heads together as usual, and rubbed noses lovingly. They occupied adjoining stalls in the stable, but, in their case, distance would have had no power to make the heart grow fonder.

"What's the matter with Little Billy?" inquired Lady Gay anxiously, "he seems so forlorn, and hangs his head in such a dejected way that I believe he must have received bad news; perhaps he has lost some friend or relative in the South African war—a cavalry charger, mayhap.

Lady Fay turned her head lazily in Little Billy's direction, and gazed at him calmly and deliberately with her soft, large and sleepy eyes seemingly only half open. In harness Lady Fay was as frisky and lively as her master could desire, but out of harness she made it a point to cultivate a languid and blasé air, to the secret amusement of Lady Gay, whose manner was the same at all times and in all places.

It would have been evident to the most careless observer that poor Little Billy felt indeed forlorn. He turned his back on his fellows, left his oats untouched, and neighed and whinnied in a manner that might have moved a heart of marble.

"Why, Little Billy, dear Little Billy," cried Lady Fay, roused from her apathy and neighing out of genuine sympathy, "what has happened; are you in any trouble?"

"Yes; something dreadful *has* happened," answered the old horse with a mournful shake of the head. He was silent a moment, and then with a jerk, as if it were necessary to force the hated word out, he added: "Automobiles."

"Automobiles!" repeated Lady Fay. "Automobiles!" echoed Lady Gay. "We have never even heard of them," cried both mares in one breath.

"Neither had I until a few days ago," said Little Billy, "Master John the other day was driving me tandem with Fleetfoot down that long country road between Bryantwood and Old Port Leicester. Suddenly an automobile went whirling and whizzing by, and I hope I may never live to see another. Well, I am an old horse now. I have had my day; I have had my day," he continued, half to himself, "and man is welcome to

improve on me with his modern appliances and new-fangled inventions, but I must say," raising his voice a little, "it's desperately hard on young things like you, with life before you. I don't see what in the world is going to become of you."

"Don't worry about us, Little Billy," answered Lady Gay, "we shall manage to take care of ourselves whatever happens. Lady Fay and I have plenty of good, old-fashioned horse sense. But we have not the ghost of an idea what awful fate is hanging over our heads, and what kind of a monster an automobile may be."

Fleetfoot, who had been Little Billy's companion in the eventful tandem drive, looked mysterious.

"For my part I call it more of a freak than a monster. Shades of Pegasus! it did not frighten me a bit, and I wonder that a grave and dignified horse like you, Little Billy, could show the white feather, and rear and plunge like an untamed colt at such a trifle."

Little Billy looked rather shame-faced, and did not attempt to defend himself.

Lady Gay, however, was the personification of anger; her nostrils quivered and her eyes blazed.

Little Billy was a great favorite of hers, and she could not bear to hear him ridiculed—by Fleetfoot, least of all.

"For shame," she exclaimed passionately, "how dare you speak so! Little Billy is worth a thousand of you, and yet you have the face to sneer at him before the whole stable. Wait until you are old as he is, then you will find that 'trifles' have power to alarm you, and that the want of thought and sympathy in others will make you realize your own old age and helplessness."

After this storm of invective, under the pretext of munching a few oats to satisfy hunger, but in reality because he felt the current of public opinion to be running strongly against him, Fleetfoot had the grace to hide his head in the manger and take no further part in the discussion.

"Tell us, Little Billy, what *are* automobiles?"

By this time the curiosity of every horse in the stable was roused, and all waited impatiently for an answer to Lady Gay's question.

"I could not have given you much information a week ago," he responded, "but now that I have seen an automobile in action, besides having overheard a conversation between the coachman and the stable boy, concerning its mechanism, advantages, and shortcomings, I may be able to describe it to you.

"Two or three days ago, after that tandem drive, Joe and Timothy drove me down to Bryantwood.

"We went along in silence for some time, then Joe spoke, 'Say, Tim, I saw quite a big lot of those automobiles last time I was up to the city for Mr. Hallowell. Master, says he, "keep a sharp lookout for them automobiles, and learn all the particulars yer can about them." Seems he thinks o' gettin' rid of several of the older horses, Little Billy as we're a-driving now and the likes of him, and investing some capital in these new inventions. Well, they *are* just the queerest! Have a sawed-off, not-quite-all-there kind of a look. Horseless carriages, motor cars, or electric wehicles is what them city chaps calls them. Some is propelled by what is known as gasoline—same stuff, yer know, as the women folks use to rub fruit stains and all that kind o' thing out of their dresses. Land's sakes, Tim, yer just should hear the fuss and commotion them gasoline ones make. I'll be jiggered they ought-to-go after blowing their own trumpet in such a brazen way. Ha! Ha!'

"Here Joe laughed hugely at his own joke, and I thought he would never know when to stop.

"You may be sure I was feeling very badly; it was not pleasant news that had been sprung on me. I have grown old in my master's service, and after having served him faithfully all these years, I am now to be sold—to some rascal of a horse-dealer, I suppose, so that there may be cash in hand to buy, and room in the stable to keep one of those dreadful automobiles.

"Tim, however, did not appear to appreciate the coachman's wit. Indeed, he was unusually silent. You know, as a rule, he is rather a talkative fellow. So I was somewhat surprised at his silence."

"'Well, I call it a crying shame,' says Tim, 'if master sells Little Billy. And him so quiet and good, too! Why, he is the best horse we have by a long shot, and has never been known even to kick. Don't believe any automobile, not even a fierce and screeching one, could make up for a-losing him. Shan't say anything more about it, though, being sort o' worked up on it, and when a feller feels that way—well, as they taught me at school, silence is golden.'

"Here the talk drifted into other channels and was not particularly interesting to me.

"The previous remarks that had been made on automobiles and my probable future gave me plenty of food for thought, and threw me into a most uncomfortable frame of mind.

"Well, friends," here Little Billy paused, threw back his head

proudly, and let his gaze wander over the stable. Every horse was listening intently, and Little Billy was assured of the fact that he had sympathetic and respectful hearers.

Little Billy continued, "I am afraid my fate, at least, is sealed, and there is no telling when yours may be. Sooner or later, I suppose, for these automobiles seem to have come to stay. From all accounts they are a great economy, saving their owner's time, money, and trouble. It is a hard thing to own up, but I am played-out now. Automobiles are new and they will sweep clean as like new brooms."

The effect of Little Billy's words on the other horses had been most profound. He had spoken—now passionately and angrily—now softly and pathetically, and he had never for an instant lost their undivided attention.

Lady Fay was not an emotional creature, but it was evident that Little Billy's words had touched her, even as they had Lady Gay.

The mournful way Lady Fay shook her pretty head, and her pitiful little whinnies were very expressive of her deep sorrow and sympathy for Little Billy; and they drew an admiring glance from Fleetfoot, who by this time had somewhat recovered from the effect of Lady Gay's sharp rebuke.

Fleetfoot stood in great awe of Lady Gay. She was certainly very much of an obstacle in his path and kept so close a watch over her friend, that he had to resort to all kinds of curious expedients to carry on his flirtation with Lady Fay.

But he was a plucky horse, full of dash and spirit, and we may be very sure he was just the one to win a lady's favor, and that in spite of Lady Gay's watchful care, he finally succeeded in his wooing of the pretty chestnut mare.

The subject of automobiles, being an extremely disagreeable one, was dropped from general conversation by common consent. It was only spoken of in whispers, and very seldom. There was a skeleton, a gruesome and horrible one, in the stable now to cast a black shadow over everything and everybody, and make life scarcely worth living to many of its inmates—and that dreaded skeleton was nothing but an automobile!

And yet they talk about "horse sense!" Why, "there ain't no such thing as horse sense," to quote that worthy authority, David Harum.

Little Billy had described himself as "played out." The truth of his description became more and more apparent as the days went by. He took little notice of his old friends, and seemed to find his greatest happiness in being thoroughly miser-

able. It was not by behaviour such as this that he had become the reigning favorite with every horse, mare, and colt of his acquaintance.

Little Billy, who had once been the life of the place, now so cheerless and sad!

But his friends understood; even Fleetfoot realized what had so completely changed Little Billy, and treated him gently and considerately in consequence.

But it so happened that the poor old horse was making himself unhappy over an imaginary grief after all.

An automobile, gaily cushioned and brightly enamelled, soon made its appearance in the stable, but Little Billy and his old friends lost no share of their master's affection and gratitude.

They were not sold, but put out to pasture in a pleasant orchard, and in winter time the old coachman gave them the care and consideration due to veterans grown gray in service.

Wonderful to relate, Little Billy learned, in course of time, to regard an automobile not only with composure, but with downright gratitude in his equine heart.

The Jingle of a Joyful Jehu

Frank X. Reilly, Jr.

" Behind the fretful beasts I've sat for years
A-jigglin' an' a-jugglin' of the reins,
A-whiskin', through the avenoo, my peers
Or haulin' timber through the country lanes.

" I've drove most everything from dray to hack;
From a thousand ears I've flicked as many flies;
Through ups an' downs an' downs an' ups—an' back—
I've broomed an' curried hosses—to the eyes.

" But I'm not sorry after all, at bottom;
I knew it was a-comin' at the start,
When the master he talked catalogs, an' got 'em,
An' now I run a red-wheel hossless cart!"

The Automobile in Colonial Development

By Sylvester Baxter

THERE can be no question that the automobile will play a most important part in the development of the new colonial possessions of the United States. What those countries need for the adequate exploitation of their immensely rich resources is proper transportation facilities. New railway lines, of course, will supply these to a very great extent. But all of them are greatly in want of proper systems of highways and one of the things to which attention on the part of the new governing powers must be given in the near future is the supply of this want.

It is not meant by the foregoing that there are no proper highways on the various islands that have lately passed into our control. There are good highways to be found in Cuba, in Puerto Rico, and even in the Philippines, but what is wanted in each and all is a thoroughly planned and developed system. The fact that some excellent roads exist there already implies that many of the kind can exist there equally well. Cuba is often spoken of as a country absolutely without roads. This is doubtless true in regard to certain districts. But in the western part of the island, in the neighborhood of Havana, there are good roads in considerable number, and a most interesting account of an automobile excursion from Havana for a considerable distance into the country lately appeared in the newspapers. General Wood made a splendid beginning with a system of perfect macadamized highways for Santiago Province while he was Governor there, and also gave the City of Santiago a superb asphalt pavement for its principal streets. General Wood is a man who appreciates the meaning of good roads for civilization, for good order and for prosperity. And now that he is Governor-General of Cuba he will naturally make it one of his main objects to cover the entire island with a network of good roads. Our very sensitive friends, the Cubans, may object to seeing their island considered under the caption of this article. The writer, however, is actuated by the sincerest regard for their welfare, and a discussion of the subject would hardly be complete without a consideration of the conditions of the problem in Cuba, whether or no that island is permanently to be a colony, dependency or

integral part of the American Union. The fact remains that the Americans are now in control there and are responsible for the proper development of the island in the ways of peace and prosperity. And its endowment with a first-class highway system and the proper utilization thereof by the best possible means of modern transportation must be one of the main instrumentalities to that end. Until this work has been thoroughly carried out our mission in Cuba cannot properly be ended.

The torrential rains of the tropics are often pointed to as a great obstacle to the creation of satisfactory roads in such countries, their force making the maintenance of the roads impracticable without an enormous expense. The actual facts, however, do not support this theory. A good road will naturally go to destruction sooner or later if due care is not given to it. But in various parts of Europe many good roads built by the Romans are in regular use to-day. The tropics do not have the destructive action of frost to contend with, and the harmful influence of heavy rains can be counteracted by well considered engineering in the first place, proper construction in the second place, and careful maintenance in the third place. The Dutch have created in the Island of Java a system of superb roads from end to end. With the luxuriant vegetation they make the island like one great park throughout, so that traveling there is a rare delight. The British have done a similar work in India and in other colonies of theirs. It is evident that we can accomplish similar results in the Philippines. When we do, nothing will be a greater factor in the establishment of good order in the islands and in the achievement of an unprecedented prosperity there.

The Spaniards themselves have shown us what can be accomplished in that line in their former possessions. The trouble with them was not that they did not know how. They knew how most admirably. But they did not appreciate the importance of the work to the prosperity of their possessions. Or, if they did, the officials in charge did not care. If a fraction of the peculations which the governing officials committed, in oppressing in people with excessive taxation and then appropriating the greater portions of the revenues to themselves—if a fraction had been devoted to the establishment of good roads the increased prosperity would have made the people abundantly able to bear taxation.

Puerto Rico offers excellent examples of the best and the worst of highway conditions, side by side. Mr. William Dinwiddie, in his admirable book on the island,* tells us that the

* Puerto Rico : Its Conditions and Possibilities. By William Dinwiddie. Harper & Brothers, 1899.

finest road in the western hemisphere is to be found in the Island of Puerto Rico: "In fact it is a road equalling for surface and as a feat of engineering skill any in the world, with the exception of some of the marvellous roadways across the Swiss Alps. It was built by the Spanish Government at an approximate cost of four million dollars, for military purposes solely; and traverses the island from side to side diagonally across its very heart for 133 kilometres (over 80 miles)."

AMERICANS TOURING IN PORTO RICO

"This magnificent highway," says Mr. Dinwiddie, "was commenced in 1880, under General Sanz's military regime in Puerto Rico, and completed eight years afterwards by General Pulido Gomez.

"It is macadamized from end to end with finely broken calcareous rock, which cements itself into an almost solid floor. It has good bridges over the numerous fast-flowing streams, with

the exception of four small rivers just north of Ponce, and the gradients are as low as it is possible to make them without extreme tortuousness of the highway. Every few kilometres are found substantial single-storied houses, with red roofs, called 'camineros,' in which the road-tenders lived, whose duty it was to keep the road up to the high standard originally set by its promoters."

This road crosses the island through a wonderfully beautiful country—enchanting valleys, wild mountains, emerald vegetation, crystal streams, and a constant succession of tropical marvels. In passing over the mountains at various points it turns and twists in its course like a gigantic serpent trailing over the landscape.

Here is a sunrise scene on the road, described by Mr. Dinwiddie: "A thousand feet below us the thousand little valleys cut by the mountain streams and walled by steep ridges, covered to their very crest with the green of growing things, lay partially veiled in darkness or lightly masked by the white diaphanous clouds of vapor which seemed gently to caress each blade of green, as they slowly floated upward toward the now sunlit and tinted peaks above. It was a wondrous sight, such as could be found nowhere in our own country. Here was not the topography of the grandly sublime ranges we find in the Rockies, not the product of the awful powers of nature as displayed by the grim, barren, needle-pointed peaks and parched and barren valleys of our southwestern deserts. It was a landscape carved in surprising forms, with the elegance and symmetry of rounded hills and deep-set valleys, and everywhere covered with the magnificent foliage of a climate warmed by a torrid sun, and watered copiously, day after day, by a moisture-laden atmosphere."

The charm of this road must be something incomparable. It is evident that this glorious highway alone is sufficient to assure success for the automobile company which some of our enterprising countrymen have organized for Puerto Rico. The other extreme in the way of highways, however, is equally in evidence on the island, and unfortunately it affects a greater number of the inhabitants. It is an abrupt transition from the perfection of road-going presented by the great military highway to the ordinary roads that alternately have the character of a slough and of the bed of a dry mountain stream. And still worse are the trails that form the major portion of the highways on the island, practicable only for saddle and pack animals.

A typical road of the bad variety is that represented by the greater part of the way from Ponce to Adjuntas, through one of

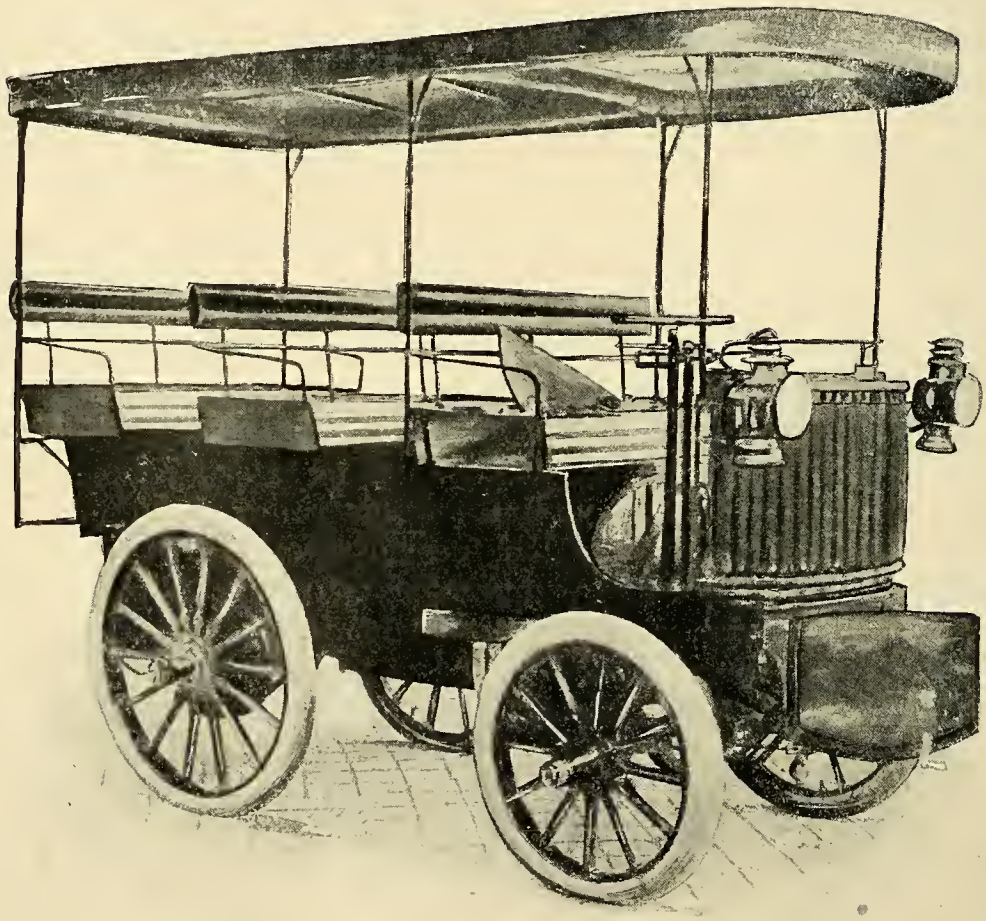
the finest coffee regions in Puerto Rico. The first 12 of the 30 kilometres are over a good military highway, but the rest of the distance is most painfully traveled. The beautiful macadamized road ends abruptly at the turning of a rocky cliff, and the rest of the way there is quagmire after quagmire. "All that is lacking to convert the remainder of this road to Adjuntas into a fine highway," says Mr. Dunwiddie, "is the macadamizing of its bed, for the survey and earth-cutting were completed many years ago. The natives will assure you that it is a 'camino real,' but that it is 'mucho malo' in rainy weather. Its frightful condition is much augmented in the coffee-packing season by the heavy ox-carts which are laboriously hauled through the axle-deep mud by many yokes of oxen. There are almost ten miles of up-hill work from the ocean side before the high, sharp crest of the mountain-range, 1,700 feet above sea-level, which overlooks the Valley of Adjuntas, is reached. There are many exquisite windings in this miry road; here it overlooks a gorge 600 feet below, from which rises the hollow roaring of cataracts hidden away from sight by the rank and overarching vegetation; there it abruptly swings around into a deep re-entrant, across whose horseshoe form the meandering road may be seen half a mile away, and in whose deepest curve a beautiful cascade noisily dashes from rock to rock, embowered in the green of ferns and vines and lanias.

"From the great crest at the top of the range, the ocean, a dozen miles away, seems to rise up on its outer edge like the curving of a huge saucer, and the few vessels far out on its waters are but tiny specks through the glasses. Toward Adjuntas, range after range of mountains is seen to the northward, and it is seldom that so rough a landscape is found in such a small area. Not a foot of the country, so far as the eye can reach in this direction, seems to be level, and yet this valley and the one of Utuado beyond are among the foremost coffee regions of the island. The road down the mountain to Adjuntas is formidable. Out on the ragged edge, overhanging the deep ravines, is a pathway good and firm; inside, for 15 feet to the edge of the heavy hanging wall of rock, it is knee-deep and even breast-high with mud, so tenacious, so well kneaded by floundering horses and cattle, that every withdrawn hoof gives off a report like drawing a cork from a bottle."

It is evident that the finishing of this road, so well begun, would be an enormous boon to the people of this district. To carry the coffee crop to market over such a highway must be tremendously expensive. But if the road were carried out as was

intended, coffee-raising, even under the present depression existing in the island owing to unsettled economic conditions, ought to be immensely encouraged by the reduction in cost of transportation.

Under an enlightened development such roads will be constructed to every inhabited part of the island. The resources which will soon be available for systematic development should be applied in generous measure to this end. While railways will probably be built to a considerable extent and will be of much use, still railways are not so important as a general system of good roads. In a country so rough in surface and so mountainous the building of railways on an extensive scale would be peculiarly difficult and costly. But no part of the island lies at a great distance from the sea; only a few hours at the most, if communication were over a good road. If such roads were constructed and made in the same admirable manner as the great military highway and the various sections of projected roads that have been built here and there they would furnish ideal



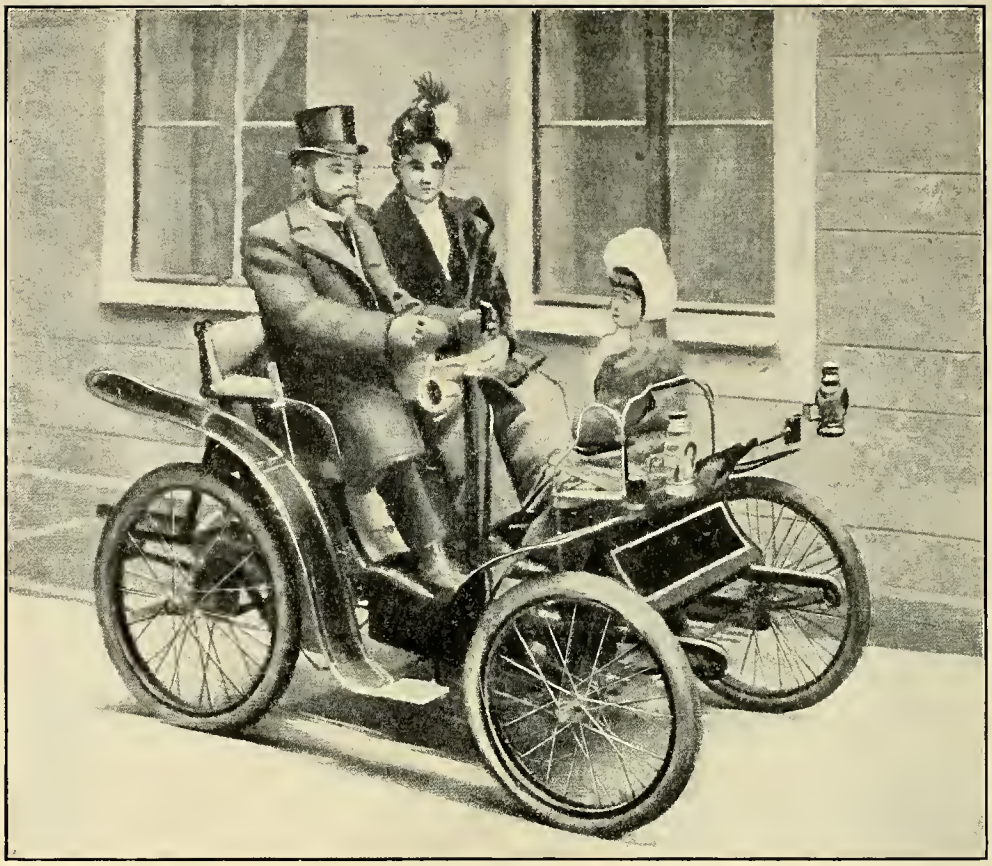
Colonial Stage

transportation lines in connection with automobile facilities. The cities and towns of the interior would be connected with the ports by motor-omnibus lines, offering a form of travel immensely more agreeable than by railway cars and practically as expeditious. Individual automobiles would come into universal use, and it would be one of the keenest enjoyments to explore the enchanting scenery of Puerto Rico by such means. And with the aid of automobile traction the movement of the rich products of the island to market would be cheap and expeditious. The life of the whole island would thus be quickened, materially, mentally and morally. Industry would be encouraged, prosperity would be assured, the earning-capacity of the common people would increase, and with it their purchasing-power, new wants would be created and commerce would expand, particularly with the adopted-mother country. Exceptionally dense though the present population of Puerto Rico is, under the new conditions effected through universal good roads and the automobile that it might increase very much above the present total and at the same time be blessed with a remarkable degree of prosperity, raising the entire community to higher levels.

Puerto Rico is cited more in detail as furnishing concrete illustrations of the best and the worst conditions of highway development side by side. But the same considerations will hold equally good in the cases of Cuba, Hawaii, and the Philippines, in all of which the automobile will certainly become a most potent instrumentality for regeneration.

CONTINENTAL RESTRICTIONS

In Belgium all automobile vehicles must carry both in front and behind, a number large enough to be seen at a distance, and after sunset each number must be lighted by a lamp. All automobiles and bicycles must be provided with a brake. All self propelled carriages must also bear the regulation number of the city and also the owner's name and address. Rubber-tired carriages must carry bells, and the maximum speed allowed is 18.64 miles an hour in the open country, and 7.46 miles in town.



Doctor's Buggy

A Gasoline Carriage for Physicians

AMONG the small gasoline carriages that attracted the attention of visitors at the recent Salon du Cycle, may be mentioned the "Æsculapius," a vehicle, as its name implies, particularly designed for the use of physicians, but well adapted also to the needs of those who are looking for a small, strong and compact automobile capable of running with regularity.

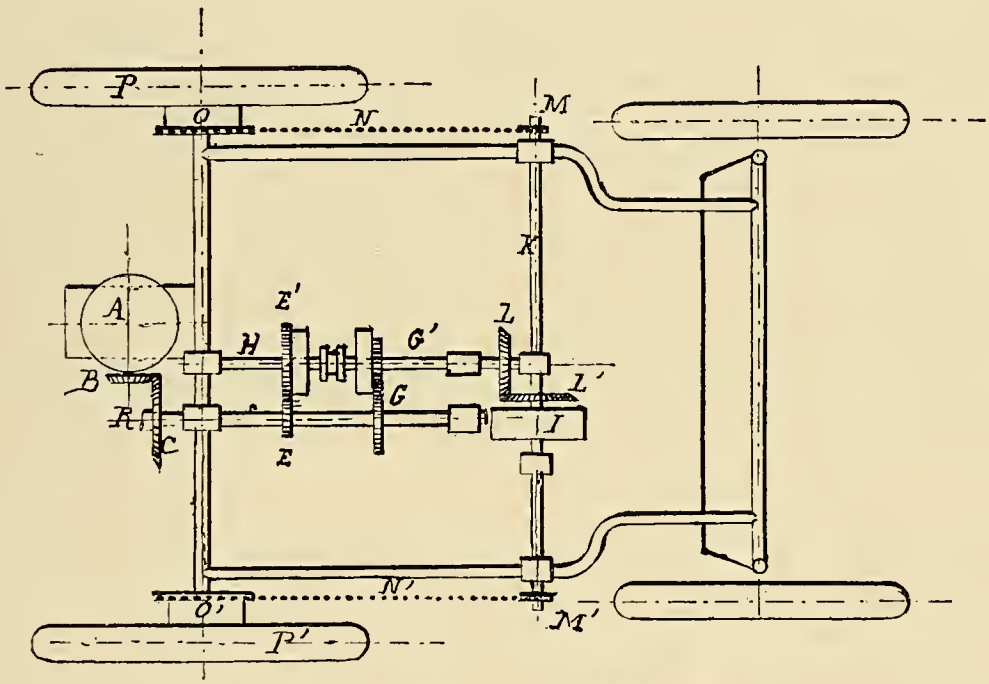
This carriage, which is constructed with great care, and is well finished in all its details, is actuated by a De Dion-Bonton motor, of which the explosion chamber is cooled by a circulation of water.

Its weight, when empty, does not exceed 440 pounds, and its dimensions are 6.5 x 4.4 feet. Mounted upon wheels pro-

vided with tangent spokes and thick pneumatic tires, the "Æsculapius," as may be seen from Fig. 1, offers all the comfort that could be desired.

The steering is done by means of a divided axle controlled by a lever with a handle. The frame is constructed entirely of steel tubes, which give it lightness as well as strength, and rests upon springs that afford the motor and the speed changing gear all the advantages of a spring suspension.

The motor (*A*, Fig. 2) is placed in the rear. The ordinary explosion chamber has been slightly modified so as to permit of a circulation of water derived from a 3¾-gallon tank placed in the box of the carriage. The circulation is brought about by



Gasoline Carriage for Physician

a thermo-siphon, and consumes but three quarts an hour at the most. The transmission of motion to the wheels is effected through the intermedium of a bevel gear, *B C*, which controls an intermediate shaft, *D*, that actuates, through the toothed wheels *E E'* or *G G'*, another intermediate shaft, *H*, connected through two bevel wheels, *L L'*, with the shaft *K* that carries the differential gear. To the extremities of the shaft *K* are keyed two sprockets, *M M'*, connected by chains, *N N'*, with two toothed wheels, *O O'*, which are fixed respectively to the driving wheels, *P P'*.

The groups of toothed wheels *E E'* and *G G'* constitute two changes of speed. Of these wheels, which are always in engage-

ment, *E'* and *G'* are loose upon the shaft that carries them, but are capable, when need be, of being rendered fast upon it by means of an elastic segment gearing of the kind employed upon American lathes.

A lever which controls a sleeve that slides upon the shaft *H* permits, at will, of throwing either one of the two speed gears into engagement without any noise.

The higher speeds are obtained by varying the ignition. Finally, one of the grips of the steering bar permits of arresting the ignition at will.

The starting is accomplished through a winch fixed at *R* to the extremity of the shaft *D*.

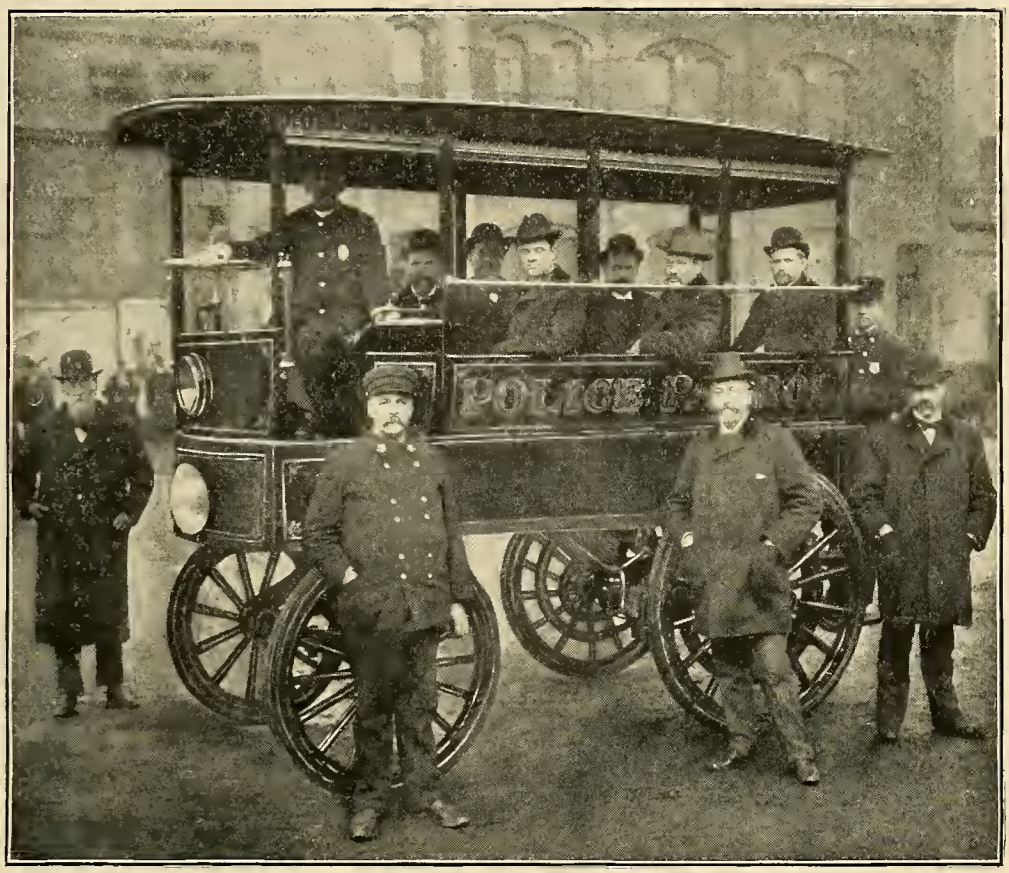
Three brakes, one of them placed upon the differential gear and controlled by a pedal, and the two others actuated by a lever and mounted upon collars secured to the driving wheels complete the carriage frame.

As for the speed of the vehicle, that, with two occupants, reaches from 15 to 17 miles an hour. All up-grades are ascended with the use of the low speed gear, the simplicity of the operation of which is such that it has never been known to fail.

AN INNOVATION IN HUNTING

A notable feature of the annual winter meeting of the Meadow Brook Hunt Club on Long Island was the presence of several automobiles. This was the first occasion in the American history of the sport on which the popular modern vehicle has taken its place in line with the road coach, the break and the whole range of sporting and road vehicles. A sight so novel naturally attracted much attention. Even the fashionable participants in the hunt, to whom automobiles are as familiar as four-in-hands, could not refrain from some expressions of surprise when they saw the noiseless vehicles speeding over the Long Island roads.

Mr. R. E. Flinsch came all the way from Rockaway in his automobile, and he held his own with the best of them. There was nothing worth seeing that he did not see. Mr. H. E. Cutting, who was accompanied by Mrs. Hermann Oelrichs, drove another automobile, and found it easy to keep his place in line. Before and behind him were persons in coaches, buggies and other varieties of horse drawn vehicles, many of whom were his friends, and all of whom watched him with keen interest as he skilfully steered his dainty carriage.



An Automobile Patrol Wagon

CHIEF OF POLICE HARRISON, of Akron, Ohio, has recently adopted an automobile patrol wagon. This wagon, judging by his own report, is as complete as any first-class wagon can be made. It is guided by a wheel in front, through a shaft and pinion onto a Parson's roller-bearing fifth wheel and lock on the steering shaft, so that it will run straight in the street without watching. It has three brakes, one band brake on the external diameter of the gears on rear wheels, controlled by a brass handle under the steering wheel, and it has an ordinary foot brake on the rubber tire, and with a connection and rheostat for converting the motors into a dynamo.

The propelling power consists of two six-horse, single reduction, multipolar series wound motors. The armatures have a special wind to use two or four brushes. The controller is of a peculiar design, with every contact consisting of a knife-switch pattern and a clear air brake at each contact. It has three speeds

forward, two back, and one charging combination, and a switch for cutting batteries out when wanting to leave wagon or make repairs.

The battery consists of forty cells of the Willard type of storage batteries, with a watt capacity of 13,440 at three-hour discharge rate, put in four trays of ten cells each, and being capable of three combinations for power, and a charging jack under seat, and also an automatic cut-out and rheostat on the wall for controlling the charging current, and volt and ammeter on wagon for rate of discharge.

It has an electric headlight, an electric light in the top of wagon, to light the interior, and an electric alarm gong for warning the public, and is equipped with side and end roller curtains for enclosing the entire wagon; has side brass handrails, and is upholstered with leather trimmings throughout.

Archibald wheels, 48 inches and 38 inches diameter; 2½-inch rubber tires; tread, 63 inches out to out; 2¼-inch Grant roller-bearing axles; four platform springs, front and rear, 2¼ inches wide; box is 4 feet wide and 10 feet long, 15 inches high under side seats; steps in rear, and controller lever on the left side of front seat.

One charge will carry the vehicle over 25 miles of ordinary roads. The wagon will make 20 miles an hour easily on paved streets. There are three different ways of applying the brakes. One is a roller brake on the wheels. A band brake working on the inside of the bull wheels, and an electric brake operated by throwing the controller back one point, making a dynamo of the motors generating a back current; this brake is only used when descending a steep grade. The wheels and fifth wheel are ball-bearing. Electric gong and head-light, and weighs 5,800 pounds. It has been run through mud six inches deep with as many people on it as could be seated.

Mechanical Propulsion and Traction

By Prof. G. Forestier

Fifth Paper

IN 1813, when, with the arrangements of the axles and hubs wholly of wood, the coefficient certainly exceeded 260 pounds, Herr Gerstner, professor of mechanics at the Technical Institute of Bohemia, proposed, in a work entitled "Memoir upon Highways, Railways and Canals." the arrangement represented in Fig. 16 for diminishing the resistance of ordinary wheels. On page 85 of the French translation of this work (1827) it is stated that this apparatus had been constructed and had operated well in the machinery hall of the Technological Academy of Prague. According to the experiments described in this memoir, the tractive force was but a third that necessary with ordinary wheels. This feeble result astonishes us, since in the Atwood machine (formerly classic) for the verification of the laws of gravity, an analogous arrangement gave an insignificant friction.

However this may be, Gerstner's experiment may be considered as the first attempt made to substitute rolling for sliding friction in hubs.

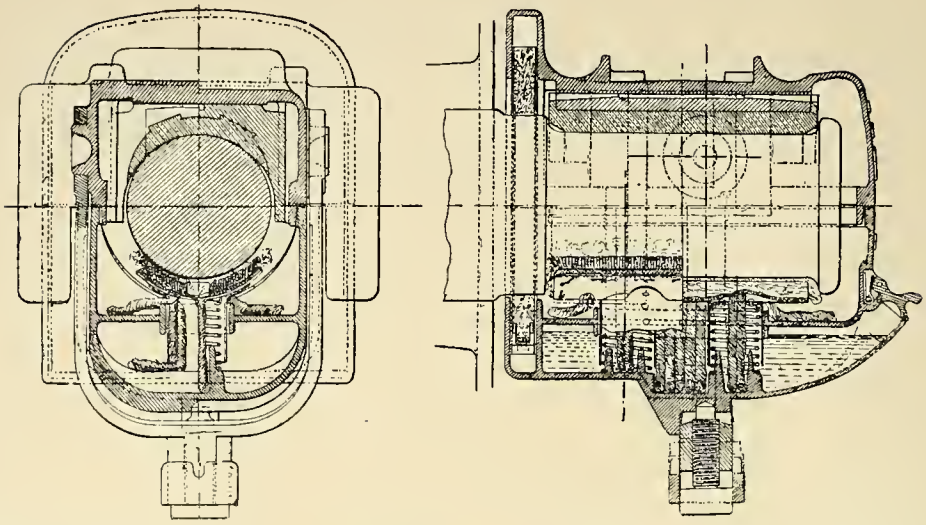
All human industries are linked together, and the progress made in one has a happy repercussion in the improvements made in another. Such has been the case with axle-journals; for ball bearings, like elastic tires, have passed from the bicycle to light carriages.

The coefficient φ then falls to 11 pounds per ton; and it will fall, it appears, to 5½ pounds if between the balls that support the axle there be interposed other and smaller ones so as to cause the disappearance of all sliding friction between the first.

For heavily loaded carriages, ball bearings are not practical, and an endeavor has been made to obtain analogous advantages by substituting rollers for the balls. Several experiments made upon street cars especially seem to have given economic results.

We shall limit ourselves to giving a diagram (Fig. 17) of the roller bearings proposed for heavily loaded vehicles.

Ball or roller bearings seem to be of service for automobile



Figs. 18 and 19. Transverse and Longitudinal Sections of an Axle-Box

carriages, especially at the moment of starting. At this moment, as well known, especially if the stoppage has been somewhat prolonged, the coefficient of the sliding friction of the journals is relatively very high as a consequence of the absence of a lubricant between the surfaces of contact of the journals and the axle-boxes.

On another hand, in the lubrication of the journals, it is necessary to avoid an excess of oil, since then the coefficient of friction, instead of tending to diminish with the speed of relative change of place, tends on the contrary to increase as a function of the square of such speed. It is in order to obviate this inconvenience that railways have discarded oil boxes containing a large supply of lubricating liquid, and have adopted lubricators in which cotton wicks deposit upon the journals just the quantity of lubricant necessary to prevent griping (Figs. 18 and 19).

Many *chauffeurs* to whom we have imparted our fears as to the inconveniences of an excess of lubricant have recognized them as well founded, but have avowed that they far preferred to consume more force than to run the risk of griping. In order to protect themselves against this danger, it would perhaps be of advantage to them, in default of siphon-wicks, to adopt roller or ball bearings in which an excess of oiling has not the same inconvenience, since they substitute rolling for sliding friction.

VI.—Wheels.—From the formulas given for the different stresses to be overcome in the motion of a vehicle, it results that the diameter of the wheels has a marked influence upon the value of the sliding friction of the journal upon the hub, of the movement of the tire upon the roadbed, etc.

As regards this latter factor, that has another effect, since, by virtue of the principle that action and reaction are equal, the wheel impairs the road so much the more in proportion as its diameter is smaller. The classic experiments of Morin and Dupuit permit of no doubt as to this.

In order to diminish as much as possible the stresses to be overcome, it is necessary, then, all things else being equal, to provide the mechanically propelled vehicle with wheels of as wide a diameter as their method of construction, the stability of the whole, the conditions of transmission of motion and the steering arrangement will admit of.

Even before the experiments of Morin and Dupuit, practice and observation had led to giving the wheels of vehicles drawn by animals the largest diameter possible, as may be seen from the following figures:

Wheels of carts	about 6½	ft.	diameter.
Hind wheels of the old stage coaches	" 5	"	"
Hind wheels of 30-passenger omnibuses	" 5½	"	"

Upon automobile carriages, on the contrary, the largest wheels reach scarcely 4 feet.

In order to explain this at first sight astonishing tendency of manufacturers, it is necessary to enter into a few details as to the construction of wheels.

The first wheels were made of wood, and consisted essentially of a rim, which was connected by spokes with a hub that revolved around an axle. The rim consisted of a certain number of curved pieces (fellies) connected with each other by dowel-pins and by bands of iron nailed to the external cylindrical surface (Fig. 20). The spokes were assembled with the rim and hub by means of tenons and mortises.

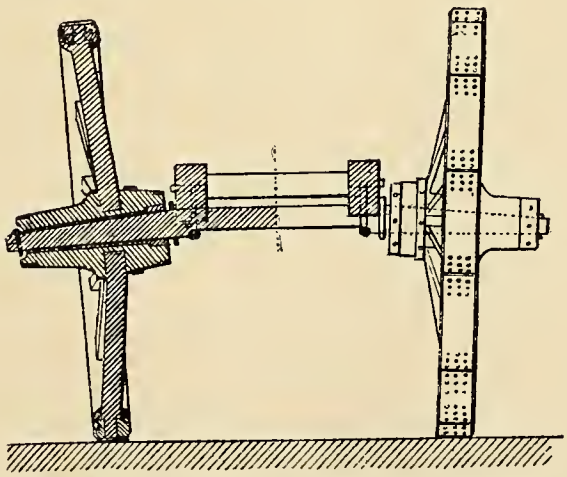


Fig. 20. Old Wooden Wheels with Sectional Tire

In addition to the fact that the wood was liable to warp, this method of assembling offered no lateral resistance. In order to prevent the wheel from becoming contorted through the action of an external blow upon the rim, it became necessary to arrange the spokes, not in a plane, but according to the generatrices of a cone having its apex near the vehicle. The wheel therefore presented what is called a "dish." Figs. 18 and 20 permit of comparing the exaggerated dishing of the wheels used in conveyances in former times and the less pronounced dishing of the truck wheels of the Say Refinery. Under such circumstances, in order that the spokes might come alternately at nearly right angles with the ground, it became necessary to incline the journal, with respect to the axle-shoulder, at an angle just equal to the dishing of the wheel (Fig. 20).

It results from the very method of connecting the rim and hub that the greater the length of the spokes the greater is the distance apart of two consecutive spokes at the rim. Hence, when the wheel is placed in such a way that the two contiguous spokes are symmetrical with respect to the vertical, that part of the rim that separates them tends to flatten so much the more in proportion as it is larger. It is therefore necessary to give it greater dimensions in the direction of the spoke. At the same time that the thickness of the rim increases, its width, and consequently its weight increases. So the weight of the old-time wheels increased very rapidly with their diameters.

Since the progress of the metallurgic industry has permitted of substituting a continuous tire for the separate iron bands nailed to the fellies, it has become possible to diminish the better consolidated rim; but its weight (and consequently that of the wheel) always increases quite rapidly with the length of the spokes, that is to say, with the diameter of the wheel.

The practice of mortising leads to relatively large hubs. In the French Artillery, the wooden hub has for a long time been replaced by a metallic one in which the spokes, pressed tightly one against the other, are held laterally by two bronze or steel cheeks connected by bolts, which, passing through the joints of the spokes, still further increase their stability. This excellent arrangement (Fig. 21) has been adopted by the majority of the automobile carriage builders who have adhered to wooden wheels and have decided upon the use of elastic tires.

Unfortunately, we are still reduced, for the assembling of the spokes and rim, to the necessity of inserting the tenon of the spoke into a mortise in the felly. An attempt has been made, it is true, to interpose metallic sockets, but practice does not seem to

have sanctioned this innovation, by which the weight is increased without any great advantage being obtained. The rim, weakened by the mortises, has therefore to possess greater thickness and width in order to resist a distortion that is so much the more to be feared in proportion as the spokes are more widely spaced, that is to say, in proportion as they are longer.

It is, however, not with a view solely to reducing the weight as much as possible that the builders of automobile carriages shrink before the diameters that theory would require. In a vehicle drawn by an animal the wheels are loose upon the axle, and the sliding friction of the journal upon the axle-box alone hinders the wheel from obeying the movement. The spokes therefore experience but a slight bending strain. In mechanically

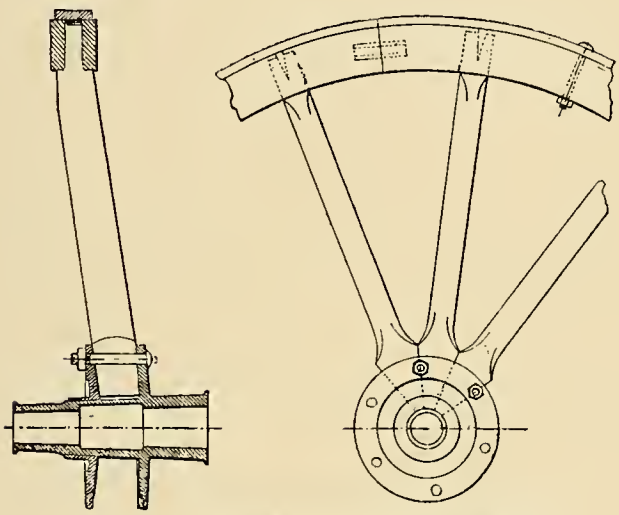


Fig. 21. Wheel of Artillery Material

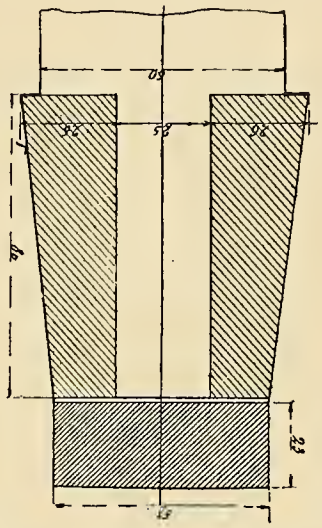


Fig. 22. Section of Tire and Felly of Omnibuses for 30 Passengers.

propelled vehicles, on the contrary, the power is applied to the hub, the resistance is found at the rim, and the spoke is consequently submitted to a bending strain that is so much the greater in proportion as its length is greater.

This reason is not the only one that causes builders to adhere to small diameters, for many have adopted an arrangement which, carrying the application of the motive couple quite far from the hub, diminishes the bending strain of the spokes. Much more than this, one builder, in order to get rid of every cause of such tendency to a flexion of the spokes, has conceived the ingenious idea of leaving the wheel loose upon the journal of the axle, through the hollow centre of which passes a shaft upon which are keyed arms that carry along the rim.

We thus get a glimpse of the possibility of increasing the diameter of the wheels without having to make them of too massive construction. The deviser of this arrangement has not, however, profited by this latitude, and further along we shall see the reason why.

We have said that if a wooden wheel is dished, the journal must present an inclination with respect to the shoulder of the axle. At the outset, manufacturers, desiring to use a chain for transmitting motion to the driving wheel, were afraid that they could not employ this means, if the axis of revolution of the wheel was not exactly parallel with the horizontal shaft carrying the chain sprocket. They therefore adopted plain wheels, without a dish, that were so much the more liable to contortion in proportion as their diameter was greater. In order to obviate this, some had recourse to two series of symmetrically dished spokes; but such wheels are troublesome to keep in repair, since it is difficult to shorten their fellies. At present, it is admitted that it is possible to apply transmission by chain to wheels of which the journal makes but a slight angle with the axle-shoulder.

It is in the fear that these but slightly dished wheels might undergo contortion that must be sought the true cause of the non-adoption of the wheel of wide diameter that the research for the least resistance requires.

We have seen above that the relation that gives the traction T to be exerted in order to cause a wheel of a weight P and a radius R to pass over an obstacle of a height h is:

$$T = P\sqrt{\frac{h}{2R}}$$

The favorable influence of a wheel of large radius springs from this relation, into which $\frac{h}{2R}$ enters; but it is still more efficacious when it is a question, in order to get out of a hole in the road, of surmounting, not a simple stone of a height h, but a paving stone of rounded surface.

Gerstner, in the method cited above, says: "The draught increases so much the more in proportion as the ratio of the distance between the summits of the paving stones to the radius of the wheel is greater. Passing over paving stones is easier with large than with small wheels.

A few incidents that occurred at the competition of Heavy Weights lead us to dwell upon another drawback to small wheels for the running of automobiles upon defective pavements. If the tangent common to the wheel and the paving stone makes

with the horizontal an angle equal to or greater than the angle of sliding friction, the driving wheel, whatever be the power applied to it, will slide if sand be not scattered in front of it in order to increase the coefficient of sliding friction. Now, such a case will present itself so much the more frequently in proportion as the wheel is smaller.

In fact, if we suppose that the load upon the driving wheels or the adherent weight is two-thirds of the total weight, R should satisfy the relation:

$$Rf - r + 2\,nl\sqrt{(i^2 + 1)\,\frac{4f^2 + 9\,\varphi^2}{(2f - 3\,\varphi\,i)^2}}$$

in which R represents the radius of the driving wheel; r the radius of curvature of the paving stones; n the number of paving stones forming the depression; l the width of a paving stone; i the inclination of the declivity; f the coefficient of sliding friction upon the paving stone; and φ the coefficient of rolling friction upon the latter.

Many incidents that have occurred in automobile contests have demonstrated this.

As for the alterations in form of the ground, they oppose to the changes of position of the tire a resistance that Coriolis has demonstrated to be:

$$F = \tfrac{3}{8}\sqrt[3]{\frac{3}{mb} \times \frac{P^4}{R^2}},$$

a relation in which m is a variable numerical coefficient and b the width of the tire.

The obstacle to motion due to the alteration in form of the roadway produced by the too heavy a load imposed upon the wheel therefore diminishes in measure as the width of the tire increases. Consequently, it is of advantage to have a tire of sufficient width to bring the specific pressure (that is to say, per unit of surface) upon the materials of the road to a figure that occasions no sensible displacement therein. Unfortunately, too wide tires, along with the sinuous contours of the path followed, involve relative slidings of the sides of the tires and of the roadway that absorb at least as much live force as the depressions of the materials caused by a tire that is not so wide.

The wear of the edges of tires that are too wide is a manifest proof of this. There is therefore a limit to be determined, and this varies with the state of the road. After continuous rains or thaws have considerably softened the roadbed and rendered the

materials loose, it is necessary to employ wide rims in order to obtain the minimum of resistance. The same would be the case upon sand or plowed earth.

When the roadbed is hardened by frost or hot weather, it is necessary to employ tires as narrow as possible in order to prevent, in curves, a wear of their edges, which is shown by a loss of motive force.

Fig. 22 shows that the Compagnie Générale des Omnibus views the matter in this light, since it adopts for the tire a width less than that which the necessities of the assembling of the spokes and rim would naturally compel us to give the latter. We find this arrangement again in Fig. 15.

It is possible, up to a certain point, to compensate for the looseness of the ground by the flexibility of the edges of the tire. Such flexibility can, in fact, obviate the relative slidings by permitting the tire to yield to the compression that occurs upon the internal edge and to the extension that takes place upon the external one. Besides, an elastic tire is capable of moulding itself upon accidental obstacles and of diminishing the retarding influence of the shocks that it occasions. Thus is explained the reduction of from 20 to 30 per cent. of the resistance to traction and propulsion that experiments with pneumatic tires have permitted of establishing.

On another hand, the deformability of the tires, by diminishing the jarring transmitted to the axles, renders feebler the relative displacements of the axles and the frame to which the motor is fixed. Consequently, the connections between the motor and the driving wheels are of less variable lengths and the force is better utilized. The flexibility of the tire, moreover, would offer another advantage—that of being able to bear at once upon several small projections in the roadway instead of striking against them in succession. Such flexibility can be brought into play only by modifying the construction of the wheel. Instead of connecting the hub with the rim by spokes working by compression, as in wooden wheels, the connections of the rim and hub should be made to work by traction by forming them of wire, as in the bicycle. Here, whatever be the weight bearing upon the hub, it is always possible to adopt sufficiently strong wires, which, working by traction, have need only of the section that is strictly necessary, while wooden spokes, working by compression, must have a section such that they shall not be liable to become sprung.

Another advantage of this method of connection is that the elastic deformability of that part of the rim which is bearing upon the ground deadens the shocks due to stones and jolting.

As the spokes form, as in bicycles, two truncated cones having their large bases at the hubs and their small ones at the rim, a lateral shock upon the tire, as happens in too abrupt a turn against the edge of a sidewalk, will have no more of a disastrous effect than it would upon a dished wheel; while a wheel having spokes in a vertical plane would be shaken.

Now that, upon many tramways, guard-rails are not employed, by reasons of economy, wooden wheels with a single series of dished spokes perhaps no longer suffice. The wheel with a double series of metallic spokes with a symmetrical dish should offer an advantage as being able to resist shocks in all directions. Such spokes should be tangent to the hub in order to resist better the moment of torsion that tends to occur from the hub to the rim when the tire of a wheel keyed upon the axle or carried along by a toothed wheel fixed to the hub is abruptly arrested or impeded in its motion by a stone or any other obstacle. For a backward motion the spokes must be arranged symmetrically with respect to the radii. The method of fixing these spokes to the hub and rim constitutes a question which, although one of detail, is none the less of great importance, since the frequency with which damages occur and the ease with which they may be repaired depend upon it.

Wheels of which the hub is connected with the rim by metallic spokes lend themselves wonderfully well to the adoption of a tire sufficiently flexible to apply itself to the roadway for an appreciable length.

These flexible tires can be arranged in two ways—either in the interior or upon the exterior of a rubber tube secured to the rim. The first system, which was tried for bicycles, consisted of iron wire. It does not seem to have succeeded in this form. Theoretically, it presents so many advantages that it is to be desired that some experiments shall be made in replacing the wire of the bicycles by a band of steel for automobile carriages.

M. Jeantaud has patented a metallic tire connected with the rim by a rubber tube. He hopes thus, without any pecuniary expense due to the rapid wear of the rubber upon the roadway being involved, to obtain a few of the advantages of the elastic tire, and principally the advantage offered by those slight lateral movements of which we have already pointed out the consequences. It is true that his tire is not flexible, but there is nothing to prevent him from making it so; although such an improvement would require the substitution of metallic spokes for wooden ones. Theoretically, it ought to be thus with pneumatic tires, since under the action of compression, the air driven

from the bottom of the tire is forced toward the top and tends to superelevate the tire and consequently the wheel itself.

VII.—Suspension—As to the utility of suspension, that is to say, the interposition of elastic parts between the frame of the vehicle and the wheels submitted directly to the shocks of the road, there can be no doubt, as regards the comfort of the passengers or the preservation of the motor fixed to the frame. It is well to assure ourselves whether the same is the case from the view point of the total resistance to be overcome. We know, in fact, that Dupuit, during his studies upon the running of vehicles,* found that the coefficients of traction of a ton were respectively:

	Metalled Roads.	Paved Roads.
Non-suspended Carts	66 lb.	37.5 lb.
Suspended Stage Coaches	66 "	44 "
Suspended Private Carriages	79 "	74.75 to 81.5 "

Nevertheless, in the resumé of his experiments, this engineer asserts that although upon even surfaces, hard or soft, the resistance to rolling is independent of the speed and suspension, such resistance, upon surfaces that are uniformly rough, increases with the speed in carriages that are not suspended, but that this increase is diminished by the suspension so much the more in proportion as the speed is greater.

This assertion of Dupuit is of the highest importance for automobile carriages, the object of which is to satisfy the need of going fast.

Dupuit's experiments made it plain that in measure as the load placed upon the suspended part of the carriage increased, the numerical value of the force of traction diminished. Since the non-suspended part of the vehicle (wheels and axle) preserved a constant weight, Dupuit was led to conclude that the interposition of suspension notably diminished the draught.

The increase of draught mentioned at the beginning is therefore not due to suspension, but to the vibrations of the accessory parts of the stage-coaches and private carriages that are transmitted to the air in producing sonorous waves, and that increase with the speed of translation, that is to say, with the number of shocks in a unit of time.

This is one of the reasons why pneumatic tires, which are anti-vibrators par excellence, produce a diminution in the draught.

Professional men had no need to await Dupuit's experiments to perceive that suspension diminished the loss of a portion of the motive force consumed by shocks against the protuberances

* Essais et experiences sur le tirage des Voitures, Paris, 1837.

of the road. As long ago as 1832, Schwilgué said*: "It is useless to dwell upon the advantages presented by the use of springs in carriages. They are now completely demonstrated. We know that they consist not only in rendering the motion of carriages gentler, but also in *diminishing the surface-wear of roads and in saving a notable portion of the motive force.*

From the moment that the suspension of frames becomes capable of diminishing the total resistance, we should carefully study what conditions it should fulfil in order to realize this object. In a carriage, whether it be horse-drawn or mechanically propelled, the motion is never uniform, but is continually varying. Consequently, if the mass in motion be capable of oscillating around a centre of rotation, the straight line passing through its centre of gravity and through the centre of oscillation will tend to make with the vertical an angle α, such that $\omega \cdot \alpha$ will be equal to the acceleration of the motion that the mass tends to produce.

It is only when the motion is uniform, that is to say, when the acceleration is null, that this angle α is equal to that which the vertical makes with the line at right angles with the surface upon which the carriage is placed.

The object of a rational suspension should be to permit the mass of the vehicle to assume this position of equilibrium and prevent the inertia of the carriage from intervening in the shock against the obstacle opposed to the motion of the vehicle.

There are accelerations in the transverse, as well as in the longitudinal or vertical direction, since both wheels of the same axle can never meet with the same conditions of rolling simultaneously. It should therefore be possible for the suspension to permit the vehicle to oscillate in a transverse direction as well as in a longitudinal or vertical one, without, however, interfering with the transmission of the action of the motor to the axles.

Let us, in the first place, consider the suspension in a two-wheeled vehicle drawn by an animal or by a man. The motor must, through an elastic connection, be protected against the jerking motion resulting from the protuberances of the surface of the ground. The interposition of elliptic springs between the shafts and the axle would satisfy this desideratum, from the standpoint of the vertical displacements of the load; but to a less degree as regards the longitudinal displacements, and very slightly as regards the vertical ones. Therefore, it must be avoided; especially in vehicles drawn by man, since there would

* Annales des Ponts et Chaussées, 1832, 2d semestre, p. 231.

result jerks upon the arms, of which deliverymen would complain, such jerking motions may be diminished by substituting springs formed of a single plate for the elliptic ones; since, with such an arrangement, the plates of the spring, forced to bend in order to submit to the transverse oscillations, will sufficiently diminish the transverse jerks transmitted to the shafts. But, since in such a case the variations in the curvature of the spring produce different horizontal distances between its two extremities, the connection of the posterior extremity with the shaft must be movable along the latter.

In some hand-carts, the posterior extremity of the spring-plate is passed by hard friction between two rollers fixed to the shaft, and extends beyond the latter to the distance necessary. In most cases, this extremity is connected with the shaft through the intermedium of a link suspended from a bracket.

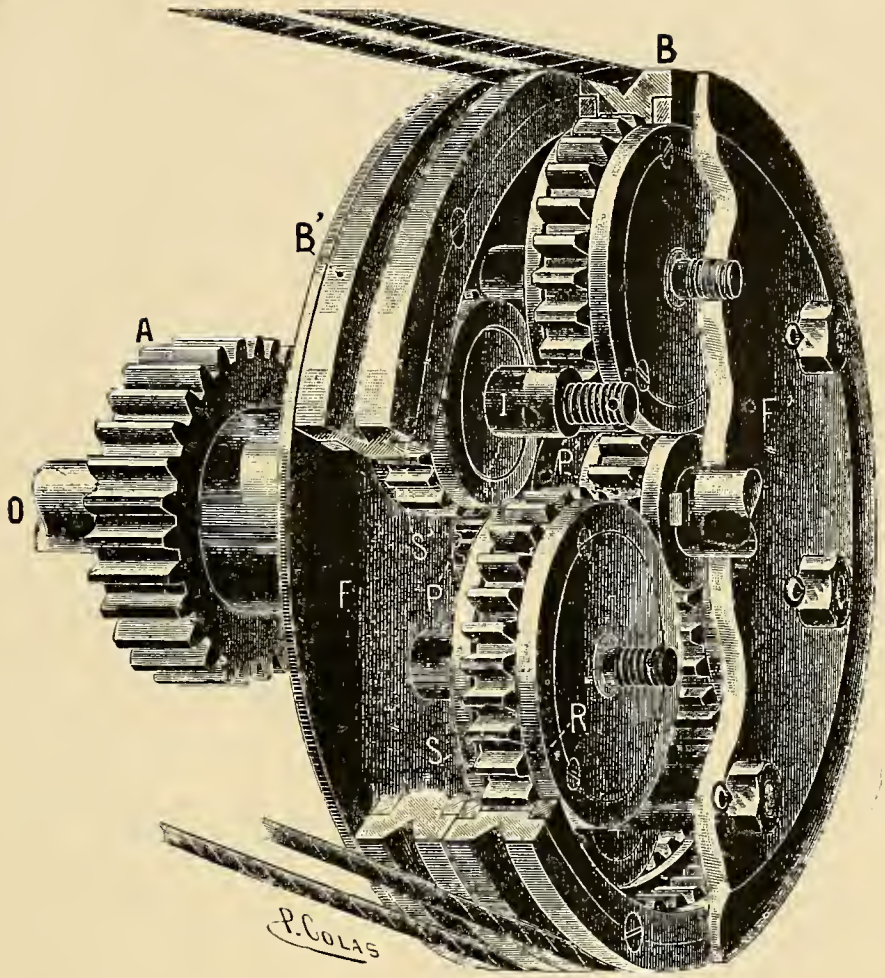
When the cart is to move at the speed of a trot, at least when empty, the posterior part of the spring, instead of being fixed to the shaft, is left free, and, through a double link, there is suspended from it a transverse spring-plate, upon the centre of which the axle bears.

Sometimes the shaft is connected with the axle, as in the tilburys of the Administration des Postes. In these vehicles the body is independent of the shafts and is supported by the centres of two transverse springs connected by links with the longitudinal springs fixed to the axle. Under such circumstances, the transverse oscillations of the body, quite heavily loaded, would take on dangerous amplitudes were they not kept within proper limits through straps of a definite length fixed to the body and shaft.

To the suspension of these tilburys, we should much prefer that of certain pleasure wagons of the best constructors, or of some of the vehicles used by bleachers. The frame that prolongs the shafts is connected with the axle through longitudinal springs formed of a single plate. The body is suspended through two transverse springs connected with the frame through links arranged in such a way as to allow of a variability in length, while at the same time assuring an equilibrium of the body.

It is well to remark that, in this rational suspension of the two-wheeled vehicle, the action of the motor is transmitted to the axle through the front part of the longitudinal spring, which then operates by extension. The connection of the front part of the spring with the frame must therefore be made through a simple roller, and not, as in some vehicles, by links.

Specially translated for the Automobile Magazine from *Le Génie Civil.*



A Progressive Change of Speed

THE new change of speed devised by M. H. Gerard, and represented in section in the accompanying engraving, is a progressive apparatus of simple construction in which are grouped several ratios of speed, each of which is obtained through an epicycloidal train of which the gearings are always in engagement.

The type that we figure herewith is designed to afford two speeds, that is to say, it comprises two trains, each of which consists of: (1) A central pinion, *P P'*, keyed upon the driving shaft; (2) three spur-wheels, *S S' S''*; and (3) an internal gear, *B B'*, the periphery of which is provided with a groove for the reception and guiding of the brake.

The axles, *I*, of the spur-wheels are secured to the external plates, *F F'*, one of which, *F*, carries at the extremity of a

socket a pinion, *A,* that meshes with the toothed wheel of the differential and transmits motion to the driving wheels. The gear wheels of each train are supported and held at an immutable distance by revolving disks, *R,* fixed laterally.

When the motor is in operation, one of the brakes renders one of the internal gears immovable, and the central pinion keyed upon the driving shaft revolves the spur-wheels, which, taking a purchase upon the stationary internal gear, carry along the axles, external plates and pinion *A* at a differential speed that depends upon the ratio of the gearings. The other train will remain idle; and one speed will be obtained. When the second train is rendered immovable, the first will be freed; and, as the ratio of the gearings is different, we shall have a second speed.

When the two brakes are free, the pinion *A,* the plates *F F′*, and the axles will remain stationary as a consequence of the resistance of the carriage, and the spur-wheels will revolve, along with the internal gear, in a direction reverse that of the running of the motor. The driving mechanism will thus be thrown out of gear.

With this apparatus, it is possible to throw the mechanism into gear progressively and with the greatest ease, without any fear of stalling the motor (even on a declivity); to change from one speed to another, and to throw the mechanism out of gear without the least shock and as gently as may be desired, since the braking of the speeds is dependent upon the will of the driver.

There is no danger of a breakage of the cogs, since the gearings are always in engagement. Moreover, the disks that support such gearings prevent the cogs from meshing too deeply and becoming wedged, and constitute rollers that have the same effect as a ball-bearing mounting, in rendering the revolution of the wheels easy, and in suppressing noise and wear. Consequently, the work absorbed may be considered as null.

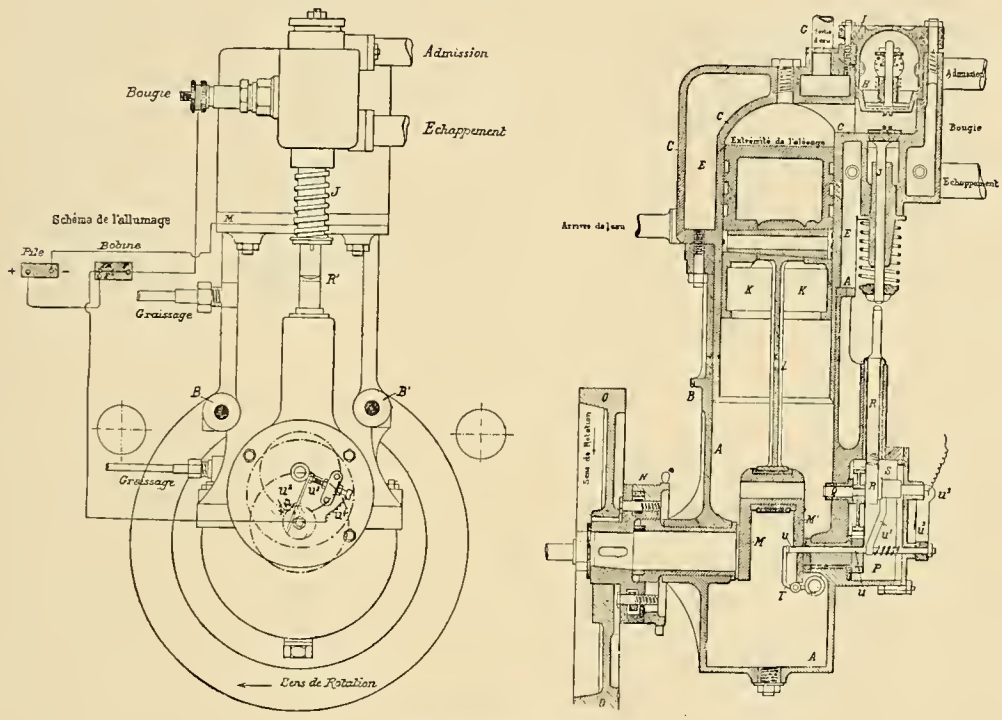
A SOCIETY VEHICLE

Mrs. John Jacob Astor is the first woman to use her own brougham automobile for social events. It is a beautiful vehicle, exquisitely lined in blue satin, and, with its liveried driver, is quite a show. At the Pell-Morris wedding the turnouts were all exceedingly handsome, but Mrs. Astor's carriage was the most admired.

It is light-looking in appearance, and has none of the " buzz " so frequently heard in autos.

The Partin Motor

THE Partin motor presents many peculiarities of construction, most of the details of which may be easily understood, without any extended description, by a reference to the legend placed beneath the sectional views given in the accompanying Figs. 1 and 2. Nevertheless, it may be well to



The Partin Motor

A, Frame; BB[1], Points of Attachment of the Motor; C, Double Jacketed Cylinder; E, Water Chamber; F, Water Supply Pipe; G, Water Discharge Pipe; H, Automatic Suction Valve; I, Cover of the Valve-box; J, Exhaust Valve; K, Piston; L, Connecting Rod; MM[1], Crank; N, Starting Gear; O, Fly Wheel; P, Pinion that Controls the Cam-shaft; Q, Cam-shaft; R, Exhaust Cam; R[1], Rod of the Exhaust Valve; S, Ignition Cam; T, Regulator Lever; U, Shaft that Carries the Ignition Lever and Vibrator; U[1], Ignition Lever; U[2], Vibrator; U[3], Contact; U[4], Insulator; V, Ignition Tube.

say a few words in regard to some of the characteristic parts, such as the valve-box, for example.

This is so arranged that the interior may be easily inspected and the valves be taken out and replaced without disturbing the intake and exhaust pipes located at the side of the box. All that has to be done is to unscrew two nuts and remove the cover, *I*, when the seat, *H*, of the admission valve, along with the valve itself, may be readily taken out. The exhaust valve will then

be exposed to view, and may likewise be dismounted after the simple removal of a key.

The arrangement for automatically regulating the ignition is likewise very simple. Upon one of the arms, M', of the crank is pivoted the regulator lever, T. One of the extremities of this is kept in contact with the shaft U by means of a spring, while the other extremity carries a counterpoise.

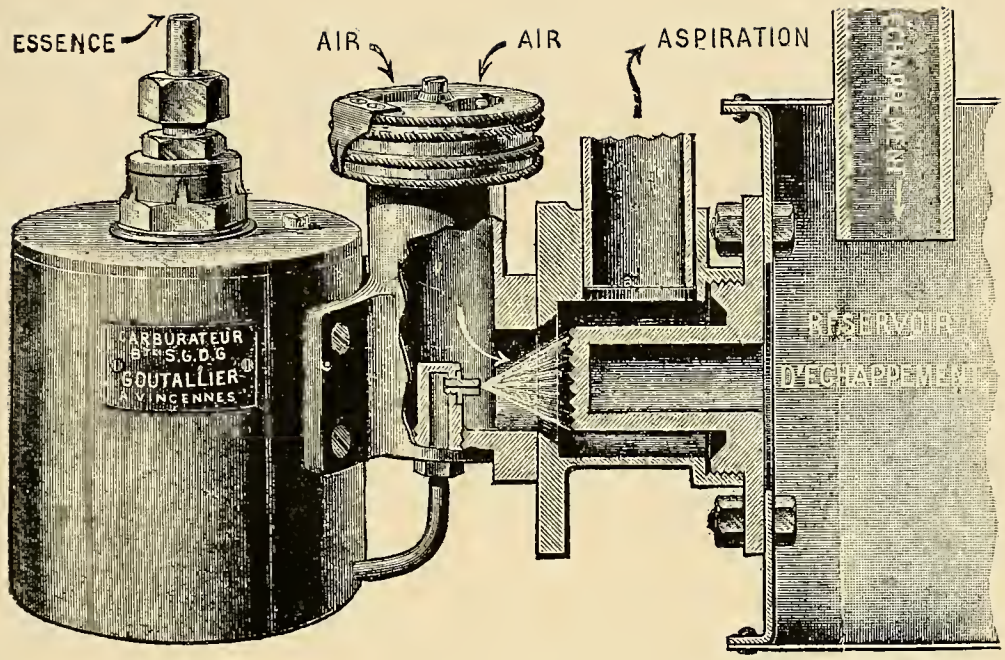
The shaft U is capable of moving in a rectilinear direction under the action of the centrifugal force exerted by the counterpoise. In case the rotary velocity of the crank-shaft should become excessive, this rectilinear motion would displace the lever U, which is in contact with the ignition cam, S. This latter is provided with a diagonal groove of 45° into which the point of the lever U^1 enters at every revolution. The result is that its point of attack varies according to the place occupied by the lever U^1 with respect to the diagonal groove; the variability being caused by the thrust of the counterpoise. The attack of the cam S at any point whatever produces at the time at which it occurs a contact of the vibrator, U^2, with the contact terminal U^3; and a wire running from this to the induction coil, and thence to ignition tube, V, ignites the explosive mixture. As the ignition has been retarded for a moment upon the ordinary point, the explosion possesses a dynamic force less than its maximum, and this diminishes the velocity of the motor.

The duration of the attack upon the cam is invariable, but the moment of the attack varies according to the position of the lever U^1 upon the cam S.

The part of the cylinder in which the explosion takes place is provided with a double jacket, C, within which circulates a quantity of water. The vapor produced by the liquid goes to the radiator, where it becomes condensed and then returns to the reservoir, E, and so on, until an exhaustion is produced by the vapor that cannot be condensed and that escapes into the open air.

AN AUTO WHEEL-CHAIR

The latest development of the electromobile is in the form of an invalid's chair. A Toronto electrician is said to have designed an electromobile for this purpose, carrying a four-horse-power motor and sufficient battery capacity for a fifteen-mile run at four and a half miles per hour.



The Goutallier Carbureter

IN constructing the carbureter illustrated herewith, the object that M. Goutallier had in view was to obtain a carburation that should be always uniform. The apparatus consists of a reservoir of constant level from the interior of which the gasoline is led by a tube to a small horizontal capillary ajutage. At the time of the admission, and by reason of the vacuum formed behind the piston, the gasoline escapes from the ajutage with force and impinges against a striated wall, which, from the fact that it forms the bottom of a conduit connected with the chamber that receives the residual gases of explosion, is kept at an elevated temperature.

The gasoline is therefore not only atomized, that is to say, reduced to the state of very minute drops, in suspension in the air, but is also gasified through the elevation of temperature to which it is submitted in coming into contact with the striated wall.

A proper quantity of air enters in the direction shown by the arrows, becomes thoroughly mixed with the gasoline vapor, and forms therewith a detonating mixture that reaches the motor through the admission tube. The quantity of air that is to enter is regulated at the outset once for all, and does not have to be varied during the operation of the motor.

At the bottom of the admission tube there is arranged a sheet of wire gauze, which subserves two purposes: first to blend the constituents of the explosive mixture intimately and form a very homogeneous whole; and, second, to prevent returns of flames to the carbureter—an accident, however, which would not have a very great influence in the present case, because of the very small quantity of explosive mixture that the apparatus contains at any given moment.

In carbureters in which, above the level of the gasoline, there is stored a large quantity of carbureted air capable of igniting and causing an explosion, the use of the wire gauze is absolutely indispensable; but, in apparatus of the type under consideration, such is not the case. Even an ignition of the gasoline need cause no alarm, since, should such a thing occur, the fire would be quickly extinguished for want of the air necessary to support combustion.

What will be especially remarked in the Goutallier carbureter is the ingenious arrangement that does away with the heating tube, which is always in the way when the apparatus has to be dismounted, and also with the necessity of regulating the hot and cold air.

The apparatus can be readily dismounted by the unscrewing of three nuts only, and by means of one and the same wrench.

AUTOCARS AT ENGLISH COUNTRY HOUSES

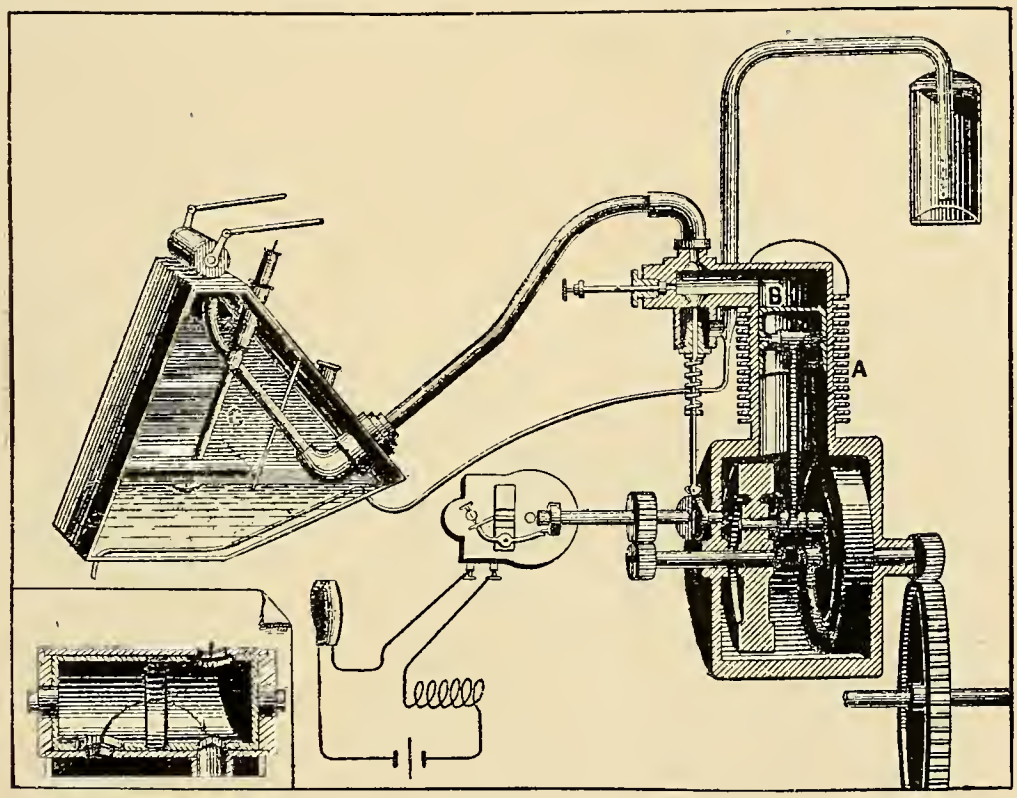
Lord Iveagh, according to the London *Daily Mail,* has a number of motor vans, lorries and carriages at work on his estate. The Duke of Westminster has a car which is used for station work. The Hon. Evelyn Ellis uses cars for station work and uses one of his motors for fire-engine and garden-hose purposes. Lord Montagu of Beaulieu and many other people have motor wagonettes for station duty and for the conveyance of beaters during the shooting season.

The Automoto Motor

THE automoto motor, which came into prominence at the last Exposition de la Salle Wagram, and which, as may be seen from the perspective view given in Fig. 1, bears considerable resemblance to the De Dion motor, is of 2¼ H. P., and of the four cycle type.

The cylinder, *A* (Fig. 2), is vertical and provided with numerous cooling flanges cast in a piece with it.

The admission valve operates in a box placed at the upper part of the motor, and is held upon its seat by a spiral spring.

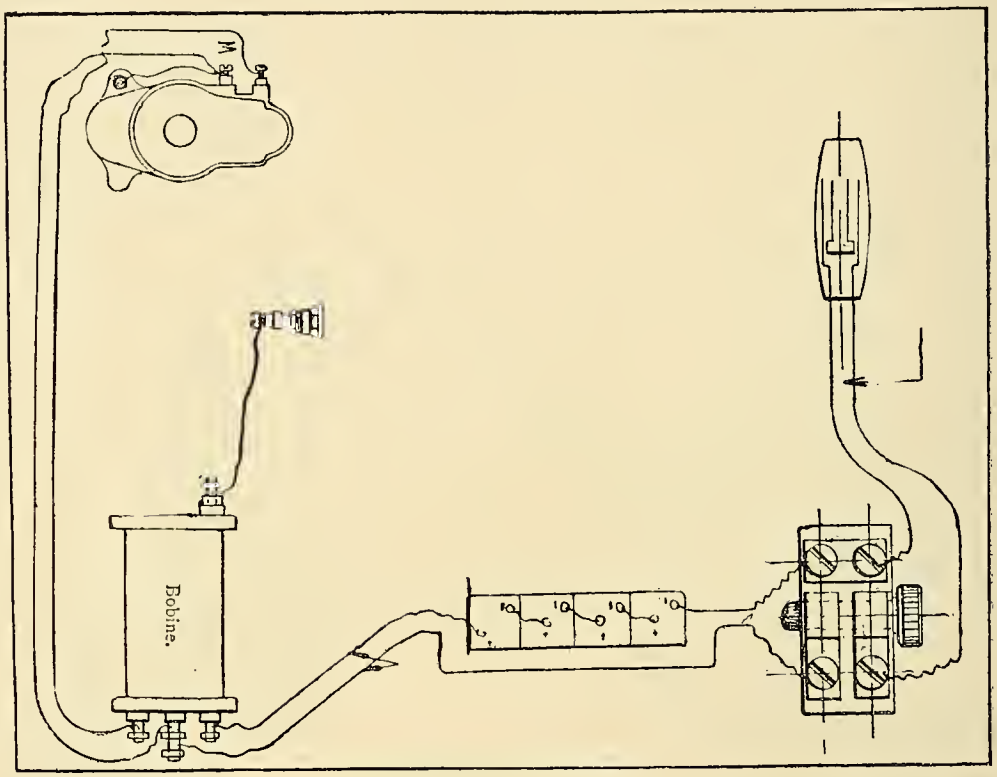


The residual gases of explosion are expelled through the lifting of a valve controlled by a cam to which motion is imparted by a pinion that revolves at a velocity half that of the motor shaft.

The lubrication is accomplished by means of the splash system. A quantity of oil, having been poured into the casing, is scattered by the flywheel over the sides of the piston and the walls of the cylinder, which are thus sufficiently lubricated.

The carbureter, which may be seen to the left in Fig. 2, is of the surface type, and offers no peculiarity worthy of description.

The admission tube and carburation cock are provided with disks of wire gauze in order to prevent back flames from entering the carbureter at the time of the explosion. In fact, in carbureters of this kind, which are of relatively large size, there exists a considerable quantity of explosive carburets which the least flame would suffice to detonate and cause numerous accidents, of which the least would be the ignition of the gasoline contained in the carbureter. The object of the wire gauze is to avert such accidents by cooling the flame sufficiently to extinguish it. It is an application of the principle upon which the miner's lamp is based.



The ignition is effected by means of an induction spark. At the proper moment, and at every two revolutions of the motor, a cam mounted upon the secondary shaft actuates a small lever, which closes the primary circuit. When the cam disengages this lever, the latter is abruptly pulled back by a spring, and thus breaks the circuit. The induced wire is then traversed by a current of high tension which produces a spark at the igniter.

The primary circuit is supplied by batteries or accumulators. Fig. 3 shows the wire arrangement that the manufacturers of the motor recommend.

A wire starting from the negative pole of the battery runs to the handle bar and then passes into the left grip, which performs

the function of an interrupter. It afterwards returns to an interrupter placed in the middle of the handle bar, and thence runs to one of the terminals, *M,* of the coil.

Another wire, starting from the positive pole of the battery, runs to the terminal, +, of the coil.

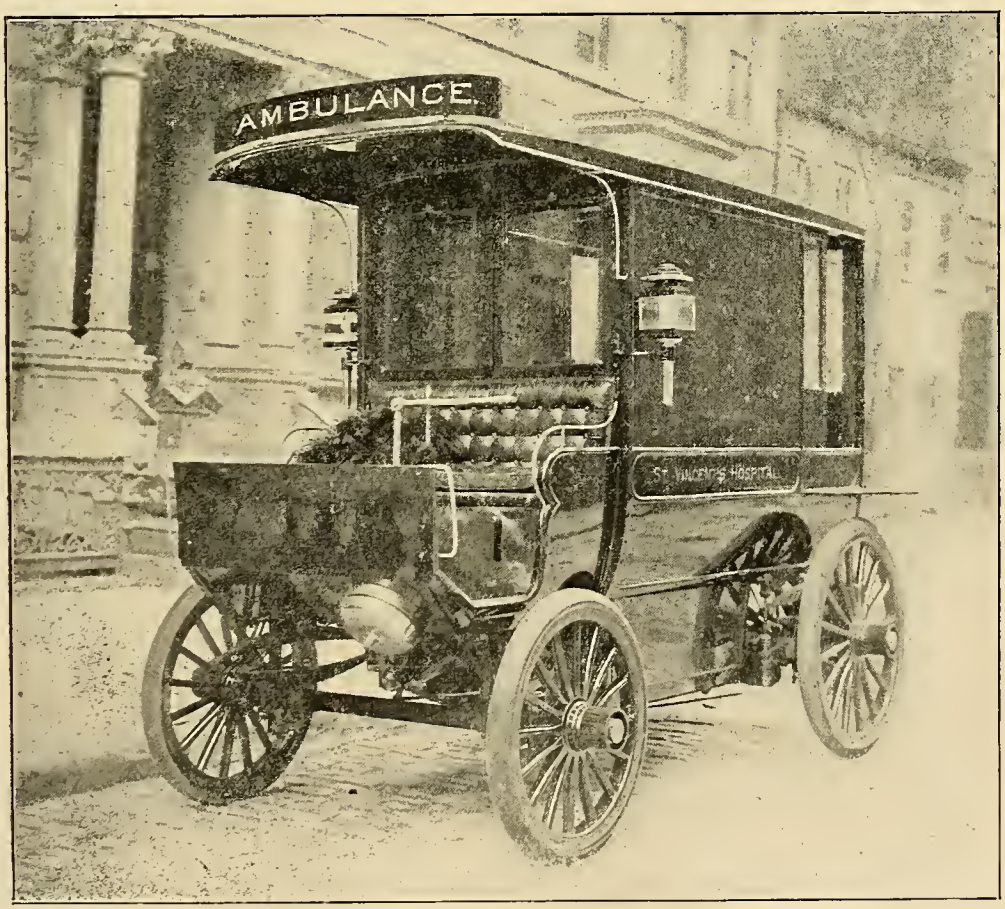
From the coil there start two other wires, one of which, connected with the terminal *M,* already mentioned, runs to the terminal, *M,* of the igniter, while the other, connected with the terminal, *F,* of the coil, runs to the terminal, *T,* of the igniter.

A fourth wire starts from the single terminal, *B,* of the coil and is fixed to the igniter.

The primary circuit is therefore as follows: the battery, the grip, the contact screw, the vibrator, the primary coil, and return to the battery.

The ignition controller, that is to say, the piece that carries the contact lever and contact screw, is capable of revolving around the axis of the cam, which so actuates it as to permit of causing variations in the periods of ignition.

The normal velocity of the automoto motor is from 1,400 to 1,800 revolutions a minute.



A New Form of Tire for Automobiles

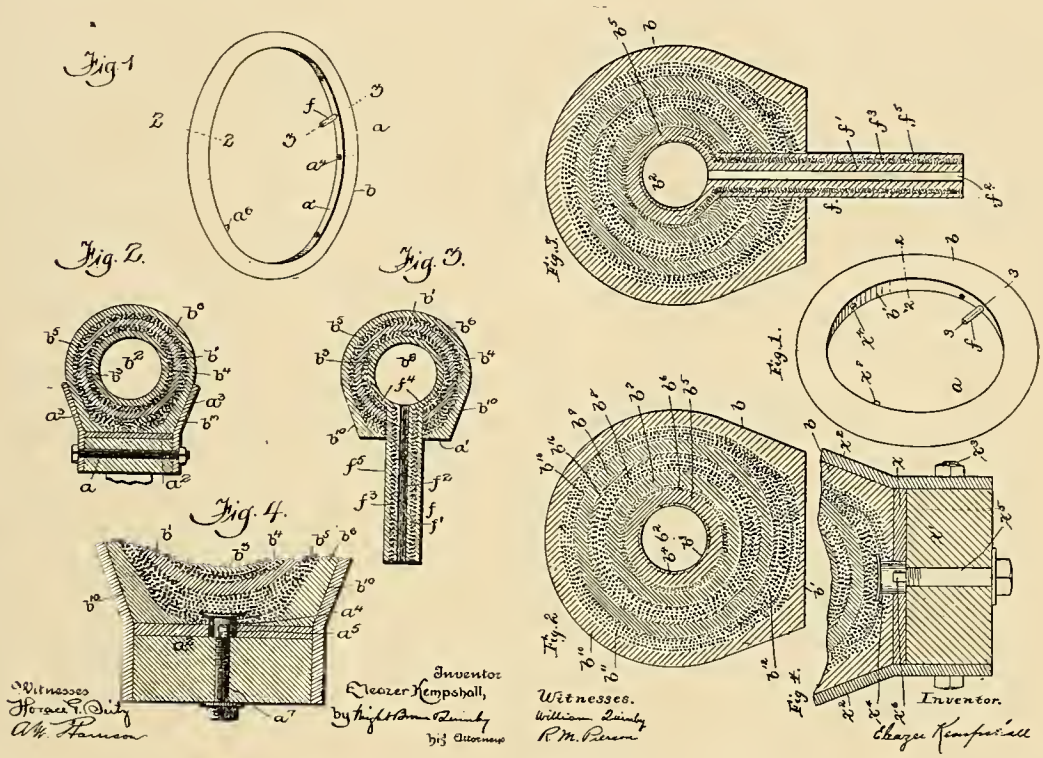
ONE of the most pronounced defects in the structure of the pneumatic tires commonly used on automobiles is the lack of any reinforcing backing for the air-chamber. It has often happened that weak spots in the tube have been pressed out in the form of nipples by the inflated air-chamber; for the pressure is practically concentrated at the defective portions, thereby bursting the tube. Our attention has been directed to a very efficient form of compound tire invented by Mr. E. Kempshall, in which a supporting backing is formed about the tube, which backing limits the outward movement of the tube to a predetermined extent and prevents air from forcing the material beyond a definite point.

Fig. 1 is a general view of the tire. Fig. 2 is a cross-section on the line 2, 2 of Fig. 1. Fig. 3 is a cross-section on the line 3, 3 of Fig. 1 and shows the air-tube, the valve, and the method of combining the two. Fig. 4 is an enlarged detail, representing the location and arrangement of the plies composing the fabric tubes and the manner of securing the tire in place on a wheel-rim.

The tire consists essentially of an inner yielding member b^3 formed of rubber and provided with an air-chamber b^2. The rubber member b^3 is confined and backed by an inner tube b^4 of reinforcing fabric. The outer, inclosing envelop of the tire is composed of a rubber facing b^{10} vulcanized upon a heavy fabric backing b^{11} made of duck. The several plies of this fabric are wound about the tube and the ends joined or spliced on the inner side of the tube, thus maintaining the uniform strength of the exterior or wear side. Between this outer, inclosing envelop and the inner air-chamber is a compound cushion of rubber which absorbs the motion. The compound cushion is interposed between the fabric backing b^6 and b^{11} and is composed of a multiple-ply tube b^8 of heavy duck, a motion-absorbing cushion of rubber b^7, and a second motion-absorbing rubber cushion b^9.

The rubber tube b^5, surrounding the backing b^4 of the air-chamber, forms the core f' of the stem. The core, as shown in Fig. 3, has an air-passage f^2 communicating with the air-chamber b^2 of the tire. A multiple tube f^3 of fabric surrounds and reinforces the core; and one or more plies of the tube f^3 are extended

into and anchored to the material of the tube b^5. A strong facing of rubber f^5 is applied to the tube f^3, which facing constitutes an extension of the tube b^5 and is integrally connected with the superimposed parts. The fabric backing f^3 of the stem protects the core f' from strains due to the pressure of the air upon the usual valves secured to the end of the stem. Since the fabric backing is anchored in the interior of the tube b^5, and since the rubber facing f^5 of the valve is a continuation of the rubber of the tube b^5, it follows that any strain upon the valve-stem is borne



by the fabric backing f^3, thus leaving the wall of the air-chamber f^2 free and enabling it to perform its proper duty of stopping the passage of air.

The tire has a general oval shape and is formed with a flat inner face b', fitting upon the correspondingly-formed metallic rim x'. Lugs x^4 are secured to the inner face of the tire and are provided with central apertures, which receive bolts x^5 passing through the rim and binding the tire in place. Flanges x^2 bolted to the rim prevent the lateral displacement of the tire.

The air-tube, valve-stem, together with the rest of the tire, are built of green stock and vulcanized into an integral structure, instead of being made and vulcanized separately.

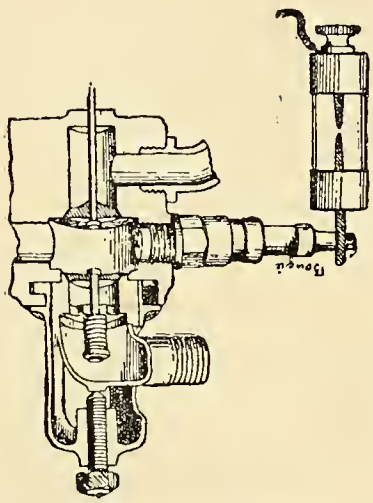
The compound cushion of rubber protects not only the wheel from injury caused by blows, but also the tubes from being rup-

tured by the strain to which a tire is naturally subjected. The rubber cushion yields both laterally and longitudinally to give the tubes the necessary play. The walls of the tire are of such thickness and are so protected by the canvas that it is well-nigh impossible to puncture the tire far enough to reach the air-chamber. Should the air-chamber be punctured, its small diameter, coupled with the thick backing, will cause its walls to meet before the tire can collapse materially.

Electric Spark Indicator

THE apparatus figured herewith shows the driver of an automobile, at a glance, the behavior of the electric spark in the explosion chamber, by causing a reproduction of it outside of the motor, and in the interior of a small glass tube mounted upon the igniter.

The apparatus consists essentially of two insulated metallic rods placed in the centre of the tube and fixed to the top and bottom caps of the latter by one of their extremities, which is threaded so as to permit the distance apart of their tips to be regulated.



Half Actual Size

One of these rods is secured to the igniter, and the other to the wires of the induction coil by a very simple arrangement.

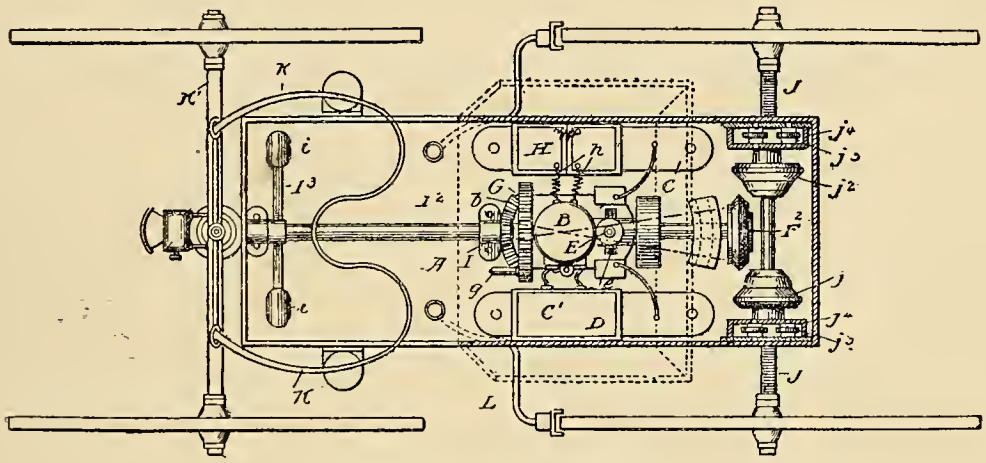
There is no danger of the occurrence of a fire, since the spark produced is protected on all sides from contact with external objects.

As the apparatus remains permanently fixed to the igniter, it allows the driver, while on the road, to keep himself constantly informed as to the working of the ignition apparatus, and thus to avert the necessity of occasionally dismounting and remounting the wires of the igniter and the igniter itself, and consequently to avoid stoppages of his carriage. It permits, too, of noting the length of the spark, and thus tends to prevent the occurrence of those electric shocks that sometimes give the heedless automobilist a painful reminder of the physiological effects of a high tension current.

The Plass Voiturette

IN the Plass voiturette, recently patented in this country, it has been the object of the inventor to reduce the parts to their simples expression, so that the maneuvering thereof may be rendered easy and capable of being effected by anybody.

In the body, *A,* of the vehicle, and directly beneath the seat, is placed a gasoline motor, *B,* on each side of which is situated a reservoir, *C,* from which the gasoline is withdrawn by a pump, *E,* that sends it to the explosion chamber. In front of the motor there is a spur-wheel, *G,* which gears with a pinion keyed upon the shaft *F*. This arrangement permits the driver to start the motor by acting upon the winch *g* of the wheel *G* with his hand.



The Plass Voiturette

The ignition is effected through the intermedium of the batteries *H*.

The motor is capable of revolving upon a pivot, *B*, which is integrally formed with the circular base, B^3, upon which the engine rests. This base is provided in front with a toothed sector, *b*, which gears with a pinion, *I*, keyed upon the shaft I^2. This latter is provided with a cross-piece to which are secured pedals, *i*.

The driving shaft, *F*, is provided in the rear with a friction cone, F^2, which is capable of transmitting motion to two other friction cones, $j\ j^2$, keyed upon the hind axle of the vehicle. These two last-mentioned cones are stepped, so that when the driver bears upon one or the other of the pedals, *i*, in order to cause the motor to revolve upon its pivot, B^2, and throw the cone

F^2 into engagement with one of the two cones j j^2, he can obtain a variation of speed dependent upon the degree of pressure exerted.

The driving axle is mounted upon rollers, j^3, that revolve in boxes, j^4, arranged on each side of the body *A*.

The steering is effected through the intermedium of a belt or guide, *K*, the extremities of which are attached to the handle-bar.

Two brakes, *L*, jointed at *I*, under the carriage body, are so arranged that they can be actuated by the driver's feet.

The "Eole" Voiturette

THE "Eole" Voiturette is a small quadricycle provided with a 2¼ horse-power Aster motor placed in front, between the two steering wheels, and well exposed to currents of air. Alongside of it is placed the carbureter. The arrangement recalls that of tricycles.

To the exterior extremity of the driving shaft, towards the axis of the carriage, is keyed a sprocket, which, through a chain, controls a toothed wheel fixed upon an intermediate shaft that carries a sprocket which is loose upon it, but capable of being connected to it through the intermedium of a drum and a spring plate after the manner of a band brake that can be tightened at will; the whole constituting a sensibly progressive engaging and disengaging coupling. This sprocket, in turn, controls, through a chain, a toothed wheel fixed to the differential gear mounted upon the axis of the driving axle.

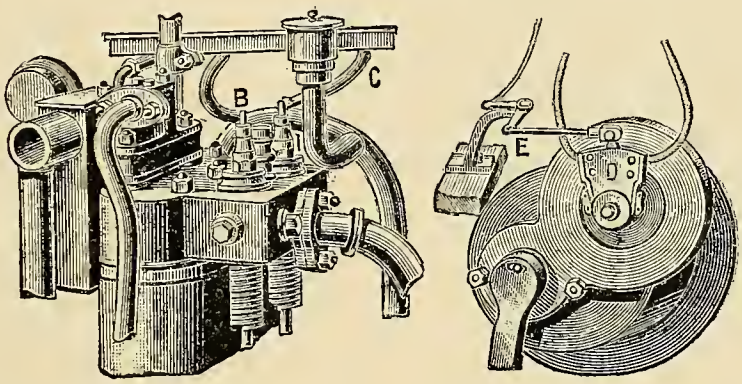
The intermediate shaft is placed near the centre of the carriage, parallel with the axles. All the parts are placed under the floor. The two transmissions constitute a double reduction gearing; the motor revolving with greater velocity than the hind wheels. The changes of speed are effected, as in a tricycle, by acting upon the explosive mixture and the igniter.

Before long we shall have a model allowing of two speeds. The second speed, however, is not necessary in the type provided with two coupled Aster motors both placed in front.

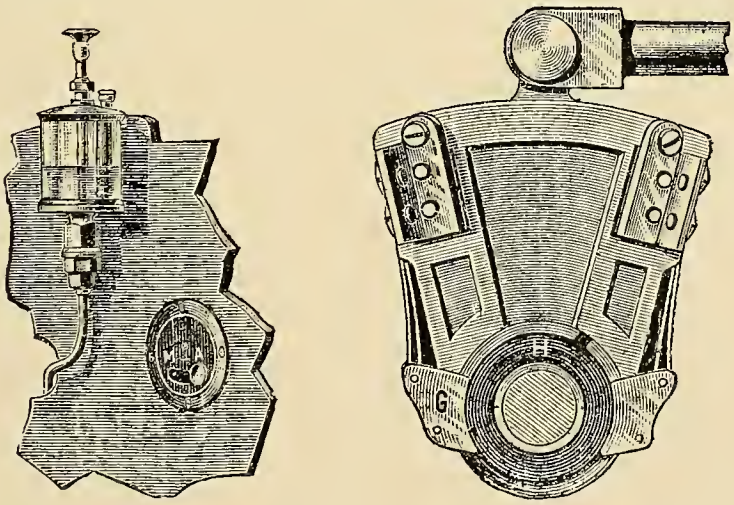
This carriage, properly suspended, weighs, when empty, about 440 pounds. It is capable of carrying two passengers seated side by side.

Electric Ignition in the Phœnix Motor

AFTER the application of the method of igniting the explosive mixture of hydrocarbon motors by means of an electric spark shall have superseded the use of incandescent tubes and become universal, the automobile industry will have made a great stride. The recent application of this method,

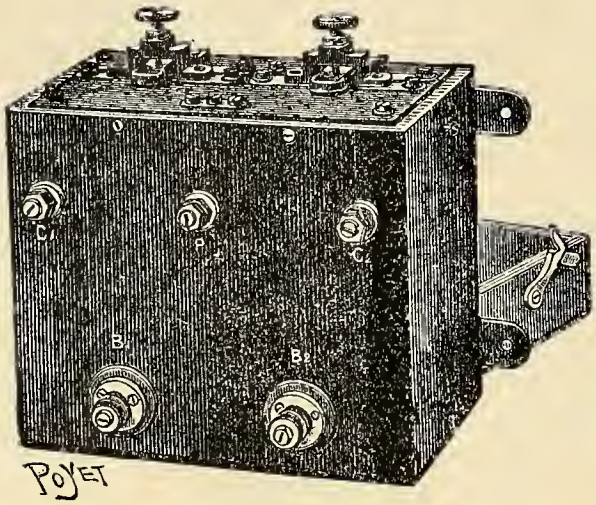


in a new form, to the Phœnix motor, by the Société Commerciale d'Automobiles, has proved so successful that a brief description of the arrangement adopted will not be devoid of interest.



In the accompanying illustrations, Fig. 1 shows the position of the igniters, *B*, which are placed upon the explosion chamber on the side opposite that of the exhaust valve. Fig. 2 represents the accumulator interrupter, which is placed alongside of the

sight-feed lubricator upon the dashboard of the carriage. Fig. 3 gives the details of the ignition controller, and Fig. 4 a general view of the same placed upon the cam shaft that controls the exhaust valves. *E* is the rod by means of which the driver transmits the accelerating or retarding motion to the ignition controller. Fig. 5 shows the box that contains the double coil, and which, along with the accumulator, is placed in the box of the carriage.



Of the two wires that start from the accumulator, one ends directly at the coil, while the other runs to the interrupter fixed to the dashboard of the carriage, opposite the driver, and consequently within easy reach of his hand.

The two wires that start from the terminals of the double coil end at the two terminals of the apparatus (Fig. 3) that controls the ignition. This apparatus consists of two tempered steel contacts, *G*, which are mounted upon springs and rub against a circular band of fibrous material surrounded by a phosphor-bronze ring. This latter is interrupted at two points, and the section thus insulated is put in connection with the body of the motor by means of a screw that traverses the band of fibre and flattens out against the distributing shaft.

Two small grease boxes placed above the pieces *G* assure the lubrication.

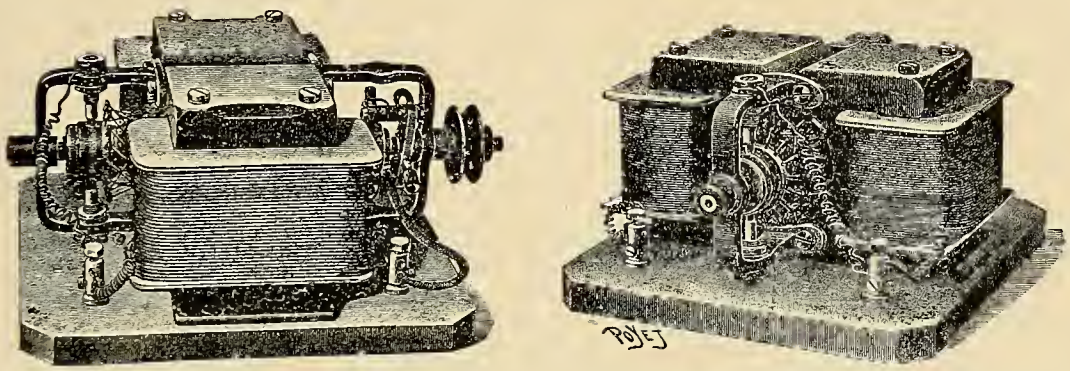
Two insulated wires connect the binding posts, B^1 and B^2, on the exterior of the box containing the coils with those of the igniters, *B*, arranged upon the explosion chamber.

The speed of the carriage is changed by varying the position of the ignition controller (Fig. 3) upon the cam shaft. The motion to effect this is transmitted from the driver's seat through the rod *E* and a bell crank.

Transformer for Charging Ignition Accumulators

By A. Delasalle

IGNITION in hydrocarbon motors is at present accomplished in two ways: (1) by incandescence, and (2) by electricity. From the standpoints of neatness and the ease with which the carriage is set in motion without loss of time, the advantages of the last-named process are indisputable; and, much more than this, it permits the ignition to be effected with greater facility than does incandescence. But, although its advantages are great, it is attended with inconveniences that must not be left out of



The Legros and Meynier Transformer for Charging Ignition Accumulators

consideration, and these the partisans of incandescence never fail to harp upon at every opportunity.

The spark is obtained through a current furnished by a generator of electric energy, and is then transformed in a coil of the Ruhenkorff type, which gives the secondary circuit the current of high tension that is necessary for the production of the spark. The generators now employed belong to one of three categories: (1) batteries; (2) accumulators; and (3) magneto-electric machines. Up to the present, there exist but a few applications of the latter type, and this is a fact to be regretted, since the magneto-electric machine is most reliable apparatus. We have to deal, then, with batteries and accumulators only. Each of these kinds of apparatus has its friends who find therein every good quality and but few defects. That batteries are excellent is undeniable; but only so long as they operate. When, to use

a common expression, they become "dead," there is nothing to be done but to buy others. This, perhaps, is an inconvenience to the purchaser, but not to the manufacturer, who does not make presents of the apparatus!

Moreover, batteries possess an electro-motive force which is inferior to that of accumulators, and consequently a greater number of them is required; and the number has to be increased, too, because of their great internal resistance.

Accumulators are in like manner costly, but, after they are discharged, all that has to be done is to resupply them with the quantity of electric energy that they have given, rendering, of course, excepted. From the viewpoint of inconveniences, the objections made to the accumulator are its want of tightness, its sulphatation and the short circuits that occur between the plates. But let us examine these different objections: It is quite true that there is a want of tightness when it is a question of ebonite boxes; but when the boxes are of celluloid, with a tight cover and special plugs, it is rarely the case that the quantity of liquid capable of escaping is great enough to do any injury. For tricycles, indeed, there are elements provided of which the electrolyte is rendered immovable; but, up to the present, we know of no liquid rendered solid that is really serviceable. The best, that made by the Schoop process from silicate of soda and sulphuric acid, is far from being what is claimed for it.

As for sulphatation, that is very simple. All that the driver has to do is to take good care of his battery, and avoid discharging it below the voltage indicated in closed circuit, that is to say, when the voltmeter marks 1.8 volt per element—the motor being in operation. If this matter be carefully attended to, the chances are that there will be no sulphating of the accumulator; and it is to the too often repeated sulphatations and desulphatations that is due the fall of active material that produces contacts between the plates. The fact must be admitted that sometimes, too, such an accident is due to defective manufacture; but the matter is purely accidental. Upon the whole, the accumulator is a good, but delicate apparatus, and one that requires to be taken care of, since the lightness that is demanded of it necessarily involves a lack of strength.

After the accumulator has fallen to 1.8 volt, it has to be recharged within as short an interval of time as possible. If the owner has not a dynamo machine or an electric supply station at his disposal, he may employ Bunsen or bichromate batteries; but only in cases in which it is absolutely impossible to do otherwise, seeing how difficult it is to obtain a regular current, and how

disagreeable and costly is the manipulation of batteries. In some cases, drivers have their recharging done by electricians, or those called so, who overtax their apparatus, and in others (and this is the better plan) have the work done at some responsible charging station or by some manufacturer of accumulators. But, with an element of 20 ampere-hours capacity, at a discharge of 0.8 ampere, this costs from 25 to 35 cents; while with others of a capacity of 50 ampere-hours, at the same rate of discharge of 25 hours, the cost is 60 cents. All that remains to be done is to take the charge from the public distributing circuits, if the driver has at his disposal a means of making a connection therewith.

The majority of automobilists own two batteries of two elements. If we suppose that both together are charged upon a 110-volt circuit, the current being one of 2 amperes, and the operation lasting 10 hours, for example, the battery will be furnished with a quantity of electricity amounting to 2 amperes × 10 hours = 20 ampere-hours.

The difference of potential at the terminals of one element during the charge will vary from 2.3 volts at the beginning to 2.5 at the end of the operation. The mean difference of potential, or, in other words, the mean ordinate of the curve of voltage, will be in the vicinity—2.42, which will give 2.42 × 4 = 9.68 volts for 4 elements in tension, and a work furnished of 20 × 9.68 = 193.6 watt-hours.

The charging effected with a current at 110 volts will give a work expended of 20 × 110 = 2,200 watt-hours. As the electric current costs 30 cents per kilowatt-hour at Paris, we shall therefore expend 2,200 kilowatts × 1.5 = 3.30, while in principle we had need of utilizing

$$\frac{193.6 \times 100}{2,200} = 8.8$$

per cent. of the work expended. The rest will therefore be employed in a lighting circuit; and it will be fortunate for the automobilist if he can do the charging only when he has need of light, or else in a metallic or liquid resistance that becomes heated.

It is expedient to remark that since the driver very often owns a spare battery, he has in most cases only one to be charged, and consequently, for the same type as the preceding, utilizes but from 4 to 5 per cent. of the energy that he expends.

It has been the desire of MM. Legros and Meynier to suppress this great inconvenience in the charging of accumulators by taking a current from a distributing circuit at, say 110 volts,

and transforming it into a current of low voltage. The power, P, of an electric current caused by a difference of potential, U, and discharging I amperes, is connected with these two figures by the relation:

$$P = U\,I \text{ watts.}$$

Having at our disposal any power whatever, we can always keep the same value in watts, by causing U and I to vary to the same degree. Such variations are obtained through a transformer. MM. Legros and Meynier's apparatus (Figs. 1 and 2) is a rotary or motive transformer with two windings, the primary circuit receiving the continuous current at 110 volts, with a very feeble consumption, and the secondary capable of giving a current of 15 volts with a discharge that is a function of the apparatus' rendering. The winding that receives the current from the distributing main (or, in other words, the primary winding) is an ordinary drum, of which the coils are connected with the contacts of a collector to which the current is led by brushes.

The secondary winding does not give rise to a continuous, but to a direct current. When a spiral closed upon itself is displaced in a magnetic field, the variation in the flow of force produced by such field gives rise to a current that changes direction, that is to say, passes through zero at the moment at which the variation in flow becomes null. At this moment the flow of force is maximum. The electro motive force produced therefore passes through one cycle for one complete circular displacement of the spiral. This cycle is accomplished according to a sinusoidal curve, and we have what is called an "alternating current." If, through an arrangement analogous to that of the Dore commutator, we change the direction of the current in the wiring, at the moment at which it changes poles, we shall have a current that will be always of the same direction, but that will pass through zero. It is a current of this kind that is produced by the Legros and Meynier transformer.

TABLE I.—*Results Obtained with the Transformer Operating as a Motor.*

Difference of Potential in Volts.	Intensity in Amperes.	Angular Velocity in Revolutions per Minute.	Power Furnished in Watts.	Power Collected at the Brake in Watts.	Rendering per Cent.	Observations.
110	0.6	2,400	66	0	0	Empty.
108	1.82	2,200	196.5	142	71	Normal charge.
106	2.6	2,034	276	196	69.5	Supercharge.

The motive that led the inventors to adopt it was that it required but a single coil, while in order to have a continuous current it would have been necessary to use several coils, which would have increased the size of the armature, and thus have defeated the object aimed at, which was to have an apparatus as light as possible. From the standpoint of rendering, the result is the same as if the secondary circuit gave a continuous current.

The total weight is 21 pounds. The inductors absorb half of the total current, which is 0.6 of an ampere upon a 110-volt distributing main, with a velocity of 2,400 revolutions a minute, when the apparatus is running empty.

The apparatus in operating as a motor has given the results shown in Table I.

TABLE II.—*Results Obtained with the Transformer in the Operation of Charging.*

Difference of Potential in the Primary in Volts.	Intensity of the Current in the Primary in Amperes.	Angular Velocity in Revolutions per Minute.	Power in the Primary in Watts.	Difference of Potential in the Secondary in Volts.	Intensity in the Secondary in Amperes.	Power in Watts.	Rendering per Cent.	OBSERVATIONS.
112	0.66	2,200	74	15	0	0	0	Empty.
112	1.40	2,200	157	15.5	6	81	51.5	5 elements.
112	1.38	2,200	155	13.5	5.95	80.5	52	5 "
110	2.	2,200	220	10.5	10.25	110.25	50.1	4 "

Table II. gives the results that have been obtained with the apparatus operating for a charging of 5 and 4 elements. The values of the difference of potential of the secondary current were obtained with an alternating current apparatus that gave the difference of the effective potential. The same is the case with the intensity. These two figures are connected with the values of U and I maximum, that is to say, with the values of U and I at the moment at which the curve passes through its maximum, by the relation:

$$U \text{ effective} = \frac{\sqrt{2}}{2} U \text{ maximum.}$$

$$I \text{ effective} = \frac{\sqrt{2}}{2} I \text{ maximum.}$$

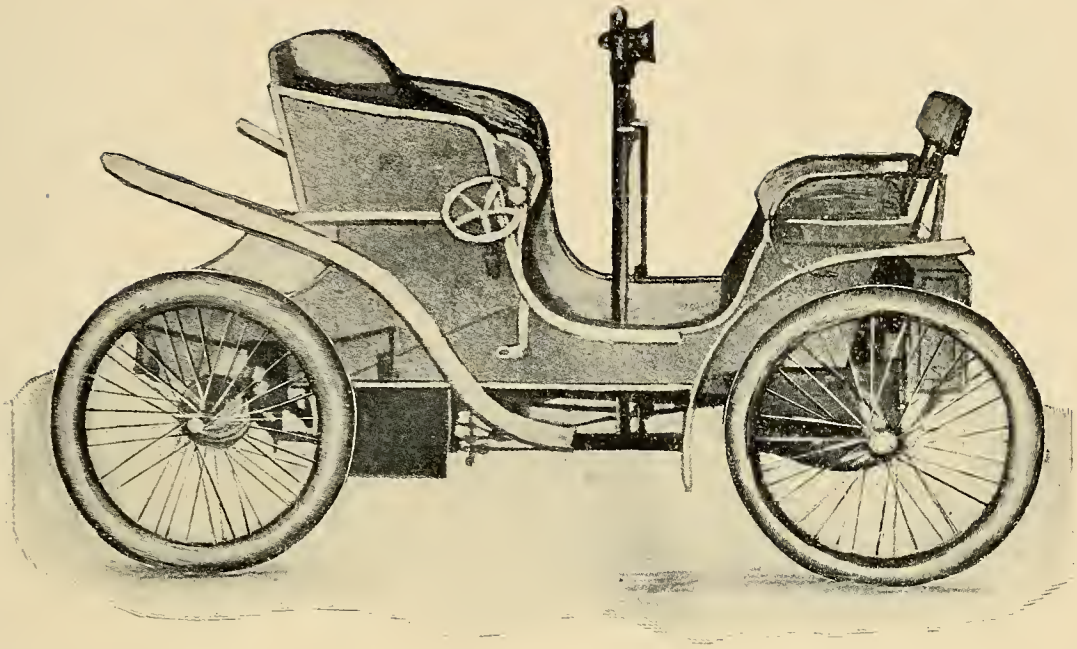
If we refer to the example mentioned in the beginning, we shall see, by observing the proportion, that for a rate of charging of 6 amperes, we have a rendering of about 11 per cent. for 5 elements in using the distributing circuit directly; whence the real saving will be at once seen.

As the apparatus is of limited weight and size, it may be easily placed upon an automobile, and be used on a trip, even though the vehicle has come to a standstill by reason of the failure of the ignition. To this effect, it suffices to actuate the transformer by means of the motor, when the apparatus will operate as a generator, since it becomes excited even at 1,000 revolutions a minute. The accumulator, although discharged, will always give, after a short inoperative period, enough voltage to start up the motor, which at this moment is thrown out of gear. The current is then turned on in such a way that it shall charge the element while it is discharging itself. By regulating the latter in order that it may give the accumulator more than it discharges, a moment will come in which everything will be in a proper state.

Upon furnishing the element with a from 6 to 8 volt current in the secondary circuit, the apparatus will operate as a reversible motor and give a current of from 40 to 50 volts. This may render it interesting for other applications, which, however, do not come within the scope of this journal.

By the addition of two rings to the collector, the apparatus might be made to operate upon the alternating current. To this effect, it would suffice to start it at a velocity such as to allow a connection to take place. Such a velocity would be that of 2,400 revolutions per minute, and would be obtained simply by means of a string wound around the pulley, which would afterwards be made to revolve after the method employed for spinning a top. This is necessary, in order that the phase of the motor shall be identical with that of the current of the distributing circuit. The secondary circuit will always naturally give a direct current.

Upon the whole, this apparatus is capable of rendering very great services to automobilists, who will effect a saving through the use of it. The cost will be quickly covered, and this will count for much in the extension of accumulators for ignition.



The New Decauville Voiturettes

ALTHOUGH, comparatively speaking, it was not very long ago that the first Decauville voiturettes made their appearance, they have already undergone several changes and improvements, and it would require but a few more modifications to convert them into genuine carriages, as, in fact, has recently been done in one case.

One of the new types which has just been brought out, and which is illustrated in Fig. 1, resembles in its general aspect a Decauville voiturette that has already become well known; but in this improved form the entire mechanism is entirely concealed in the carriagework and is thus protected against dust. There was nothing to prevent the adoption of such an arrangement, since, for the former flange-cooled motor of 3 H. P., it had been decided to substitute one of higher power cooled by a circulation of water through the intermedium of a pump and radiator. This new motor, which is of 5 H. P., is provided with two cylinders of 3.2 inch internal diameter.

The vehicle is spring-supported in front and rear—the rear support resembling that employed upon many French railway passenger coaches.

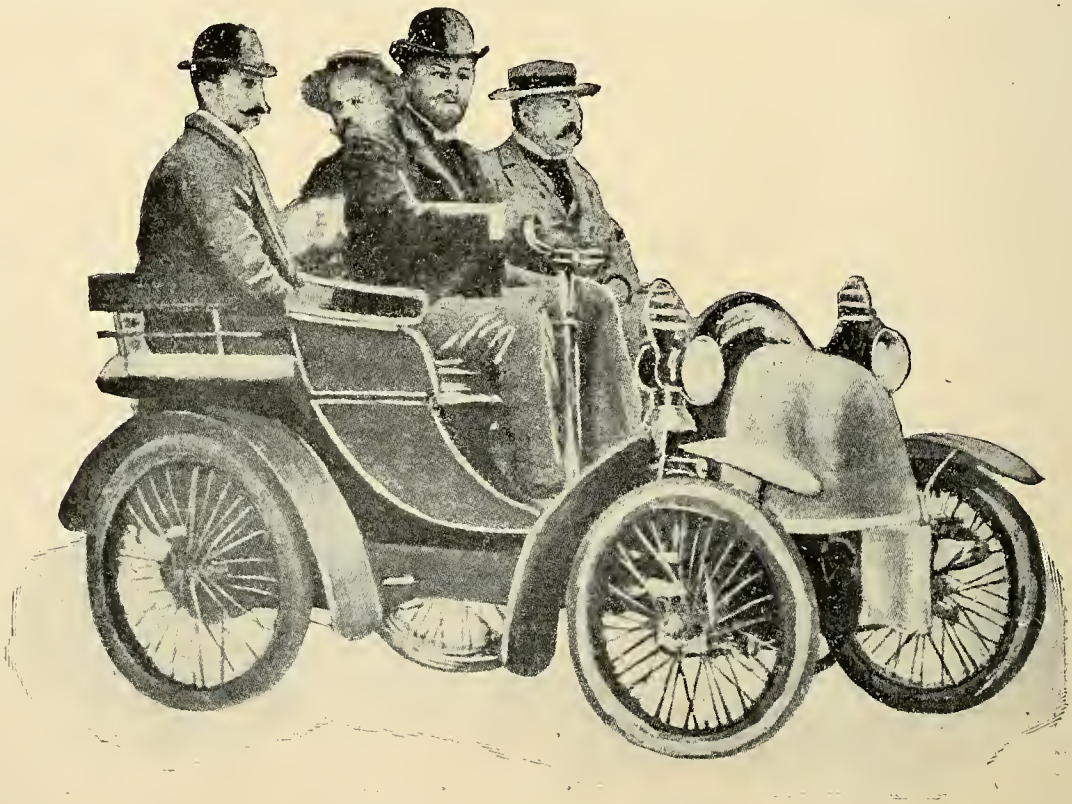
The front wheels are 26 inches in diameter and the hind ones 32.

As alluded to above, the Decauville establishment, going a step further, has brought out a new type of voiturette, which, although very small, may be regarded as a true carriage. This vehicle (Fig. 2), the trials of which are as yet scarcely completed, is driven by an 8 H. P. motor cooled by a circulation of water. It is provided with a gearing that permits of giving it four rates of speed. The motor runs normally at a velocity of 800 revolutions a minute, which is rendered constant by means of a governor. At such velocity, the speed of the carriage may vary all the way from 4¾ to 27 miles an hour. Nevertheless, an accelerator has been provided, so that, should occasion require it, the velocity of the motor may be modified in such a way that any intermediate speed of the carriage can be obtained at will.

The weight of the vehicle, in running order, is but 880 pounds. It is spring-supported at the front and rear, and is mounted upon wheels provided with steel spokes.

As in the voiturettes, the cranks are set at an angle of 180 degrees, so as to prevent vibrations. The transmission is effected solely by gearings, and to the entire exclusion of belts and chains.

The space occupied by the vehicle is very small, say 7¾ × 4½ feet; and yet it is capable of accommodating four passengers.



New Decauville Carriage

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Editorial Comment

IT is a matter of great interest that the Automobile Club of America has decided to hold a trade-show of automobiles and automobile accessories next November. The Madison Square Garden has been selected for the scene of the exhibition and special preparations are to be made to fit the great interior for the purpose. The Automobile Club of America is the organization best suited to have such an exhibition in charge and an occasion of great interest may be looked for. But judging by certain features of the programme already announced, we fear that the management has committed itself to procedures which will prove to be somewhat mistaken. We have already expressed ourselves in relation to the desirability of having the occasion an outdoor, rather than an indoor show. The automobile is an outdoor institution, and to be appreciated it needs to be shown in its native element, as it were. To exhibit the automobile indoors is much like having a yachting or boating show, should such forms of entertainment be devised—on dry land!

We note that it is announced that "the interest of the general public will be aroused by the performances of all types of self-propelled vehicles in a circular track in the centre of the Garden. This feature will be relied upon to add life and animation to the show, which otherwise would be a machinery exhibit. Automobiles will do various queer things in the ring, and if all the

suggestions that have been made are carried out an ambulance corps may be needed. There will be a hill climbing contest between automobiles propelled by steam, gasoline and electricity, similar to those given at English shows. Inclined platforms will be provided for these tests, and plenty of amusement is promised by the races up these slopes."

Under the conditions of indoor tests the attributed shortcomings of the gasoline and steam types, such as "odor and noise," even though not appreciable under ordinary circumstances, might be painfully apparent in the motionless air and within the reverberating confines of an interior space. On the other hand, the shortcomings of the electric type are of a nature that they would not be manifest in such a place, and their strong points would show to the best advantage. It would therefore be a great mistake to conduct the exhibition on such lines. The Automobile Club of America is a body above the implication of unfair intentions, and the organization of the first exhibition of the kind in this country on such lines as have been reported could be nothing more than a mistake arising from inexperience. But the effect would be one of discrimination against enormously important branches of the automobile industry. Such a result would be unspeakably unfortunate. It is therefore a matter of the greatest importance to have all the arrangements made upon a basis unquestionably equitable for every interest concerned. "A fair field and no favor" is a motto that must invariably be held in view on all occasions that have to do with industrial competition and emulation, as well as in regard to competition and emulation of every other kind. Therefore it should be understood at the earliest possible moment that no automobile of any type is to be shown in action inside of the building, and that manufacturers should have their vehicles at some suitable outside place ready for demonstration. A study of the Paris exhibition of automobiles will naturally give many excellent hints as to the best manner for conducting the first automobile show on this side of the Atlantic.

Coming Racing Events in France

The last year of the nineteenth century will certainly be a remarkable one for automobile sport. Young as the sport is, it must be admitted that there are not a few automobilists who would not be sorry to see it the last year of racing in that field. For the new vehicles built expressly for the coming great contests will develop such speed as to threaten the security of life

and limb on the part of those who use the highways for the ordinary purposes of transit for which they were intended. The field of interest lies almost wholly in France. The Paris Exposition is chiefly responsible for this great activity. Every day new events loom up in the perspective of the automobile sporting-calendar that has been arranged for the period of the Exposition. Four of these races command attention as events of the greatest importance in their line. The curtain rises, so to say, with the Paris-Bordeaux race, which will be of moment for the French manufacturer and for French automobilists as a demonstration that all the " kings of the road " would have been eligible to contest for the Bennett Cup. This race will also be of note from the fact that foreign automobilists will participate for the first time. At the same time it will be decided what team the Belgian Automobile Club will select for the Bennett-Cup contest.

The second important event, the Bennett-Cup race, will be an international affair. It may be remarked that every one of the clubs participating—the French, the German, the Belgian, the Italian and the American—expect to carry off the trophy!

Three weeks thereafter will come the annual race organized by the Paris daily newspaper, *Le Matin*. This, we think, will be the most interesting of all. Not only the contestants for the Bennett Cup, but many leading automobilists debarred from the Bennett race, will be entered. The last of this great series will come in July, and is called the Race of the Exposition. When these events are over it is more than probable that both the automobilist and the manufacturer will be satisfied.

The itinerary for the Gordon Bennett Cup contest has been prepared. The route will be between Paris and Lyons. The start will be from Versailles at about four o'clock in the morning. The course will be by way of Montargis, Nevers, Moulins, La Palisse and Roanne. Up to La Palisse the grades are gentle and the ways are excellent. From that point there is a descent to Roanne and the route becomes hilly and uneven, traversing the mountain of Beaujolais and Lyon. Taken all in all it is an admirable itinerary for a good race. The average speed is expected to be from 39 to 40 miles an hour.

Beside the foregoing there are the races from Paris to Rheims, from Paris to Boulogne, five or six contests for light vehicles, several exposition contests limited to the tourist class, and others for light and heavy public conveyances. The prizes offered for these various races are considerable. All the racing events are to take place under the auspices and control of the Automobile Club of France.

More About Liquid Air

In the January Automobile Magazine we expressed the opinion that "Liquid Air" had no commercial value, either for power or refrigeration. This condemnation is confirmed by Professor Carl Linde, of Munich, the great authority on heat engines, and himself the inventor of one of the best of liquid air producers. In his lecture at the meeting of the German Naturalists and Physicians at Munich he states: "*If* liquid air cost nothing, and if it could be kept without loss, it would have great value." These "ifs" are the difficulties.

The present largest machines are able to make at the outside limit one pound of liquid air per horse-power hour. We may ultimately attain a production of two pounds per horse-power hour, this being very doubtful, but not absolutely impossible.

In the largest establishments its cost may be reduced to two cents a pound. At this rate the production of cold will cost fifty times as much as in a steam-driven refrigerating machine.

Loss by evaporation may possibly be reduced to about 1% an hour, even a slower rate having been obtained in the Dewar bulbs, which cannot be made of commercial size.

For motors, liquid air can have no value except where cost is no object. It takes six times as much energy to liquify air as the energy obtainable from the liquid air; there are further great losses in any machine, probably 80%, so that only one to two per cent. of the energy spent to liquify can be obtained again as work.

Professor Linde, however, suggests a possible use for liquid air in the gas or oil engine. In these engines the fuel, whether gas or oil, is mixed with air to form a gas which, by explosion, drives a piston. There are two drawbacks to these engines:

First—The heat of the explosion is very high, between 2,500 and 3,000 degrees, and to prevent the cylinder heating red, or even white, it is water jacketed and the heat lead off. This jacketing carries off from 30% to 50% of the energy without an equivalent in useful work.

Second—While steam engines receive an impulse every half turn of the flywheel, gas or oil engines receive an impulse every two turns. The first stroke is that of impulse or explosion, the second of expulsion of burnt gases, the third of indraft of fresh charge, the fourth of compression of the charge. Owing to the extreme heat and high pressures only one side of the piston is usually used. As a consequence gas and oil engines, although

economical of fuel, are very heavy and require one or two heavy flywheels to secure even motion.

If, instead of air, a few drops of liquid air were injected into the cylinder, together with the required oil, combustion at lowest possible temperature could be obtained and the water jacket losses would be minimized, and both sides of the piston could be used and a charge of liquid air and oil injected at every stroke.

Such a heat motor could probably be made more powerful for its weight and for fuel consumption than any motor ever built, and it would therefore have great value in certain automobile or other small motor work.

Cost must, however, be considered. A pound of oil costing one cent a pound requires for its combustion about 18 pounds of liquid air costing a minimum of two cents a pound, and therefore, aside from the difficulty of either securing or keeping a supply of liquid air, the operating costs of such an engine, which is not a liquid air engine but an oil engine, will be 36 times as great as the cost of an engine using atmospheric air.

Professor Linde sees no hope for the commercial use of liquid air, either for power, refrigeration or explosives, but thinks it may have value in surgery or to obtain an air rich in oxygen for certain chemical operations. The latter is at present the only probable field for its use on a commercial scale.

The Question of Design

A fault that is found with the appearance of the automobile lies in the universal tendency to embody in a new thing the aspect of some familiar thing nearest akin thereto. One of the most conspicuous examples of this tendency is exhibited in the extraordinarily close manner in which the design of the stage-coach was followed in the railway carriages of Europe. An American who visits Europe for the first time is astonished to see how the lines and the detailed features of the stage-coach are imitated in the passenger-cars of railways everywhere. These cars were originally designed to resemble as closely as possible the pattern originally furnished in the first of such cars, which were composed simply of several stage-coach bodies secured to a platform that was mounted on wheels. And the type, awkward and inconvenient as it is, has persisted to this day. Without the slightest use, and in a manner that contradicts natural lines, the aim still is to produce the effect of a composite stage-coach. The doors and the windows are the same, the seats are the same, and in

the interior various stage-coach details are retained that do not have the slightest relation to a railway-carriage. Other details remain in a rudimentary form. For instance, it is not uncommon to see included in the fittings, simply for ornamental effect, straps such as stage-coach passengers were wont to cling to when traveling a jolting road. The American type of passenger-car, however, is such a complete departure from the stage-coach prototype, that it demonstrates that the unreasoning following of a model purposed for a quite different form of use is not inevitable. But when we consider that the first passenger-cars in this country were constructed after English patterns it seems remarkable that the change should ever have been made to something so radically different, and so thoroughly in conformity with natural requirements. It gives hope, however, that correspondingly independent lines will ultimately be followed in the development of the automobile in this country.

The common remark that the automobile looks too much like a carriage going about without a horse has much to justify it, and it indicates a radical defect in design. The carriage for animal-traction was designed to go with the horse, and in the correctly designed automobile the absence of the horse should not be felt. Every person with a true sense of beauty—and therefore a sense of proportion in animals according to the nature of a given species—knows how abominably a horse looks with his tail docked, as demanded by absurd standards of fashion. The proportion as to length is radically changed and the consequence is that the absence of the tail gives the animal an abnormal effect of abbreviation, a kangaroo-like awkwardness. It is such a sense of abbreviation that one is apt to feel in the average automobile design. Horse and carriage were a unity, and simply to make a carriage as before gives the impression of a broken unity. The problem should be considered by artistic designers in the light of only existing factors, forgetting entirely the factors that have ceased to exist. If a good designer could be found who had never seen a horse and carriage and the requirements of the case should be placed before him we should be likely to secure a most admirable design, thoroughly expressive of the purpose and nature of the vehicle. As it is, designers will have to divorce their minds from the old associations of the carriage as they have known it. For this reason better results may be looked for from designers that have not been connected with the designing of ordinary carriages. The writer once saw a capital design for an automobile sketched by Mr. Frederic E. Church, the eminent painter, who possesses native mechanical ability to an excep-

tional degree. It met in a sensibly graceful and artistic manner the practical requirements of the problem.

In considering what should be the proper conditions for automobile design it should be remembered, for instance, that unlike a carriage for horses there is no longer need to sit high to avoid dust and mud from the feet of animals. With a low base comes a better centre of gravity and greater safety. Neither is it essential, in the case of a coachman, for that individual to sit in front and obstruct the view, as was necessary when he had to look after his horses. Flat surfaces in front should also be avoided. Every wheelman knows how hard it is to go in the face of the wind. A flat surface with a head wind therefore means a great waste of power for an automobile, a waste that would be avoided by making the front as sharp as practicable. Great improvements have been made in recent automobile designs and we already have not a few handsome-looking vehicles. The Draulette Electromobile, for example, illustrated in our March number, has a notably graceful and appropriate design. It should also be remembered that it takes some time before an adopted design can be realized in the output of the great manufacturing establishments. For instance, types of vehicles that were designed three years ago are now just making their appearance in public, and the art has naturally made great advances since that day. From what has already been accomplished in the way of improved design there is reason to hope that results will be reached as felicitous in the way of separating the shape of the automobile from unavailing precedents as those achieved in the case of the railway coach in this country.

A Mobile Exhibition

The projected grand tour of the Automobile Club of Great Britain arranged for the coming summer is to be an affair of unusual interest. A round trip is to be made on a great scale throughout England and Scotland, visiting all the leading cities. And in each city a feature will be made of holding a sort of informal exhibition, showing the vehicles to the public in ways that cannot fail to be both interesting and instructive. This is an example which, of course, cannot possibly be followed in this country in its entirety. In the first place, our national domain is too extensive to make it practicable. In the second place, we have not the roads that would admit of a tour of the kind in any section of this country, even as circumscribed as the Island of Great Britain. Yet it furnishes suggestions for something of the sort

on a more limited scale, and the idea ought to be followed in the near future. Certain parts of the country are already famed for fine roads. In the States of Massachusetts and New Jersey, for instance, there are so many excellent roads that in each of those sections it would be easy to arrange such a tour. It would not only be for the participators an immensely enjoyable occasion, it would be an occasion of enormous popular interest. In every leading place visited the coming of the automobiles would be the event of the week—even of the season, we might say. It would be an occasion for novel festivities. Notable hospitalities would be shown, the public would be immensely interested and would be familiarized with the new form of locomotion, for which friends would be made everywhere. Hardly anything would be better calculated to demonstrate the utilities and the pleasures of the automobile, and its serviceability for the community. It should be a comparatively easy matter to organize such a tour in a manner that would make it an occasion memorable for pleasure and comfortable travel from beginning to end. A beginning might be made this year in both of the States mentioned, and likewise in other sections of the country where conditions are favorable. And once the beginning made, the tour would be likely to become an annual event—increasingly with each successive year one of the great occasions of the summer. In fact, it would be an automobile exhibition of the most appropriate kind—a traveling exhibition, a mobile show, true to its name and nature.

Automobile Highway

Once more the plan of a national highway from the Atlantic to the Pacific has been revived, this time by owners of automobiles. The Automobile Club of America is taking active steps to popularize the movement for a good road from sea to sea.

A commission of enthusiastic automobilists has been appointed, among its members being Gen. Nelson A. Miles, Col. Peter S. Mitchie and Prof. Samuel E. Tillman, of the United States Military Academy, and Major Richard L. Soxie, of the Engineer Corps, U. S. A. This commission held its first meeting at the Waldorf-Astoria April 2, and the movement was formally launched at a dinner in honor of Gen. Miles.

Among the invited speakers were Gen. Roy Stone, head of the Department of Road Inquiry, under the Department of Agriculture, who has expressed his sympathy with the movement.

Automobilists intend that the highway shall be built independent of existing roads and the expense borne by the United States, aided by States through which the road will pass.

A Chance for Heavyweights

We have received the following letter from the American Consulate at St. Petersburg :

" Will the Automobile Magazine be kind enough to notify the manufacturers of automobile freight wagons that the Russian Minister of War proposes that if any manufacturer ship to him care of Colonel N. A. Blinoff, Chief Staff, Ministry of War, St. Petersburg, Russia, two such machines, one to be propelled by steam and the other by kerosene, he will pay the freight and duty on both, purchase the one best suited and return the other. The machines to be in St. Petersburg by June, 1900.

" Manufactures will please mail catalogues to Colonel Blonoff, giving price, weight, inside dimensions, rapidity of movement and other data.

" This is a great opportunity to furnish the Russian Army with wagons and will lead to a large business.

Very respectfully,

W. R. Holloway,

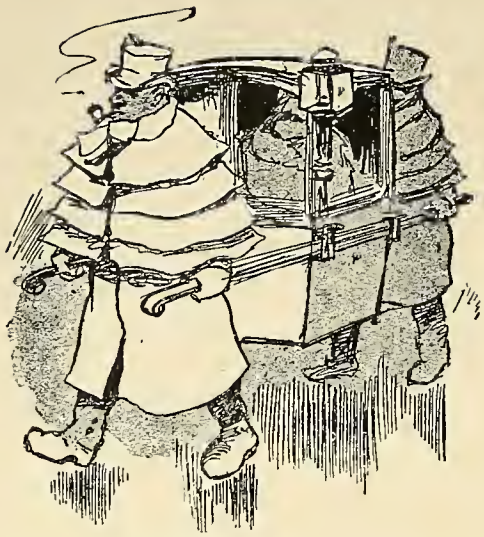
Consul-General."

A similar request has been forwarded to us by Prof. R. H. Thurston, of Cornell University. This letter came from M. C. Burch, of the Department of Justice, in Washington, D. C.:

" My attention has been attracted to Prof. Thurston's article in January number of the Automobile Magazine. I am much interested in a study of mechanical methods for transportation of ores and other heavy but not bulky freights in the arid regions of the West. While I would prefer oil motors, I would not hesitate to adopt another kind if under all the circumstances it seemed desirable. I would be greatly obliged if you would send me any catalogues, circulars or other data you may be able to spare that would assist me."

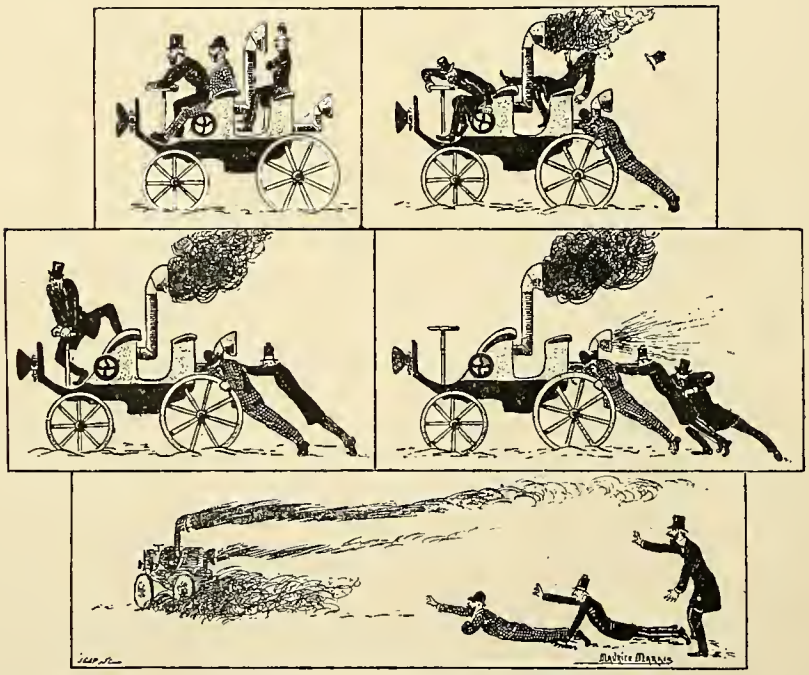
The United States Consul at Batavia writes about the prospects of automobilism in Java as follows: " This is the very finest kind of a country for automobiles, as the roads are good, and, owing to the bad climate, the wear and tear on horseflesh is very great. At present there are only two in the island—of what make I do not know. I am convinced that it would pay to introduce them. Power is cheap here, and water is abundant, and fuel and labor reasonable in price."

Automobile Humors

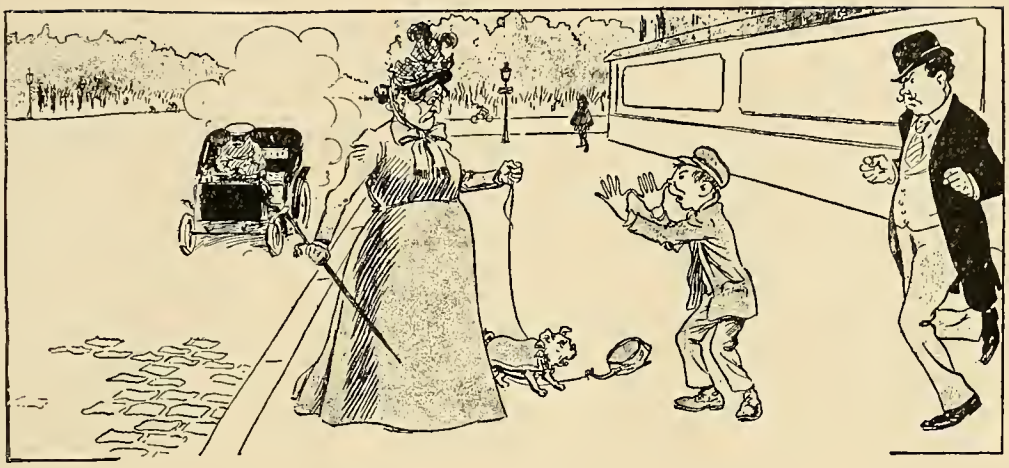


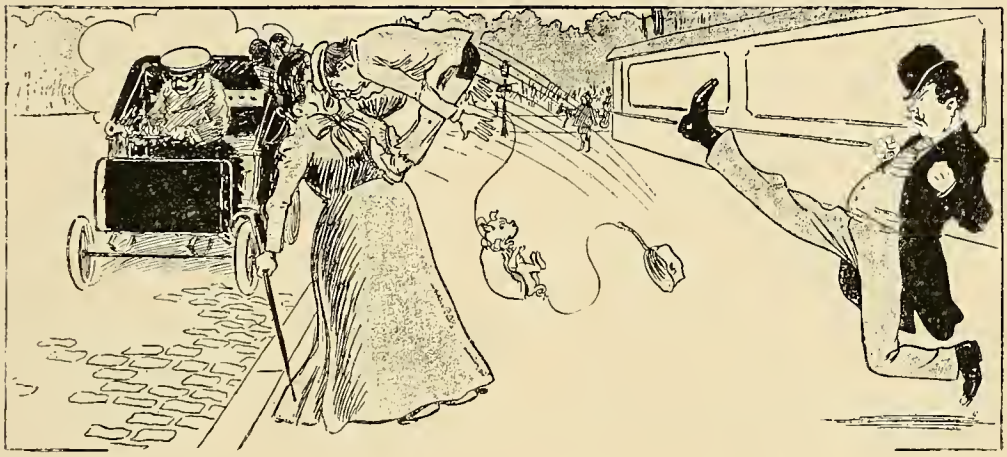
A Horseless Carriage

Types of German Schnauferlmen
Allgemeine Deutsch Auto Zeitung



A STORY WITHOUT WORDS
From *Le Monde Illustré*





THE MOTHER-IN-LAW AVENGED

FALCO in *L'Univers Illustre*

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Accumulators—

A serial article, by E. C. Rimington, on the construction and management of electric accumulators for automobiles. With illustrations. "The Automotor Journal," London, February, 1900.

A technical article by Prof. Félicien Michotte. "The Automobile Magazine," March, 1900.

Advantages of Multi-cylinder Motors—

An article on the respective merits of two, three and four cylinder gasoline engines of various types. "The Motor Age," Chicago, February 8, 1900.

An Automobile for Land and Water—

A descriptive notice. "The Automobile Magazine," March, 1900.

A Typical French Voiturette—

An illustrated description. "The Automobile Magazine," March, 1900.

Automobile Management—

A serial article, by Philauto, giving practical hints to users of automobiles. "The Motor-car World," London, February, 1900.

Automobiles and their Construction in the United States—

An article and illustrations relating to this subject. "The Carriage Monthly," Philadelphia, Pa., February, 1900.

Automobiles and their Motors—

A serial technical article. With illustrations. "L'Industrie Automobile," Paris February 25, 1900.

Automobile Tariffs—

(Some of the foreign tariffs compared.) "The Automobile Magazine," March, 1900.

Boilers for Steam Automobiles—

Description of the Toward water tube boilers for steam automobiles. With five illustrations. "The Autocar," Coventry, England, February 3, 1900.

Brakes—

Description and illustration of a special brake for automobiles, devised by M. E. Berteau. "La Locomotion Automobile," Paris, February 1, 1900.

Carbureters—

Illustrated description of a new carbureter devised and patented by Charles Le Blon. "La France Automobile," Paris, January 7, 1900.

The Goutallier carbureter described and illustrated. "Les Petites Annales Illustrées du Cycle et de l'Automobile," Paris, January 13, 1900.

Peugeot's carbureter described and illustrated. "L'Industrie Automobile," Paris, January 25, 1900.

The Lepape carbureter described and illustrated. "La France Automobile," Paris, January 25, 1900.

Illustrated description of the Aster carburer. "La Locomotion Automobile," Paris, January 25, 1900.

Illustrated description of both the Le Blon and the Abeille carbureters. "The Automotor Journal," London, February, 1900.

Description of the Parsons carbureter, with one illustration. "The Automotor Journal," London, February, 1900, also "La Locomotion Automobile," February 22, 1900.

The new Raymond carbureter described and illustrated. "The Motor-Car Journal," London, February 9, 1900.

Illustrated description of the Lempriere combined inlet valve and carbureter. "La Locomotion Automobile," Paris, February 22, 1900.

Cooler and Starter—

The Estcourt cooler and starter described, with two illustrations. "The Autocar," Coventry, England, March 3, 1900.

Electric Automobiles—

Full description of the Pieper carriage, with illustrations. The propulsion of this vehicle is effected by a novel combination of electric power and a gasoline motor. "Les Petites Annales Illustrées du Cycle et de l'Automobile," Paris, January 7, 1900.

Description, with illustrations, of the E. C. Stearns & Co.'s carriage. "Electrical World and Engineer," New York, January 27, 1900.

Description and illustration of a new electric carriage, designed by Mr. W. H. Chapman, of Portland, Me. "The Motor Vehicle Review," Cleveland, O., January 30, 1900.

Description of the Scheele carriages. With three illustrations. "The Motor-car Journal," London, February 2, 1900.

"European types of electric automobiles." An illustrated description of the Henschel, the Lohner, and the Piper carriages; also of other vehicles. "Electrical World and Engineer," New York, February 10, 1900.

The Chapman light weight storage battery automobile fully described. With three illustrations. "Electrical World and Engineer," New York, February 17, 1900.

The Draulette electromobile described and illustrated. "The Automobile Magazine," March, 1900.

An enclosed automobile for doctors, designed by Elmer A. Sperry and built by the Cleveland Machine Screw Company. A brief description. With one illustration. "Electrical World and Engineer," New York, March 3, 1900.

"Trolley-fed Automobiles in France." A descriptive and illustrated article about the trolley-fed automobile system that is now being experimented with near Paris. The inventor is Mr. Lombard-Gerin. "Electrical World and Engineer," New York, March 10, 1900.

Electric Ignition—

A comparative study of various American devices for electric ignition. "The Horseless Age," New York, February 7, 1900.

Electric Motors—

The Chapman electric motor and outfit for automobiles, which can be attached to any carriage. Its description and illustration. "Cycle and Automobile Trade Journal," Philadelphia, March, 1900.

"The calculation of the capacity of Batteries and Motors for Motor Vehicles." Suggestions and formulæ for said calculation. "The Hub," New York, March, 1900.

A technical article, by P. M. Heldt, under the title of "Motors for Electric Automobiles." With one illustration. "Electrical World and Engineer," New York, March 10, 1900.

Electric Truck—

Description and illustration of an electric truck for delivering pianos, built by the Woods Motor Vehicle Company of Chicago. "The Motor Vehicle Review," Cleveland, O., February 13, 1900.

Elementary Instruction About Electric Automobiles—

A serial article by J. M. Davis. "La France Automobile," Paris, February 25, 1900.

Fore-carriage—

Illustrated description of the Vollmer detachable fore-carriage for automobiles. "Scientific American," New York, February 10, 1900.

Gallery of American Automobiles—

(Exposition carriages.) "The Automobile Magazine," March, 1900.

Hot Tube Versus Electric Ignition—

A technical article, by Herbert L. Towle. "The Horseless Age," New York, February 28, 1900.

Hydro-carbon Automobiles—

A brief description of the Gladiator voiturette. With one illustration. "La France Automobile," Paris, January 18, 1900.

André Py's voiturette described. With five illustrations. By Paul Sarrey. "La Locomotion Automobile," Paris, January 18, 1900.

The Chesnay carriage briefly described. One illustration. "La France Automobile," Paris, January 21, 1900.

A full description of the various parts of the Peugeot carriage. With illustrations. "The Motor Vehicle Review," Cleveland, O., January 23, 1900.

"The Construction of a Gasoline Motor Vehicle." An article. With illustrations, by Clarence C. Bramwell. "The Motor Vehicle Review," Cleveland, O., January 23, 1900.

A full description, with four illustrations, of the Delahaye carriage. "La France Automobile," Paris. January 25, 1900.

Illustrated description of a new gasoline truck built by Amédée Bollée Fils. "Le Chauffeur," Paris, January 25, 1900.

A brief description of the Vinet voiturette. With one illustration. "Le Chauffeur," Paris, January 25, 1900.

The Clément carriage described and illustrated. "Le Chauffeur," Paris, January 25, 1900.

The Cochot light vehicles briefly described. With two illustrations. "The Motor-Car Journal," London, January 26, 1900.

Description of the "Balmoral" gasoline "char-à-banc." With one illustration. "The Motor-Car Journal," London, January 26, 1900.

Illustrated description of the Tourand Automobile. "La France Automobile," Paris, January 28, 1900.

Full description of the Morisse voiturette, as built by E. J. Brierre & Cie. With three illustrations. "L'Avenir de l'Automobile et du Cycle," Paris, February, 1900.

The Gobron and Brillié Automobiles fully described by G. Chanveau. With illustrations. "The Automobile Magazine," February, 1900.

Illustrated description of the "New Orleans" carriage, built at the New Orleans Works, in Twickenham, England. "The Autocar," Coventry, England, February 3, 1900.

The latest two and four-seated Leach carriages described and illustrated. "The Motor Vehicle Review," Cleveland, O., February 6, 1900.

The Bolide car and motor fully described and illustrated. "The Autocar," Coventry, England, February 10, 1900.

"The construction of a Gasoline Motor Vehicle." Serial articles by Clarence C. Bramwell. "The Motor Vehicle Review," Cleveland, O., February 6, 13, 1900.

The "Phoenix" delivery wagon described and illustrated "The Motor Vehicle Review," Cleveland, O., February 13, 1900.

The Colliot carriage, with its two-cylinder motor. An illustrated description of same, by Paul Sarrey. "La Locomotion Automobile," Paris, February 22, 1900.

The Canello-Durkopp carriage fully described. With four illustrations. "The Motor-Car Journal," London, February 23, 1900.

Brief description of two new English voiturettes, called the "Billings" and the "Monk and Lonsdale." "The Motor-Car Journal," London, February 23, 1900.

The Morris motor-omnibus briefly described. With one illustration. "The Motor-Car Journal," London, February 23, 1900.

Description of the Billings and Burns voiturette. With one illustration. "The Autocar," Coventry, England, February 24, 1900.

Hertel's voiturette briefly described. Two illustrations. "The Automobile Magazine," March, 1900.

Description and illustration of the Loutzky automobile. "The Automobile Magazine," March, 1900.

The Pougnaud-Brothier naphtolettes described and illustrated. "The Automobile Magazine," March, 1900.

Description of a gasoline surrey built by the Holyoke Motor Works. With two illustrations. "The Motor Age," Chicago, Ill., March 8, 1900.

Hydro-carbon Motocyles—

Illustrated description of the Delangere gasoline tricycle. "La Locomotion Automobile," Paris, February 8, 1900.

Description of the Steffy motocycle. With two illustrations. "Cycle and Automobile Trade Journal," Philadelphia, February, 1900; also "Scientific American," New York, March 3, 1900.

A description of the "Wartburg" motocycle. "The Automobile Magazine, March, 1900.

Hydro-carbon Motors—

Oil Engines and Motor Cars. Anthony G. New. Considers the application of oil engines to motor cars. Part first deals with the car, the engine and the interaction of car and engine. "Engineer," London, January 5, 1900. Serial. 1st part.

Illustrated description of the Wellington motor. "The Automotor Journal," London, February, 1900.

The Partin motor for cycles described and illustrated. "The Automotor Journal," London, February, 1900.

The "Philibert-Bourdiaux" gasoline motor described and illustrated. "La Locomotion Automobile," Paris, February 8, 1900.

Illustrated description of the Adams gasoline motor. "The Autocar," Coventry, England, February 10, 1900.

The "Minerva" motor described and illustrated. "The Automobile Magazine," March, 1900.

Description and illustration of the "Niagara" carriage motor. "Cycle and Automobile Trade Journal," Philadelphia, March, 1900.

"Lucas-Villain Explosion Engines." A brief description with illustrations. "The Automobile Magazine," March, 1900.

"A Power Increasing Motor." By Henry Sturmey. "The Automobile Magazine," March, 1900.

A brief description, with one illustration, of the "Star" motor. "The Autocar," Coventry, England, March 3, 1900.

Igniters—

"The Bosch Magneto-Electric Igniter for Automobiles." A full description of same. With illustrations. "The Automobile Magazine," March, 1900.

The Motsinger sparker for hydro-carbon motors, described and illustrated. "The Motor Vehicle Review," Cleveland, O., March 6, 1900.

Ignition—

A serial article by "Flash," under the heading of "All About Ignition." "The Motor-Car World," London, February, 1900.

Interchangeable Motor and Transmission Gear—

Illustrated description of the Pantz motor and transmission gear as applied to various vehicles. "The Motor-Car Journal," London, January 26, 1900.

International Automobile Congress—

Official programme of the Automobile Congress that will take place at the Paris Exposition. "Les Petites Annales Illustrées du Cycle et de l'Automobile," Paris, February 3, 1900.

Mechanical Propulsion and Traction—

Fourth paper, with illustrations, by Prof. G. Forestier. "The Automobile Magazine," March, 1900.

Odometers—

Full description, with illustrations, of the "Enomis" odometer. "The Automobile Magazine," March, 1900.

Progress of Motor Vehicles—

By W. N. Fitz-Gerald. "The Automobile Magazine," March, 1900.

Safety Device—

The Bickford "New Safety Device" for steam carriages, described and illustrated. "The Horseless Age," New York, March 7, 1900.

Speed Changing Gears—

Illustrated description of a novel speed changing gear invented by Messrs. Oliverson and Killingsbeck, of Southport, England. "The Motor-Car Journal," London, January 26, 1900.

A speed changing gear without supplementary friction (Levasseur and Wertheimer system.) Description and illustration of same. "La Locomotion Automobile," Paris, February 8, 1900.

Starters—

The new Dion-Bouton starting device. Described and illustrated. "La France Automobile," Paris, January 11, 1900.

Full description of the Hope starter. With ten illustrations. "The Autocar," Coventry, England, February 17, 1900.

Steam Automobiles—

A brief description of the new Coulthard steam wagon. With one illustration. "The Automotor Journal," London, February, 1900.

Description of the Baldwin steam-automobile. Two illustrations. "Cycle and Automobile Trade Journal," Philadelphia, February, 1900.

"The Valve Motion and Reversing Gear of Steam Vehicles." An article by "Loco." "Cycle and Automobile Trade Journal," Philadelphia, February, 1900.

A serial article describing the Gardner-Serpollet 8 H.P. cab. With illustrations. "La France Automobile," Paris, February 25, 1900.

The new one-seated Stanhope runabout as built by the Milwaukee Automobile Company. Described and illustrated. "The Motor Vehicle Review," Cleveland, O., March 6, 1900.

Steam Omnibus—

The Purrey Steam Automobile (Automotrice à Vapeur, Système Valentin Purrey). H. Brosselin. A detailed description of the mechanism and operation of the steam omnibus now under practical trial by the Compagnie Genérale des Omnibus of Paris. 2 plates. "Revue Generale des Chemins de Fer," January, 1900.

A brief description of a new French steam omnibus. With one illustration. "The Motor-Car Journal," London, February 23, 1900.

The Construction of a Gasoline Motor Vehicle—

A serial technical article by C. Bramwell. "The Motor Vehicle Review," Cleveland, O., February 20 and 27, and March 6, 1900.

The First Hydro-carbon Automobile—

Report on the first carriage propelled by a gas motor. Read by Mr. Ch. Jeantaud before the Committee of the Automobile Club de France. "Revue des Transports Parisiens," Paris, February 1, 1900.

The Horse Power of Motors—

A technical article, with illustrations, by E. C. Oliver. "The Horseless Age," New York, February 28, 1900.

The Manufacture of Electric Automobiles—

An article on the process of construction of electric automobiles, referring specially to the methods adopted by the Columbia and Electric Vehicle Company of Hartford, Conn. Eleven illustrations. "Electrical World and Engineer," New York, January 13, 1900.

Mr. George F. Chamberlin,
Vice-President,
President pro tem. of the Automobile Club of America

The Automobile MAGAZINE

VOL. II MAY 1900 NO. 2

Doings of the Automobile Club of America

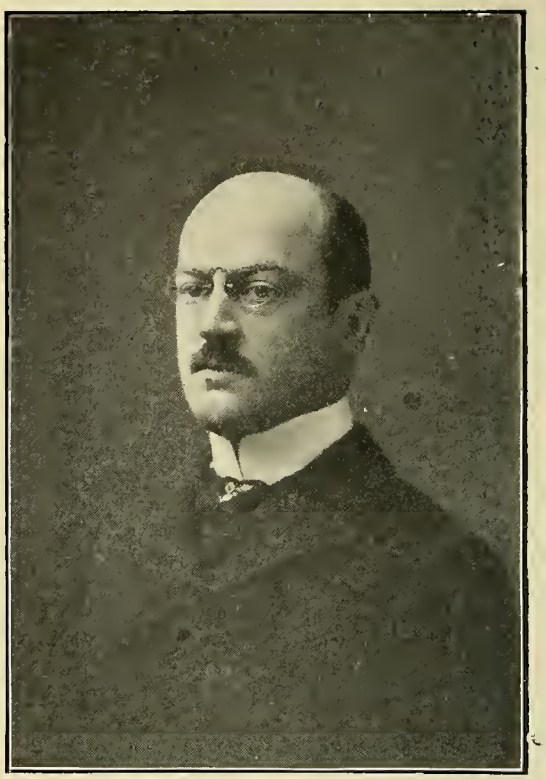
AT the opening of the active automobile season, we think it will interest our readers to learn about the doings of the Automobile Club of America. We will in future give every month a like synopsis of the activity of this young and vigorous institution, and at some later date will present the history of the club from its inception. Under the guidance of Mr. George F. Chamberlin, Vice-President and acting President; Capt. Homer W. Hedge, the Secretary, and Mr. Whitney Lyon, the founder, the club has already developed into one of the foremost New York clubs.

It has made itself felt as a powerful organization, not only in New York City and State, but even throughout the United States, by fostering a new national industry and by its enterprise in initiating a new phase of the "good roads" movement in the proposed creation of a system of national highways, beginning with a transcontinental boulevard from the Atlantic to the Pacific. To Mr. John Brisben Walker, the eminent editor and publisher, also a member of the club, is due the credit for the first conception of this giant project.

The great event of the year, and one that may have most beneficent and far-reaching consequences, was the dinner given by the club in the Astor gallery of the Waldorf-Astoria on the evening of April 2, when a number of distinguished guests were invited to meet Major-General Nelson A. Miles of the United States army and the other members of the

commission appointed to consider the subject of a national highway from the Atlantic to the Pacific. The dinner was the first regular affair of the kind given by the club. Vice-President Chamberlin presided, and with him at the head table sat General Miles and Francis E. Stanley, Newton, Mass.; Colonel Peter Michie, United States Military Academy; Colonel Richard L. Hoxie, United States Engineer Corps; Colonel Samuel E. Tillman, United States Military Academy, and Colonel John Jacob Astor.

Among others present were ex-Mayor William L. Strong, Colonel Albert A. Pope, the Rev. Dr. Henry M. Sanders, Julian Hawthorne, Isaac B. Potter, A. R. Shattuck, General George Moore Smith, Major P. B. Strong, William Leary, Dave H. Morris, John H. Flagler, Albert C. Bostwick, Leonce Blanchet, V. Everit Macy, George Isham Scott, Edwin W. Adams, J. O. Jimenes, Jefferson M. Seligman, E. E. Schwarzkopf, J. S. Bache, Amzi L. Barber, W. H. Johnson, Walter E. Frew, S. S. Wheeler, A. R. Hawley, Whitney Lyon, J. M. Ceballos, E. S. Jaffray, Charles J. Canda, the Rev. E. N. Potter, Rudolph Walker, David S. Walker, P. Farrelly, Colonel Edgar Bass, Charles R. Flint and Stephen Farrelly.



Cap. Homer W. Hedge,
Secretary of the Club

Mr. Whitney Lyon,
Founder of the Club

The National Commission for the Construction of the Transcontinental Boulevard

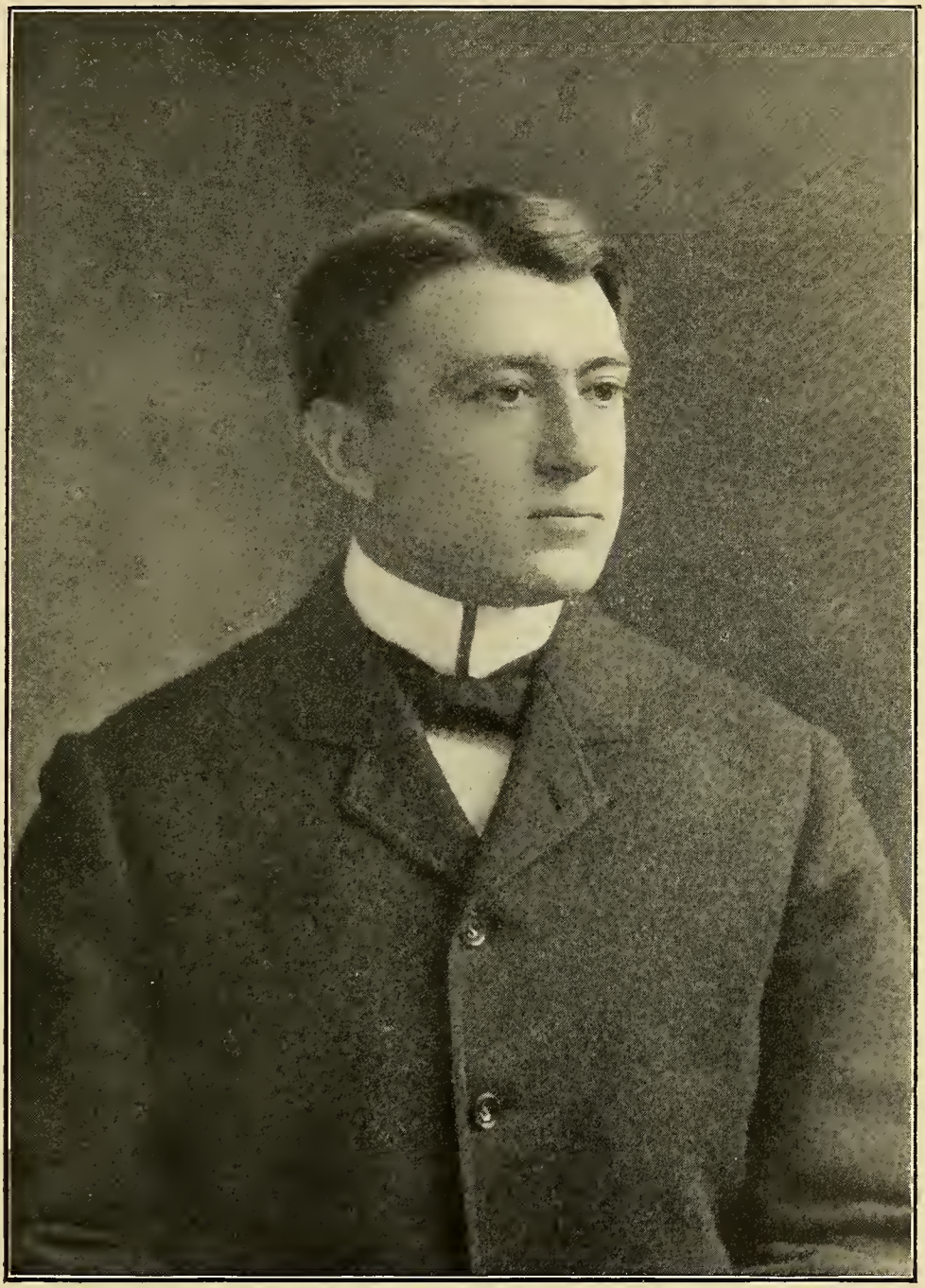
By courtesy of the *N. Y. Tribune*

Mr. A. R. Shattuck,
Chairman of Good Roads and Library Committee

Mr. Chamberlin, in his introductory remarks, said:

"This club has always, from its very organization, recognized that the future use of the self-propelled pleasure vehicle in this country will be largely a question of good roads. The charter of this club expressly provides that one of its principal objects and purposes shall be 'to promote and encourage in all ways the construction of good roads and the development and improvement of highways.' The club is proud that it has been able already to awaken some public sentiment along this line, its first official publication having been entitled 'A Plea for Good Roads.' When, therefore, it was proposed that the first dinner of the Automobile Club of America should be in honor of the distinguished gentlemen composing the Commission who are to make a report on the project of a transcontinental highway, every member felt that our association, of all others, was most vitally interested in the magnificent enterprise. As early in our country's history as 1800 a small beginning was made in the actual construction of a system of National highways. But the advent of the railroad and subsequent financial difficulties put an end to the splendid plans

Mr. Albert C. Bostwick,
Chairman Runs, Tours and Contests Committee



S. T. Davis, Jr.,
The King of the Roads

of our forefathers. The year 1900 now witnesses the beginning of a new movement toward the realization of the vast and magnificent project which we are to informally discuss this evening."

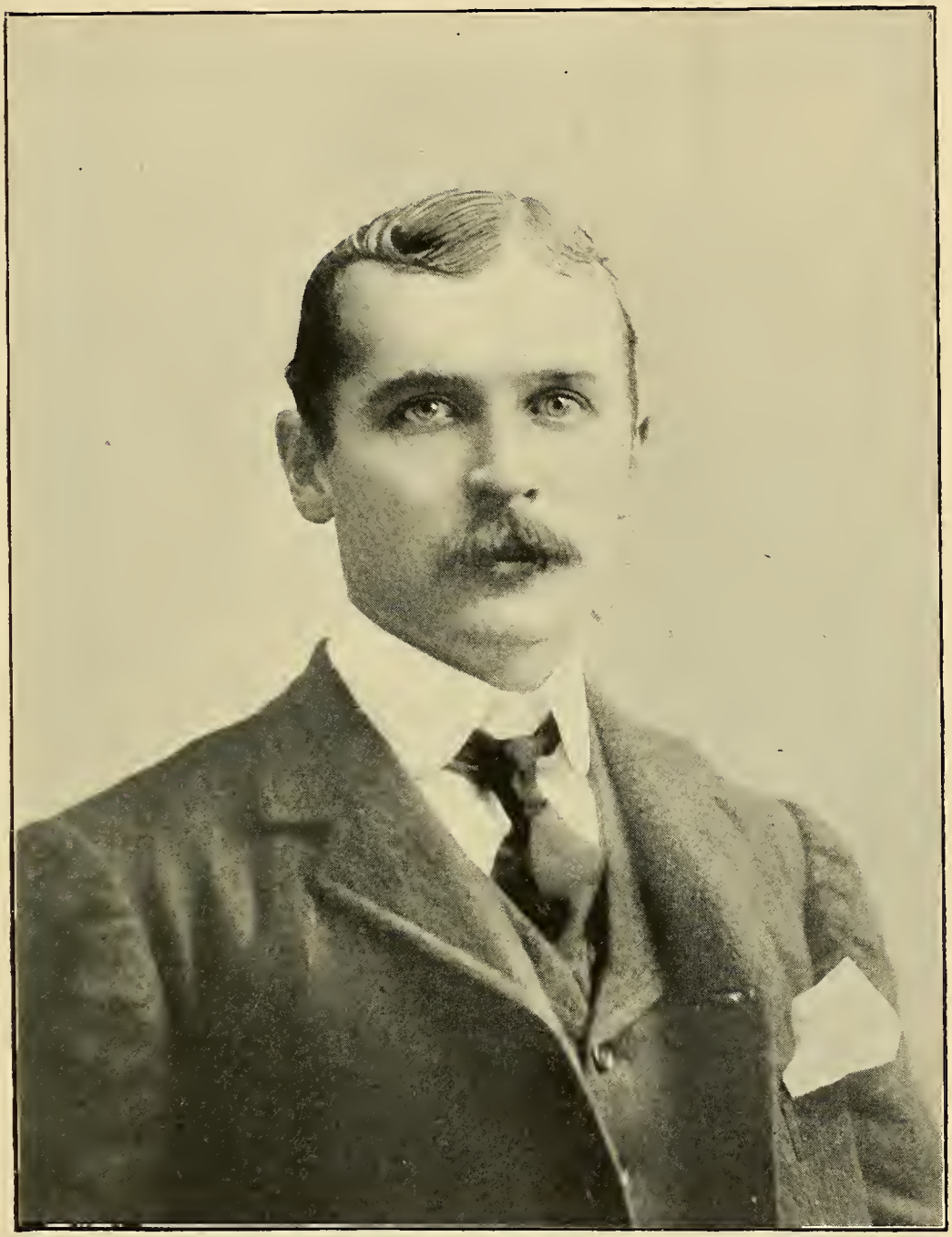
Mr. Chamberlin then introduced Gen. Miles as the head of the Commission. Gen. Miles was received with cheers and the com-

Mr. C. G. Dinsmore,
Of the Committee on Foreign Relations,
Delegate to the Paris Races and Congress

pany rose to drink to his health. Gen. Miles said that "Every one who knows the history of the country knows that the great continental railways were not built altogether for commerce, but to develop the ties that bind the West to the East. The great continental railways were constructed to establish order, and to provide that each State should be a part of one great country; they were built not alone for commercial interests but for the higher, grander and glorious purpose of welding the East to the West. The Commission had devoted itself to considering the best routes for connecting the great centres of activity with each other. The Commission had thought of a highway along the Atlantic Coast from a point as far north as Portland, Me., to as far south as New Orleans or St. Augustine. Then branching at some important point from this road, the Commissioner had thought of a highway which would extend to the Pacific Coast. Personally he was inclined to agree with those who contended that it should start at New York, inasmuch as that city was the metropolis of the East. The route of the road should go through Chicago, then it might strike St. Louis, continuing through Kansas City or Omaha, over the mountains to Ogden and then to San Francisco. It will be only a short time before you will be able to ride on your bicycle or automobile from coast to coast."

Ex-Mayor Strong urged that the State of New York build a first-class highway from New York City to Buffalo at its own expense, and said that it would be of particular value to farming interests.

Isaac B. Potter, former President of the League of American Wheelmen, spoke of the interests of wheelmen in the movement.



Mr. George Isham Scott,
Of the Board of Governors

Col. Pope, the founder of the good-roads movement in the United States, told about the success of good roads in Massachusetts and said that New York, the richest State, had about the poorest roads. He predicted an enormous development for the automobile in the near future. He reported the following

resolutions, which were seconded by Col. Astor, and unanimously adopted:

"That the route presenting the most feasible line for a National highway from the Atlantic to the Pacific seems to your Committee to be between the fortieth and forty-second parallels of latitude. This embraces Boston, from which the route could be stretched east to Portland, Me., then Albany, reached by a great highway from New York, Philadelphia, Baltimore, Washington, Richmond, Charleston, Savannah and St. Augustine. From Albany running west through Syracuse, Rochester, Buffalo and Niagara Falls; through Erie, Penn.; Cleveland and Toledo, Ohio; Adrian and Coldwater, Mich.; Elkhart and South Bend, Ind.; from Chicago, Ill., to Davenport, Des Moines and Council Bluffs, Iowa; through Omaha, Lincoln and Hastings, Neb.; starting across the Rocky Mountains at Denver, reaching Salt Lake, and thence southwestwardly to Sacramento and San Francisco, a southern line reaching thence to Los Angeles, and a northerly one Portland, Ore., and Seattle, Wash.

"*Resolved,* That in view of the military importance of such a highway, and of the advantages to those sections through which it would be built, and, furthermore, in view of the example in good road building it would give to the people of twenty-five States and Territories, through which it would pass, the matter be brought prominently to the attention of the people of the twenty-five States and Territories concerned, in order that Congress may be petitioned to authorize the preliminary surveys required for such National highway; providing, if possible, for the completion of the survey of the section between Boston and Chicago the first year, that between Chicago and Omaha the second year, that between New York and St. Augustine the third year and the remaining sections within the following year.

"*Resolved,* That it be suggested to the petitioners to prepare the completion of the National highway by an appropriation for one-third the expenditure required from the Congress of the United States, one-third by the States for those portions lying within their respective boundaries, and one-third by the counties, townships and cities through which the road shall pass, while the owners of all property benefited be asked to donate the right of way.

"It is the further opinion of the Committee that, in view of the rapidity of motion which science is substituting for the slower forms of roadway travel, and in view of conditions which many recent tests upon the great highways of France and England have already made clear, two points should be kept in mind with reference to construction—first, ample width, and, second,

The Bohemian Beefsteak Dinner of the Automobile Club

By courtesy of the *N. Y. Herald*

the avoidance of curves. One hundred and twenty feet is shown in the boulevard which Massachusetts has built leading out of Boston, to be not too great a width. One-half this width might be built in the first instance, but by all means should the entire right-of-way be secured. The impossibility of avoiding collisions between carriages moving rapidly around curves calls attention to the necessity for long, straight lines in a way that did not present itself in the earlier days of highway engineering."

Among the other speakers were Col. Astor, Julian Hawthorne, M. Verdery, and the Rev. Dr. Henry M. Saunders.

The automobile Club of America will soon have to elect a new President and a new Vice-President. Mr. G. F. Chamberlin, the retiring Vice-President, has been urged to accept the Presidency, but he feels that he cannot give the time demanded for th duties of the office. There is a unanimous sentiment in favor of Col. John Jacob Astor, but he also has declined, although there are hopes that he may be induced to reconsider his decision. Mr. A. R. Shattuck and Gen. George Moore Smith are prominently mentioned, and it is thought that the Vice-Presidency may go either to Mr. George Isham Scott or Mr. S. T. Davis, Jr.

Many of the members feel that there is too much racing about the runs of the club, road-racing not being in accord with the true objects of the organization, while in this country it is also strongly disapproved by public sentiment.

In one of the recent runs of the club, Mr. S. T. Davis, Jr., made the distance with his locomobile from the Ardsley Casino to Central Bridge, 17½ miles, in 34 minutes. He was also the first to arrive at the Casino, starting from the Waldorf-Astoria at 10 o'clock and reaching that point at 11.17.

The club lectures are a valuable feature. On the evening of April 7 Mr. C. J. Field, Chairman of the Technical Committee, addressed the members and their friends with a practical talk on automobiles. A notable talk was given on the evening of April 28 by Prof. R. H. Thurston, Director of the Schools of Engineering and of Mechanic Arts at Cornell University.

One of the club's most enjoyable occasions was the Bohemian beefsteak dinner, organized by Mr. Whitney Lyon, the father of the club, and given in informal fashion. The decorations, relating to the automobile, were grotesquely humorous. The speaking was off-hand and Mr. Albert R. Shattuck, Chairman of the Good-roads Committee, told about his Committee's work.

Mr. Clarence Gray Dinsmore has been elected as delegate to represent the club at the International Automobile Races at Paris, with Mr. John H. Flagler as vice-delegate.

The Automobile in Society

By William E. Baldwin

SOCIETY people have taken up the automobile to an extent that was not expected a year ago. Automobilism has become a fad with the wealthy and more exclusive classes, and the high-stepping horses which formerly drew My Lady's carriage are in despair, for even the society women have fallen victims to the charms of the machines which carry them smoothly and speedily over the roads, at a pace that would kill the average horse.

Society is not only taking up the automobile in town, but at the various country places this summer there will be any quantity of automobiles. Newport and Lenox took them up to some extent last summer, and the automobile parade and the obstacle contest at the former place were the chief events of the season. The Newport automobilists are already planning a series of similar affairs for the coming season.

One of the most prominent of the fashionable automobilists is Mr. W. K. Vanderbilt, Jr. He was one of the first of the society set to purchase a carriage, and he had all sorts of fun learning how to operate it. Some of his adventures at Newport were the talk of all society, but Mr. Vanderbilt, persevering in spite of various runaways, finally mastered the machine. It is related that on one occasion while going down a hill near Newport, he became alarmed at the extreme speed he was making, and put on the brakes too suddenly. The result was that the automobile developed qualities of an acrobatic nature that Mr. Vanderbilt never before suspected, and turned what is described as a complete revolution in the air. Mr. Vanderbilt was thrown some distance, and when the automobile landed from its eccentric flight it carefully avoided hitting the prostrate young multi-millionaire.

Some of the other young society men in Newport had similar adventures, but as an automobile is not a difficult machine to handle, after you have had a little experience, they soon had their carriages buzzing about the roads in the vicinity without accidents. Mr. Honorè Palmer and Mr. Potter Palmer, sons of Mr. and Mrs. Potter Palmer, of Chicago, are both automobilists, and Mr. Harry Lehr, although not an automobile owner, often bor-

rowed machines of his friends and became an expert in a short time.

New York society women who spend their summers at Newport are to take up automobilism this season, and Mrs. Stuyvesant Fish is taking lessons now in order to be able to handle her carriage on Bellevue avenue without mishap. Mrs. John Jacob Astor, who is now abroad, is another woman who is going to take up the sport, and Mrs. Harry Payne Whitney has been learning from her husband how to operate the machine. Mrs. Hermann Oelrichs, not to be outdone by her associates, will also have her own automobile.

The Automobile Club of America has done much to bring automobilism to the attention of society. While the membership of this club is not confined exclusively to society men, many young clubmen, and others who have wealth and position, are included within its ranks. The Automobile Club is an organization which shows true sportsmanship in its methods, and it is interesting to note that some of its most prominent spirits are society men.

Mr. David Wolfe Bishop, son of Mr. David W. Bishop, of No. 11 Madison avenue, is an enthusiastic member of the club. He was the pioneer automobilist of the Lenox set, and introduced the De Dion motor tricycle to the summer colony in the Berkshires. Mr. Bishop did all kinds of difficult work in the Berkshires, and in hill climbing especially made many records. His brother, Mr. Cortlandt Field Bishop, has a similar machine, and they made many trips last summer in company. Mr. Bishop now has a gasoline carriage, and takes part in all of the club runs, his guest at a recent run being Baron Hermann, of the German Embassy at Washington.

Mr. Albert C. Bostwick, Chairman of the Runs Committee of the Automobile Club of America, is another young society man who has gone in extensively for automobilism. He has several carriages and is enterprising and sporty. He is the son of the late Jabez Bostwick, who amassed a large fortune in Standard Oil. Young Bostwick has a charming home at No. 8 East Sixty-third street, and recently married Miss Marie L. Stokes, one of the handsomest young women in New York society.

Col. John Jacob Astor is another prominent member of the Automobile Club of America, and it is expected that he will soon assume a much more important part in the affairs of the club than in the past few months. He is a careful automobilist, and has been abroad learning from the experts of the other side many things which will come in handy in the future.

Mr. Harry Payne Whitney, who married Miss Gertrude Vanderbilt, is an enthusiastic automobilist, and did considerable work at Newport last season, sharing with Mr. W. K. Vanderbilt, Jr., in some of his extraordinary adventures. Mr. Whitney, who sometimes visits at his father's immense estate on October Mountain, near Lenox, will take an automobile with him next summer into the Berkshires, and will try a little rough work.

Mr. George Isham Scott, who has recently returned from Europe, and who is a prominent member of the English and French Automobile Club, is also a member of the Automobile Club of America, his favorite machine appearing to be a De Dion tricycle. He is reputed as one of our foremost automobilists.

Mr. Whitney Lyon, in a big automobile, is always on hand at the various meets of the club, and frequently takes out large parties on his trap. He is one of the pioneers of automobilism in New York, and was one of the men who tested the ordinance preventing the use of automobiles in Central Park.

Mr. Albert R. Shattuck, of No. 19 Washington Square, North, is another society man who is interested in automobilism, and he is out nearly every day. He is identified with the Lenox set, and is a prominent member of the Metropolitan and other fashionable clubs in New York.

Mr. J. Egmont Schermerhorn is another member of the Lenox set who has gone in extensively for automobilism, and this summer will, no doubt, take his automobile with him to the Berkshires. Mr. Schermerhorn has long been prominent in society in New York, and his wife (formerly Miss Kate L. Cotting) is also becoming interested in the sport. Mr. Schermerhorn lives at No. 25 East Seventy-ninth street, where he has a magnificent house. He is a member of the Metropolitan, Knickerbocker, University, Calumet, New York and other fashionable clubs.

Although Dr. W. Seward Webb has long been a member of the Coaching Club, and is one of the most prominent horsemen in this country, he is also broad minded enough to see the possibilities of the automobile, and has recently become a member of the Automobile Club of America. Dr. Webb has a lot of the finest coach horses in this country at his place, Shelburne Farms, in Vermont, and is one of the most expert whips among the amateur element. He is now seriously considering giving up driving for automobilism, and is to have several automobiles on hand for the use of the guests who visit him at his country place.

Mr. Dave Hennen Morris, an old Harvard man, who married Miss Alice Shepard, a daughter of the late Elliot F. Shepard, has

lately become deeply interested in automobiles. At every scheduled run of the Automobile Club he is always on hand, and he is becoming very expert in handling one of the machines.

Mr. Edwin Gould has taken up automobilism, although the sport has not appeared to appeal to his brothers, Mr. George J. Gould or Mr. Howard Gould. Mr. Gould has done considerable work, but prefers the country to the more crowded city streets.

In running over the list of our fashionable automobilists a host of other names readily suggest themselves, including Mr. Barber, Mr. J. C. McCoy, Mr. Jules Bache, Mr. William B. Coster, of the Calumet Club; Mr. Ernesto G. Fabbri, who married Miss Edith Shepard, and who lives at Scarborough; Mr. E. H. Harriman, of the Union Club; Mr. V. Everit Macy, of Scarborough; Mr. James Roosevelt Roosevelt, of the Knickerbocker Club, and Mr. Warner De La Montaigne Van Norden, son of Mr. Warner Van Norden.

While society people have largely affected the small runabouts and similar light carriages which are suitable for road work, they are also taking up the broughams and victorias, and use automobiles for more formal purposes. Several society women have been known to pay fashionable calls in their electric broughams, and the sight of a motor victoria on Fifth avenue is now becoming so common as to create little comment.

Two Automobile Road Races

Organized by the Automobile Club of America.

THE FIRST ROAD RACE

THE first road race of the Automobile Club of America took place March 31, 1900. The course was between the Waldorf-Astoria Hotel and the Casino, in Ardsley-on-Hudson, a distance of 26 miles.

Ten vehicles participated. The start was made at 10 A. M. In compliance with the municipal regulation as to speed the carriages were paced to Central Bridge; from this point to the finish, the speed not being governed, the race began in earnest.

The course, after leaving Central Bridge, was by way of Sedgwick avenue, to Kingsbridge Station, to Broadway, to Getty Square, Yonkers, to Warburton avenue, to the Casino at Ardsley.

The results of the race are given in the following table, the previous record for the course being 1 hour and 55 minutes:

Finish.	Name.	Power Used.	Horse Power.	Weight of Vehicle.	Time.
					H. M.
1	S. T. Davis, Jr.	Steam	3	550 pounds	1.17
2	C. S. Weston and Frank Stillman	Gasoline	9	1,600 "	1.25
3	D. W. Bishop, Jr.	"	6	1,500 "	1.27
4	G. F. Chamberlin	"	6	1,500 "	1.29
5	A. C. Bostwick and Leonce Blanchet	"	6	1,500 "	1.34
6	A. R. Shattuck and General G. M. Smith	"	6	1,500 "	1.45
7	D. H. Morris	Steam	3	550 "	1.50
8	J. C. McCoy	Gasoline	6	1,500 "	2.13
9	G. I. Scott	Gasoline Tricycle	1¾	225 "	2.30
10	A. L. Riker and Jefferson Seligman	Gasoline	6	1,500 "	2.35

Mr. Scott on his tricycle was in the lead on Warburton avenue, near Yonkers, when things went wrong and he had to push his machine afoot to the club-house.

Mr. Léonce Blanchet, the Donor of the Cup

THE SECOND ROAD RACE

50 Miles in 2 hours 3 minutes and 30 seconds, for the Blanchet Cup

Over the finest stretch of turnpike in the neighborhood of the metropolis nine members of the Automobile Club of America competed for a cup presented by Mr. Léonce Blanchet, member of the Automobile Club of France.

A HANDSOME CUP

The cup, which was offered by him in recognition of the many courtesies tendered him by the Automobile Club of America, is a beautiful trophy, and was on exhibition for one week at the rooms of the club at the Waldorf-Astoria, where it was much admired. It is of silver and is of the loving-cup design, with two widespread handles. The inscription reads: "Presented to the Automobile Club of America by Léonce Blanchet. Fifty-mile Race, April 14, 1900." The name of the winner will, of course, be added.

Two Automobile Road Races

The Winner Towed to the Starting Line

THE COURSE

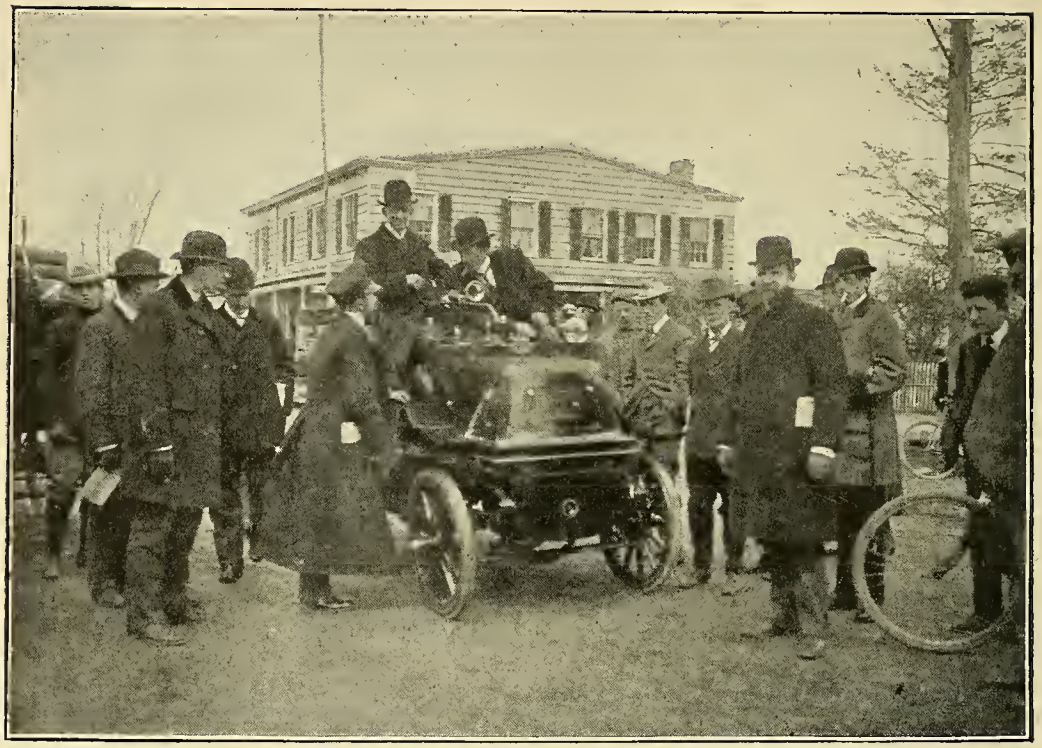
The course stretched from Springfield, three miles beyond Jamaica, to Babylon, a distance of twenty-five miles, passing on the way the villages of Lynbrook, Rockville Centre, Millburn, Freeport, Merrick, Bellmore and Amityville and return. There was no attempt at any point to interfere with the race, as was feared, the residents in the villages, the farmers and the local police doing excellent work in keeping the road clear.

The Merrick road, along which the "autos" raced, proved to be an ideal course for such a contest. The route was selected with great care by the Committee on Runs and Tours.

EXCITEMENT IN THE VILLAGE

The usually quiet village of Springfield has seldom, if ever, been the scene of so much excitement and activity as prevailed for hours before and during the progress of the contest. In addition to the automobiles competing, twenty others made the starting and finishing point their rendezvous for the day.

There was a big crowd of automobilists and other spectators present to see the start. The inhabitants of the neighboring country gathered in great numbers and made various comments, all more or less amusing, about the machines. This is the first



The Timekeepers' Conveyance

big race ever held by the club, and in consequence it was of more than ordinary interest.

A clubman was stationed at every crossroad to warn approaching teams and cyclists when a fast moving "auto" was approaching. The Long Island Railroad crosses the course twice, and it was arranged to take out time if any "auto" became stalled by barred gates caused by the passage of a train.

Before the start Dr. E. C. Chamberlin and Capt. Homer W. Hedge went on ahead in their automobiles to act as timekeepers.

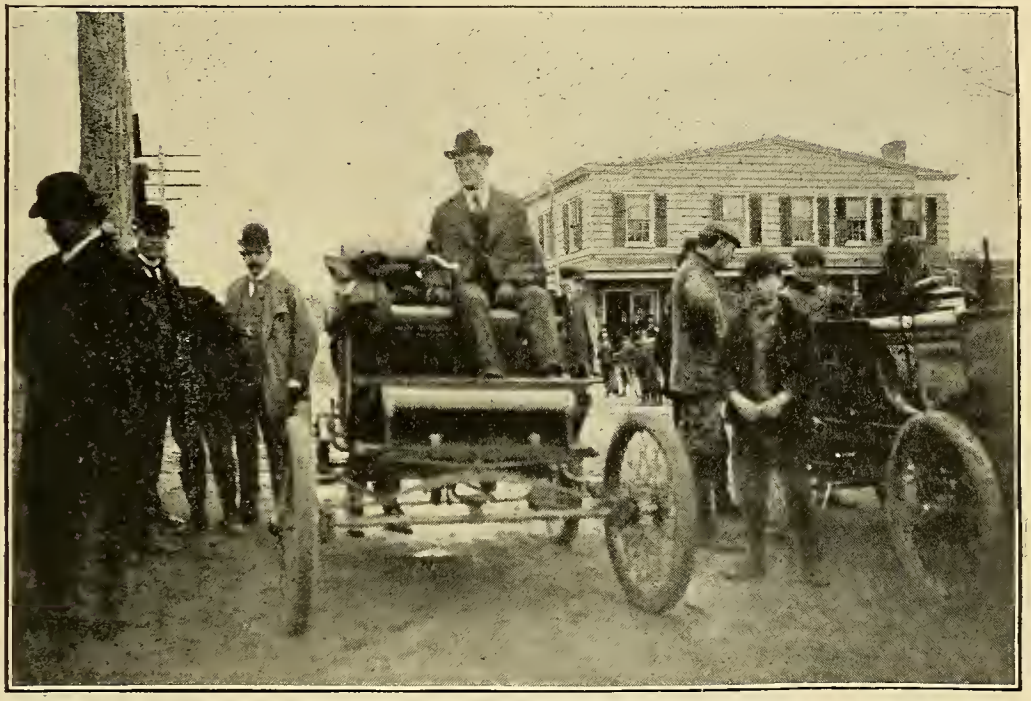
THE START

The start was at 10.24 o'clock. Only nine of the fifteen "autos" entered took part in the race. Mr. Whitney Lyon acted as starter, and Mr. V. Everit Macy held the watch. The automobiles were started under thirty seconds headway, the first man out being Mr. A. L. Riker in a specially built electric wagon, which was towed to the starting point to save his power for the race. Mr. Bostwick came next, Mr. Bishop third, Mr. Fischer fourth, Mr. Hall fifth, Mr. Field sixth, Mr. Chamberlin seventh, Mr. Morris eighth, and Mr. Davis last. The machines went away with remarkable precision. The Locomobile owned by Mr. S. T. Davis, Jr., was the favorite with the experts, and it

was generally expected that he would win. In the run to Babylon, Mr. Davis slowly but surely overhauled those in front of him, except Mr. Riker.

The feature of the race, not calculated upon by the promoters, was furnished by Mr. C. H. Tangeman, a motor enthusiast of Brooklyn. Mounted on a noisy little gasoline tricycle, he left Springfield just as Mr. Riker was being started, and, keeping company with the latter on the outward journey, he raced away from him on the home stretch, arriving at Springfield nearly five minutes in advance of the actual winner.

Mr. Tangeman, of course, was not a competitor for the prize, nor was his machine eligible had he desired to compete. His



Mr. Alexander Fisher

presence, however, furnished both amusement and excitement all along the line.

THE OUTWARD TRIP

On the outward trip the racers had the wind behind them. The roads were in almost perfect condition and the air was fresh without being uncomfortably chilly. To the plaudits of the enthusiastic spectators Mr. Riker began the journey, with Mr. C. H. Tangeman on his fretful machine trailing him.

RACED WITH A TRICYCLE

Toward Valley Stream the ill-assorted vehicles raced together. Then the tricycle drew into the lead and made the pace to Free-

Mr. D. Wolfe Bishop, Jr.

port. From this point to Seaford and Babylon the two alternated in the lead, the smaller machine being first to make the turn.

Mr. George F. Chamberlin

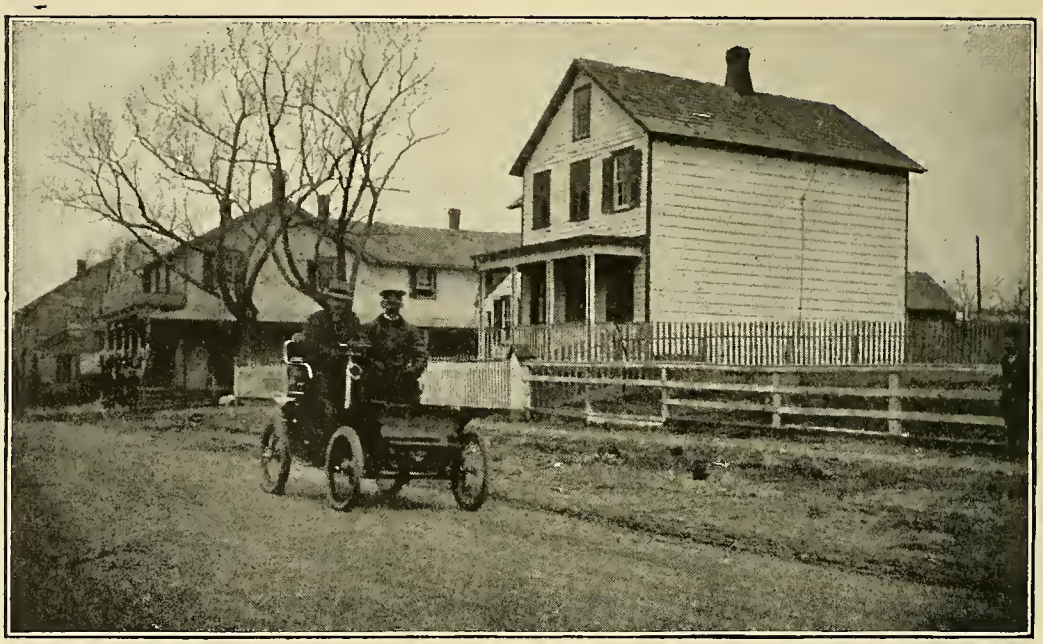
Mr. A. L. Riker

Mr. Riker's time to that point was one hour and thirty-eight seconds, but less than two minutes later he was followed by Mr. S. T. Davis, Jr., who had been the last to leave Springfield. Mr. Davis' time to the turn was only fifty-eight minutes and fifteen seconds, and it looked as if he might prove the winner of the race.

THE RETURN TRIP

The turn at Babylon was made around two barrels placed in the centre of the road. There are crossroads at this point, but the automobile experts did not apparently need the extra room, for all of them made the turn around in the actual width of the Merrick road. The only accident at this point happened to the machine containing Messrs. Field and Skinner. The attempt was made to make the turn too quickly, and the result was that one of the pneumatic tires was twisted off the rim. The repairs were made at once and the machine finished.

In the beat back against the wind, however, the superiority of Mr. Riker's racing car was easily demonstrated, and he steadily gained over all his opponents, arriving back at Springfield at twenty-seven and a half minutes past twelve o'clock.



Mr. C. J. Field

THE FINISH

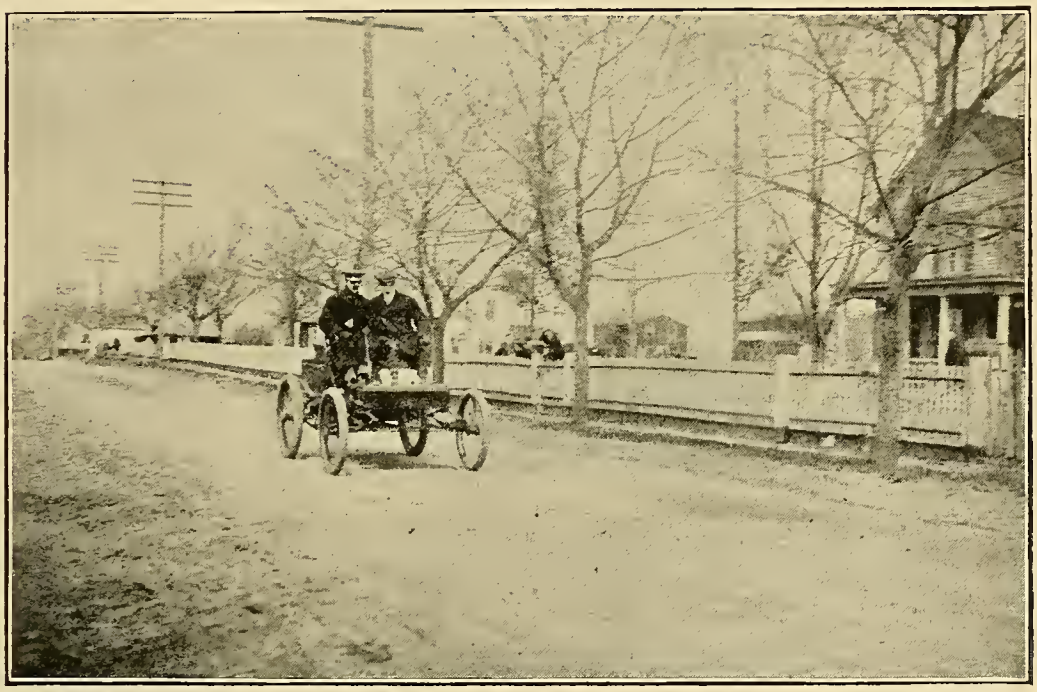
He made the finish in good style, rushing down the hill into Springfield at the rate of twenty-five miles an hour.

Had the race been a much shorter one it is the opinion of the experts that the steam machines, which travel at a very high rate

The Finish

of speed for short stretches, would not have been defeated so easily. Had it been a much longer one it is the opinion of the veteran *chaffeurs* that the gasoline vehicles would have carried away the prize.

Had the race been one straight run of 50 miles, the results would probably have been different.



Mr. A. C. Bostwick and Mr. Léonce Blanchet

RESULTS OF THE RACE

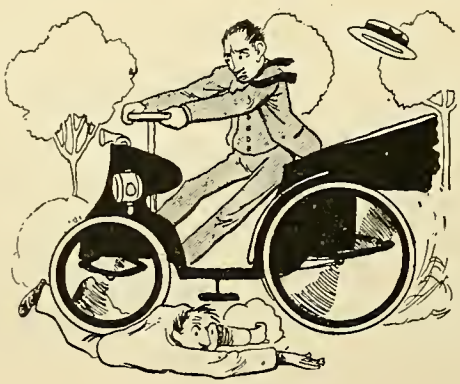
Finish.	Name.	Kind of Power.	Horse-power.	Weight of Vehicle.	Time, 25 Miles.	Time, 50 Miles.
1	A. L. Riker	Electricity	—	2,500	1.00.38	2.03.30
2	S. T. Davis, Jr.	Steam	3	550	0.58.15	2.18.27
3	A. Fischer	Gasoline	5	1,400	1.06.44	2.30.01
4	D. Wolte Bishop, Jr.	"	6	1,550	1.13.10	2.37.52
5	A. C. Bostwick	"	6	1,500	1.17.03	2.46.40
6	G. F. Chamberlain	"	6	1,500	1.18.58	2.48.42
7	C. J. Field	"	3	700	1.24.00	3.15.30
0	D. H. Morris	Steam	3	550	1.01.45	.....
0	W. H. Hall	"	3	550	.....	.....

The time made was not extraordinary, compared with French records, but was capital for a beginning in long distance racing. The event will always be looked back upon with interest as that of the first of its kind held in America.

Mr. A. L. Riker, the Winner of the Fifty-mile Race

PRESENT RATING OF CHAUFFEURS

		First Race.	Second Race.
		26 Miles.	50 Miles.
1	Davis	1	2
2	Riker	10	1
3	Bishop	3	4
4	Fischer	0	3
5	Weston	2	0



Two Automobile Road Races

COMMENTS ON THE RACE.

While there is unanimity of feeling in the matter of Mr. Riker's personal victory, it cannot be said the race proved anything worthy of addition to the history of the automobile. In Mr. Riker's wheeled meteor is exploited a specially built racing machine competing with ordinary pleasure vehicles, costing from $750 to $1,000, weighing from 550 to 1,600 pounds, and averaging 4 or 5 horse-power.

Mr. Riker's racer weighs about 2,500 pounds, 1,200 pounds of which is invested in accumulators. The machine is equipped with two motors. The horse-power used therein is an unknown quantity. As to the cost of the vehicle it can only be surmised to be about 6 or 7 times the intrinsic value of the other vehicles entered in the race.

One fact was firmly established by this race, however, in the remarkable demonstration of the durability and staying power of Mr. Davis' steam carriage, an ordinary runabout with an ordinary boiler, beating the electric marvel from Springfield to Babylon, a distance of 25 miles, by 2 minutes. At the latter point Mr. Davis found it necessary to replenish his boiler, an operation covering a period of 7 minutes. As with their brethren of the railroad locomotive, 7 minutes to the modern sport-loving automobilist assumes the chronological proportion of as many centuries.

With the strong wind-pressure encountered on the home-stretch all the competitors were at a great disadvantage with the exception of Mr. Riker's racer, which experienced no difficulty in putting 15 minutes before Mr. Davis' 550-pound locomobile.

The fact that Mr. Riker's machine is compact in construction cannot be forgotten when consideration is given to the speed maintained in the head-wind during his return from Babylon to Springfield.

The machine carries 72 cells, divided into 3 compartments, each controlled by a lever. One compartment was employed in the outward trip, one during the return and the remaining compartment was called into use at the finish of the race.

Mr. Riker's machine is, indeed, a wonderfully constructed affair, reflecting great credit on its designer and engineer.

All the good points of masterly vehicle engineering, mechanical workmanship and electrical application have been brought into service in this unpretentious appearing, simple and compact vehicle.

Air and road resistances have been admirably calculated in

Secretary Hedge and Mr. Whitney Lyon

its low setting, without neglecting consideration of strain in the construction of its delicate mechanism. Enthusiasts of the automobile cannot but compliment those who contributed to the construction of this racer and to entertain the hope that Mr. Riker has new surprises in store, whereof we will be apprised during the Paris Exposition.

While the arrangements for this long-distance race were admirably planned, the plans were but poorly executed.

It was noticed that, after selecting with exquisite choice the Merrick road for the scene of the contest, the majority of the members of the Committee on Runs and Tours absented themselves from the race. To this, the cause of the inadequate preparations at the starting point may be assigned.

The lack of experience displayed in the conduct of the race from the start to the finish, indeed, was marked. Many instances of this fact came into unpleasant view before and during the contest.

At 10 A. M., at which hour the race was scheduled to start, hurried explanations were furnished the contestants as to direction, railroad crossings, turning point, etc.

No preparation for the finish was made.

The manner of distinguishing the identity of the contestants, also, was managed unsatisfactorily. Instead of having each vehicle bear its owner's number, the tagging was accomplished by the adjustment of a black leather shield, bearing the number in white, on the chest of the principal contestant, and held in place by a strap passed around the body.

As each rider endeavored to minimize the wind resistance, his crouching figure swallowed his identity in the hollows of his anatomy.

The white upright turning stake, which should have been placed in position in Babylon, remained laying on the road in Springfield.

At the last moment, when it seemed that the preliminaries were about to develop into chaos, Mr. Whitney Lyon obligingly undertook to bring about something resembling order, in which impromptu capacity he succeeded admirably.

In the selection of the point marking the finish absolutely no judgment was shown. In this matter the finishing point was, illogically, set down as the starting point.

Again Mr. Lyon, in his obliging foresight, placed another member of the club at the top of the hill overlooking the finish line, to signal the approach of the down-shooting machines.

To the wisdom of Mr. Lyon's precaution testimony is borne on what promised at the finish to be a most tragic incident.

Just as the automobile handled by Mr. Fischer was signalled a two-horse farm truck reached the hill, going toward Babylon. The approaching machine, which was coming along at a two-minute clip, frightened the horses, and their driver lost control of them. The animals whirled directly across the road. A cry of horror went up from the spectators, for it looked impossible for Mr. Fischer to pass between the frightened horses and the other automobile.

It was a moment when nerve and brain were required. Being unable to slacken speed, Mr. Fischer depended upon the suppleness of his wrist to avoid disaster. The automobile seemed to lurch just at the critical moment, and then it swept almost across the road, clearing the wagon. It was a remarkable piece of steering, and the spectators yelled in their delight and appreciation. In no other vehicle, under the same conditions, could Mr. Fischer have avoided a smashup.

A real revelation was his gasoline auto—which can be considered among the best make of gasoline carriages in America.

The skillful driving, under most adverse conditions, of Mr. Bishop attracted favorable comment in all quarters. His per-

formance during the race stamped him as one of the best *chauffeurs* in the country.

The race, in brief, was an uneven contest between steam, gasoline and electricity—a contest in which ordinary steam and gasoline carriages were pitted against an electric comet on wheels, built to compete, in Paris, for the kilometre (⅝ of a mile) record.

The decided sentiment against road-racing that prevails in the Automobile Club of America—with which public sentiment is also strongly in accord—makes it imperative for the fostering of our new national industry to provide for automobile racing within enclosed spaces. In this manner the electric, steam and gasoline forms of motive power will be given equal opportunity to exhibit their qualities to the public eager for acquaintance with the new form of locomotion.

Road-racing is sowing terror and death on the highways of France; such a state of things would not be tolerated in this country, and if it were, it would certainly injure the industry at the start and greatly retard its development.

It is therefore proposed to organize the Automobile Racing Association of America.

A large number of members of the Automobile Club of America have expressed their willingness to join in the movement for the proposed organization.

Until such an organization is perfected we will probably witness some more of these criticism-inviting road races.

AMERICAN AUTOMOBILES IN THE PHILIPPINES.

The signal corps of the United States Army has recently been supplied with electric automobile wagons for use in the Philippines. These wagons are of two kinds, one to carry the instruments and material and the other to carry the personnel. The first is built like a covered ambulance, with rubber-tired wheels, and contains a storage battery capable of running the vehicle for 30 hours on one charge when carrying 1,500 pounds of load. There are two 3½ horse-power motors, one in each rear wheel. The maximum speed is about 10 miles an hour. The other wagon is constructed like a high cart and is in other respects similar to the first. Both wagons are fitted with electric side lights, and the first also has electric lights in the interior. Other military applications of the automobile have been considered by the military world, but this is the first actual introduction.

The French Voiturette Cup

THE contest for the cup offered by our French contemporary, *Le Journal des Sports,* has proven that the voiturette is by no means the frail contrivance supposed by many unfamiliar with its construction. The race over the Saint-Germain-Rouen course, a distance of 218 kilometres (135.38 miles) was a fairly good test of the endurance of the light road carriage. Vehicles of all kinds were entered—some with water-jackets,

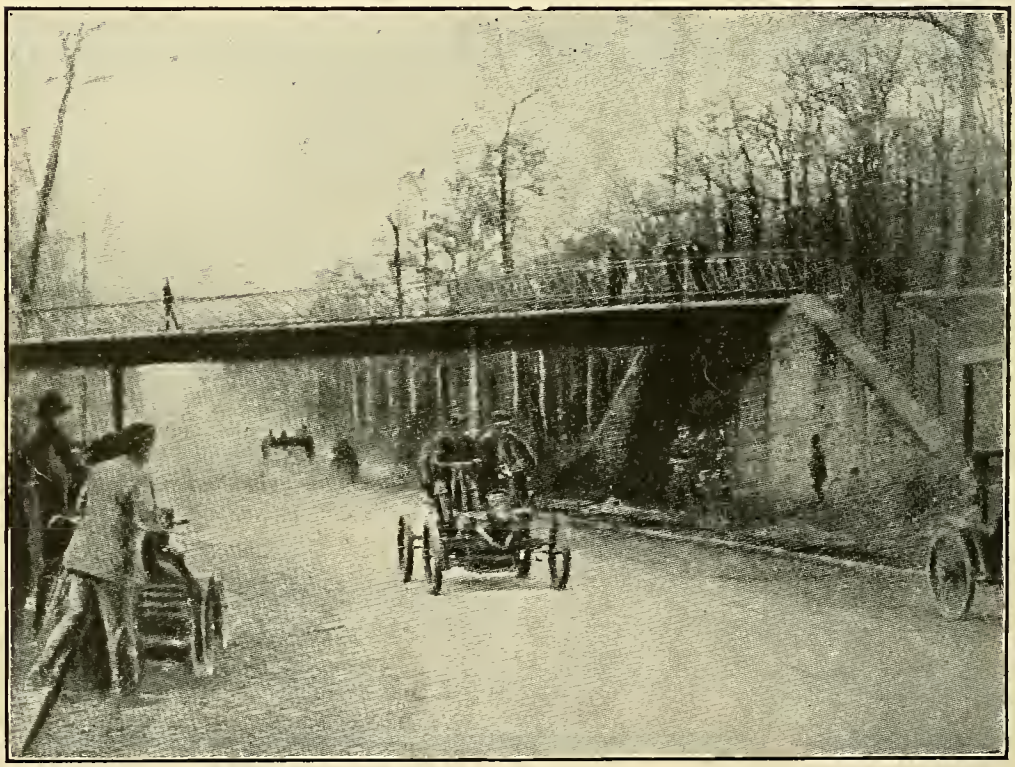
Starting of Class A and C at Chambourcy

some with flanged cylinders, some with electric igniters, some with ignition-tubes. Certain carriages went over the course with a speed and regularity of motion, truly remarkable. The greater number of voiturettes finished without accident, a result which is noteworthy when it is considered that in automobile races safety is thrown to the winds for the sake of running at the very highest possible speed. Not merely to finish, but to finish first is the aim of every racing *chauffeur.*

It is true that a race over a course of 218 kilometres, even when that course is well-sprinkled with hills such as those of

Rolleboise, Gaillon, Anthieux, and Fleury, may not be a sufficient test of the voiturette's capability of withstanding great strains; but it certainly proves that considerable improvement has been made in the building of road carriages, especially when it is considered that in former races voiturettes often enough miserably failed in comparison with heavier vehicles.

The larger voiturettes, as every one expected, won the race. Weight and power told. It was noticeable that the carriages with water-jacketed motors seemed to outclass the vehicles with flanged motor-cylinders. But the flange-cooled motors were far from being beaten. Their lightness and simplicity proved of service to them and enabled them to achieve truly remarkable results. Of the carriages entered in the class comprising vehicles weighing less than 250 kilos (550 lbs.), the winner made a very good showing. The winner in the class of vehicles weighing over 250 kilos was M. Lefebvre, whose vehicle was a Darracq carriage.



Finish of the winner on the road of Loges in St. Germain

Coxey's Lieutenant on Good Roads

THE newspapers of Kansas City printed under date of April 6 are replete with accounts of the open-air meeting conducted in that city on the night of April 5 by Carl Browne, of Coxey's Army fame. Coxey's famous lieutenant, it appears, has revived his commendable idea relative to the popular construction of good roads throughout the country. At the meeting the following resolutions were adopted:

Whereas, On last Monday evening a meeting was held in New York City of the Automobile Club of America, at which time a movement was inaugurated to agitate for the purpose of petitioning Congress for the construction of a great national road from the Atlantic to the Pacific, with connecting lines from all parts of the country North and South; and

Whereas, Such an enterprise being not only indicative of the great progressive spirit of the American people, will, if carried out, be a source of employment for thousands of people at good wages; therefore be it

Resolved, By this mass meeting of citizens of Kansas City, that we heartily indorse the proposed work and will do all in our power to petition Congress to aid the same.

The substance of these resolutions, it will be remembered, were adopted at the dinner tendered recently at the Waldorf-Astoria by the Automobile Club of America to Major-General Miles and the members of the Commission who have consented to make a preliminary report looking to the construction of a national highway from the Atlantic to the Pacific.

From Lieutenant Browne the Automobile Club of America have recently received the interesting communication which follows:

"507 East 18th St.,
Kansas City, Mo., April 6th, 1900.

Automobile Club of America:

Gentlemen—Reading in the *K. C. Journal* a dispatch that you were about to begin agitation for a great National highway, it naturally attracted my attention, for ever since I led the march to Washington, D. C., in 1894 to petition Congress to build a great National road to put the millions of *then idle men* to work,

I have been traveling, speaking and advocating the same thing in a desultory sort of a way, for there was no central idea or plan to work on, and I hailed your action with delight. So last evening I called an open air meeting here which was largely attended, read your resolutions and proposed work as published in the papers here and after talking awhile submitted the preamble and resolution enclosed as published in the *K. C. Journal,* and they were unanimously adopted. I am satisfied that the proposition will go with a whirl if pushed by your club, and the L. A. W. as it should and could be so that action could be had by the meeting of the next Congress.

I write this to submit a proposition to you on the line of the agitation of the subject.

If your club will fit me out with an automobile, I will, accompanied by my wife (Gen. Coxey's daughter, who rode the white horse as the Goddess of Peace on the historical first day of May, 1894, in Washington, D. C.), start from New York City for a trip to San Francisco over the proposed route of the National road, making speeches for it and having it endorsed by resolutions and otherwise, and putting machinery in motion for obtaining signatures for a monster petition to Congress. The experience I have had in this kind of work leads me to believe that I can be of great service in this great undertaking of yours, besides both myself and wife being national characters to considerable extent among the working classes at least, we would naturally draw out great crowds to see and hear, as do whenever I go to hold a meeting as witnessed here last night. I will ask no remuneration for our services further than the automobile and transportation for us from here to New York City, for myself and wife.

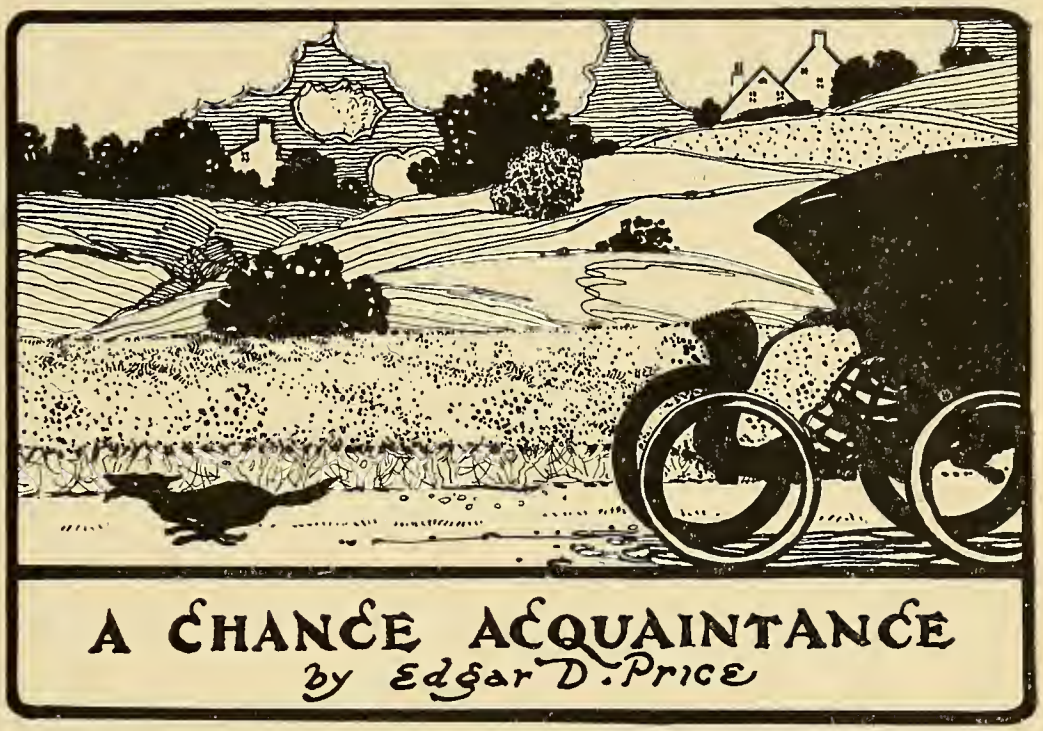
Should your club decide to accept this proposition it will be necessary for you to wire me here by Monday evening next, if possible, and not later than Tuesday noon, the simple word "*all right,*" then I will immediately begin to prepare to start on receipt of your letter containing transportation.

The necessity for this haste is the reason that I will embark Tuesday in another enterprise awaiting reply from me, but since this opportunity presents itself I prefer this, if possible, for it has become almost second nature to me to advocate great National roads and public improvements—I am an enthusiast on the idea.

Hoping to hear favorable to this proposition, I remain,

Yours truly,

CARL BROWNE."



YOU will have to turn expressman and deliver Doctor Wallace's phaeton, Reggie," said the portly president of the Syndicate Automobile Company to his private secretary, "he wishes to take his first lesson this afternoon, but the instructors are all busy. He lives," consulting a memorandum, "at Swell Ridge, New Jersey. You ought to make it with the phaeton in two hours."

And thus it came that Private Secretary Reginald Van Valen, attired in a rather large pattern of tweeds and a deerstalker, and smoking a "bull dog" pipe, went skimming over the Jersey meadows on a certain bright June day, to give a lesson in "driving" to a rich old doctor; a thing he was well qualified to do, having worked in the Syndicate shops before he became secretary.

Doctor Wallace was out when he arrived at his destination—a sudden call—but had left word of his early return; so, loading his pipe afresh, and making himself comfortable in the roomy phaeton, he settled down to await the doctor's coming.

"Excuse me, is this Doctor Wallace's new automobile?" The voice at his elbow was a trifle imperative, but the owner thereof, a young lady in a dainty summer gown, was good to look upon.

"Yes, Miss," answered the startled secretary, secreting his pipe and pulling himself together.

"That's right, sit up and look more business-like. You are the groom or what-d'ye-call-him that runs it, I presume; I am Doctor Wallace's niece, Miss French—move over, please, I am going to get in—now, John—I will call you John, being used to that name—take me for a ride!"

Whew! All that in one breath. And she took him for a servant. Here was richness; he would follow it up. "Certainly, Miss," he said meekly, starting the carriage forward, "at your service, Miss."

"Now," said the young lady when they were out of town, "tell me all about the way things work; I am going to surprise Uncle Dick by learning how to run his horseless carriage."

"Yes, Miss," replied "John," with twinkling eyes, "it's quite easy, Miss; to begin with, you push this here handle"—and he launched into a description of the mechanism of the phaeton, rendered into "Stable English."

"Really," said Miss French approvingly, when he had finished, "you seem to be quite posted, John, please to change seats with me and I will try my hand at running it."

"Yes, Miss, you will excuse me, Miss, if I hold the handles with you while you are practising."

"Of course," was the surprised reply, "I expect you to, John," and for the next half-hour the few people whom they met along the road were startled at the vagaries of the handsome automobile thus doubly maneuvered.

"There, Miss, now I think you have the knack, try it alone for a bit," said the artful "John," watching with pleasure the animation displayed in the girl's sparkling eyes and ruddy cheeks.

Miss French felt that she was having "the time of her life." Bowling over the smooth roads in the June sunshine, in this wonderful machine, which obeyed her every touch, her spirits rose to the boiling point. She ached to pour out her delight to some one. If only John, who, she noticed, was quite a nice-looking fellow, in spite of his loud clothes—if he was a gentleman—somebody she could talk to freely; but John, with his eternal "Yes, Miss," was only a servant; and her active tongue rebelled at the imposed silence.

A warning rattle told the observant "John" that something had gone wrong, and coming to a country blacksmith shop, he requested Miss French to stop before it, while he made an examination. An important nut was missing and he stepped within the sooty shop to procure a makeshift.

To the mischievous girl, burning to drive the fascinating vehicle without a monitor, here was a heaven-sent opportunity. A push on the starting lever, and the automobile was moving swiftly down the road. Looking behind her, she saw the groom emerge from the shop and run after, shouting and waving his hands. An absurd couplet, learned in her childhood, flashed into her mind:

"Good-bye, John,
Don't stay long!"

she carolled, increasing the speed, and "John" was left behind.

At the end of a mile, sober second thoughts prevailed, and the madcap was ready to return. She moved the stopping lever, but, like the celebrated steam-leg of Mynheer Van Dam:

"It had started to go,
And it wouldn't stop!"

a bolt, from which the nut had unscrewed, had dropped out, disconnecting the lever. The phaeton was running away!

Frantically Miss French worked with the useless lever, and as the realization of her predicament came to her, she felt suddenly weak. An innocent cow, standing squarely across the road just ahead, precipitated the inevitable. Dropping the steering lever, the girl covered her face with her hands, while the runaway, left to its own devices, proceeded to dodge the cow and make straight for the roadside fence—a sounding crash, and with spinning wheels it toppled over into the ditch.

A moment later, and a hysterical young lady, her gown ruined and her hair in disorder, crawled into sight from beneath the smashed top, and sitting on the grassy bank, regarded the ruin she had made, with misty eyes.

It was thus that "John," capless and out of breath, found her. To his panting questions as to her injuries, she replied in accents suspiciously tearful; then suddenly laughed loud and long, as the humor of the situation struck her.

The example was contagious and the "groom," immensely relieved to find no harm done to the fair cause of the mischief, joined in unrebuked.

An approaching carriage had a sobering effect. The horse showed signs of bolting at the sight of the overturned vehicle, and "John" promptly seized its bridle, while Miss French, recognizing the driver, who was regarding the scene in mute amazement, called out gleefully:

"Oh, Mrs. Broome, such an adventure as I have had; this is Uncle Dick's new automobile—what there is left of it, and the

groom that runs it; I stole them and was run away with and just had a thrilling upset; isn't it ridiculous!"

"A little slower, Kitty," laughed Mrs. Broome, "did you say the—er—groom ran away and upset you?" exchanging a merry look with the "groom."

"Certainly—what are you laughing about?" said the girl, uncomfortable at the continued smiles on the faces about her; "John, you are insolent; I shall report you to Doctor Wallace"——

"Oh, dear, here is a mystery," said Mrs. Broome, "Reggie, you rascal, what do you mean by this masquerading?"

"Reggie?" echoed the girl, an inkling of the truth penetrating her mind.

"Certainly; Reginald Cuyler Van Valen, according to his sponsors in baptism, of which I have the doubtful honor to be one. Pray, what has he been calling himself; you, sir, explain!" to Reggie.

"I—I—she"—began the guilty Reggie.

"Mrs. Broome, will you please to take me home," interrupted the girl, her cheeks aflame; "as for you, Mister Van Valen, a gentleman"—with stinging emphasis—"would not have allowed me to make the mistake, uncorrected, of taking him for a—a servant!" And with this shot below the water line, the carriage drove off, leaving the abashed young man to take care of the wrecked phaeton as best he might.

It was a decidedly cool young lady whom Mr. Van Valen—quite by chance—met a fortnight later in the parlors of the Swell Ridge hotel, where Mrs. Broome was stopping, and it was only by dint of abject apologies that he secured forgiveness on condition that he never again allude to the mortifying affair.

Between these two the acquaintance so singularly begun now prospered merrily, and it was not many moons before it ripened into something closer. Secretary Reggie's automobile trap became a familiar sight in Swell Ridge, and many were the rides indulged in by the pair through the long summer that followed, protected by a "sure-enough" groom, perched behind.

The occasion of the Van Valen-French wedding, which occurred on a brilliant October day, brought together the largest concourse of automobile vehicles ever seen in Swell Ridge.

After the reception, an "auto" brougham took the happy couple to the depot, and the radiant bride, nestling close to her husband, whispered mischievously in his ear:

"You ought to bless that phaeton—'John.'" To which he replied with fervor:

"Yes, Miss—I mean Missus; I do!"

The Coming International Automobile Congress

THE international congress of the automobile sports and industries will hold its meetings in Paris, from the ninth to the sixteenth of July. The following rules have been adopted, by which the members are to be governed:

Article 2.—The International Automobile Congress shall be opened on July 9, 1900, in the great hall of the Palais des Congrès.

Subsequent meetings, conferences, and other reunions shall be held in the club-house of the Automobile Club de France, 6 Place de la Concorde. The congress shall last for one week.

Article 3.—Those persons only shall be considered members of the Congress who shall have applied to the Secretary of the Committee of Organization before the opening of its session, or who shall have inscribed their names during that session, and who shall have paid the assessment agreed upon.

The assessment of each member shall be 20 francs.

The title of donating member (*membre donateur*) can be secured by the payment of an assessment not less than 100 francs.

Article 4.—The members of the Congress shall receive membership-cards to be sent to them by the Committee of Organization. These cards are strictly personal.

These cards do not entitle the holder to enter the grounds of the Exposition gratuitously; they give him the right to enter the club-house of the Automobile Club de France and to take part in all the meetings which will be held there during the Congress.

Article 7.—The Congress shall comprise:

Public meetings;
General meetings;
Sectional meetings;
Conferences;
Visits to industrial establishments, witnessing of tests, promenades, etc.

Article 10.—No paper shall be read at a meeting nor be made the subject of discussion, if the author has not submitted a résumé thereof, or the conclusions he has reached, to the Committee of Organization before May 1, 1900.

Article 14.—A summary of the proceedings shall be printed and distributed among the members, as soon as possible, after the close of the session.

Article 15.—A detailed report of the work of the Congress shall be published by the Committee of Organization. The Committee reserves the right of fixing the length of papers or communications submitted for publication.

This report shall be sent gratuitously to the members of the Congress.

PROGRAMME OF THE CONGRESS

I.—Historical Questions.

History of automobile locomotion in Various Countries—Author, Count de Chasseloup-Laubat.

II.—Technical Questions.

A.—Motors.

Steam-Engines.—Author, René Varennes.

Steam-Generators.—General introduction—Degree of vaporization and weight of the generator—Water vaporized per unit of fuel—Solid and liquid fuel—Feeding devices—Superheating.

Engines.—General considerations—Fixed or variable expansion—Compound Engines—Direct admission to large cylinder in starting—Efficiency—Weight of the engine per horse-power at normal speed—Lubrication—Aero-condensers—Oil separators—Devices for rendering the exhaust invisible.

Explosion-Engines.—Author, G. Forestier. General considerations—Carburation—Ignition—Cooling, Pumps, Radiators—Regulation—Starting—Lubrication—Exhaust-muffles—Efficiency—Weight of the motor per horse-power, fly-wheel included—Effect of Compression—Devices for varying the power of the motor.

Progressive Combustion Motors.—Author, M. Banki. Efficiency—Weight per horse-power, etc.

Electric Motors.—Author, E. Hospitalier.

Accumulators.—Total weight per kilowatt hour at the terminals for different rates of discharge—Rates of charging and discharging—Efficiency at normal rate of charging and discharging—Life of battery expressed in number of charges, either for the entire accumulator or for the positive plates.

Motors.—General considerations—Type of Armature Excitation—Brushes—Normal Speed—Weight per horse-power—Efficiency.

Switches.—General considerations—Starting—Varying the speed of the motor. Electric Braking—Recuperation—Instruments of measurement, control, and safety—Use of trolley on the road.

Miscellaneous Motors.—Author, M. Barbet.

Compressed or Liquefied Gas Motors.—Miscellaneous Motors—Efficiency—Weight per horse-power, etc.

B.—Transmission.

Author, M. Gaillardet.

Clutches—Speed-changing gears—Reversing-gears—Gearing—Belts and Pulleys—Friction-gears—Other Systems of Power-Transmission—Differentials and their substitutes—Connection of the driving wheels with the last member of the transmission-gear (chains, divided axles, etc.)—Devices for protecting and lubricating the transmission gear—Bearings, use of balls and rollers, anti-friction Metals—Special devices designed to counteract the effect of the elasticity of the frame on the transmission-gear (divided shafts, elastic couplings, etc.).

C.—Carriage Frames and their Appurtenances.

Frame and Suspension.—Author, M. Jeantaud.

Frame.—Wooden and iron frames—Frames of special construction—Tubular frames.

Suspension, Springs.—Complete suspension of wagon body and motor—Suspension of the body only, the motor not being suspended or only partially suspended.

Wheels, Axles, Tires.—Authors, Captain Ferrus and A. Michelin.

Wooden wheels.—Wooden wheels with metal hubs—Wheels with wooden hubs, wooden spokes, and metal rims—All-metal wheels with direct or tangent spokes—Disk-wheels—Hubs and spindles—Ball and Roller Bearings—Metal Tires—Elastic Tires (solid or hollow rubber).

Pneumatic Tires.—Protection of elastic or pneumatic tires—Elastic wheels of various types—Slipping and sliding of the wheels and the prevention thereof.

Brakes.—Author, M. Bochet.

Brakes controlling some part of the transmission gear.—Brakes acting directly on the wheels—Brakes acting directly on the ground—Brakes acting in front and in the rear—Prevention of the Recoil—Motors as brakes.

STEERING.—Author, Carlo Bourlet.

Steering.—King Bolts—Pivots—Diagrams showing the correct method. Theoretical solutions and solutions approximately corresponding with practice.—Various systems of pivots—Use of balls—Irreversible steering-gears—Advantages accruing from a large steering angle—Diameter of the smallest circle in which a vehicle can turn—Differences between the tracks of vehicles in which the front wheels are the steering-wheels and in which the rear wheels are the steering-wheels. Advantages and disadvantages of the two systems.

Driving and Steering Wheels.—Various systems of transmission solving the problem.

DETAILS OF CONSTRUCTION.—Author, A. Bollée.

Prevention of breaks in the pipes and tubes of automobiles.—Different systems of joints—Means of preventing the unscrewing of nuts—Use of aluminium and its alloys.

D.—The Carriage-Body. Author, M. Jeantaud.

New forms of bodies.—Lightness—Use of aluminium—Interchangeable bodies adapted for the same frame.

E.—Tractive Force.

TRACTION—Author, G. Forestier.

Coefficients of rolling-friction on roads.—General efficiency of the transmission-gears of automobiles, from the motor to the rim of the driving-wheel—Effect of Suspension—Effect of the Tires—Effect of the resistance of the air—Forms best adapted to reduce this last effect.

POWER TO BE GIVEN TO AUTOMOBILES.—Author, M. Hirsch.

Tendency to increase the power.—Difference in the action of mechanical and animal motive power; great momentary elasticity of the latter—Difference in behavior of driving and non-driving wheels—Reports of experiments pertaining to this question.

III.—Economic Questions.

Authors, Pierre Giffard and Lucien Pénssé.

Comparison of vehicles driven by motors of different types (steam, petroleum, electricity, etc.).—From the standpoint of the weight of the motor and its fuel supply—From the standpoint of ease of control, comfort, cleanliness, etc.—Reports of experiments, tests, and contests, giving the cost of transporting persons and merchandise, and the conclusions to be drawn therefrom.

Importance and cost of repairs.—Cost of keeping the wheels and tires in condition (iron, elastic, or pneumatic). Life and cost of maintaining accumulators.

Coming International Automobile Congress

Report of the work of the Automobile Club de France.—Various Contests—Races.

IV.—International Questions. Authors, Ballif and Sauvage.

Unification of the international formalities to be observed in traveling from one country to another.—Standardizing of gages and bolts—Standardizing of charging terminals of electric carriages—Standardizing of accumulator cells.

The Gordon Bennett Cup

June 14

THE itinerary of the Bennett Cup race between Paris and Lyons has finally been arranged as follows:

Suresnes, Saint-Cloud, Ville-d'Avray, *Versailles,* Buc, Tournus, Châteaufort, Saint-Rémy-les-Chevreuse, Les Molières, Station de Limours, Angervilliers, Saint-Cyr-sous-Dourdan, Dourdan, Les Granges-le-Roi, La Forêt-le-Roi, *Etampes,* Sermaises, Intville-la-Guêtard.

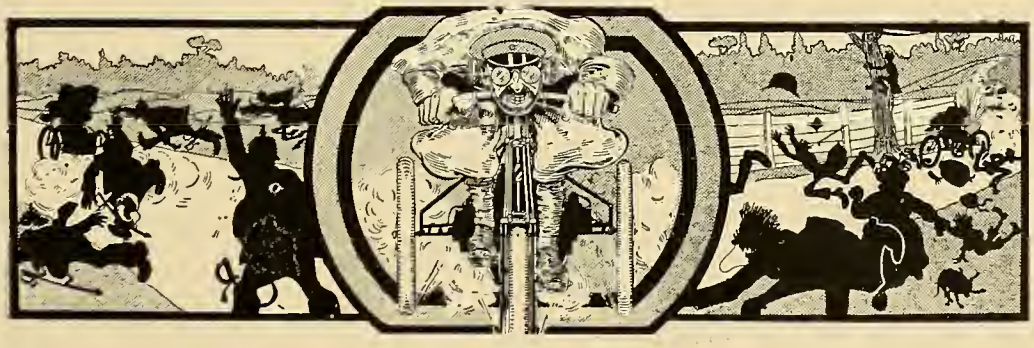
Pithiviers, Dadonville, Boynes, Barville, Beaune-la-Rolande, Maizières, Ladon, Saint-Maurice-sous-Fossard, *Montargis,* Mormant, Nogent-sur-Vernisson, La Bussière, *Briare,* Bonny-sur-Loire.

Neuvy-sur-Loire, La Celle-sur-Loire, Myonves, *Cosne,* Pouilly-sur-Loire, Mesves-sur-Loire, *La Charité,* La Marche, Pougues, *Nevers,* Saint-Pierre-le-Moutier.

Villeneuve, *Moulins,* Toulon, Bessay, Saint-Loup, Varennes-sur-Allier, Perrigny, *La Palisse,* Saint-Prix.

Saint-Martin-d'Estreaux, La Pacaudière, Changy, Saint-Forgeux-l'Espinasse, *Roanne,* Le Coteau, Neaux, Saint-Symphorien-de-Lay, Nachézal.

Tarare, Pontcharra-sur-Turdyne, Bully, *L'Arbresle,* La Tour-de-Salvagny, Tassin, LYONS.



Diary of the Forthcoming European Automobile Events

PUBLISHED FOR THE BENEFIT OF AMERICAN TOURISTS

THE AUTOMOBILE CLUB OF GREAT BRITAIN AND IRELAND

April 24 to May 11 . .	The 1,000 miles Motor Vehicle Trial, London to Edinburgh and back, including one-day exhibitions at nine Provincial Cities.
May	Heavy Trials.
May	Three Days' Trials of Electrical Vehicles.
May 14–19.	Exhibition of Motor Vehicles competing in the Trials, Prince's Skating Club.
May 31 to June 5 . . .	Whitsuntide Tour.
June	Tests of Horse-Power of Motor Vehicles.
June 30.	Motor Cycle Race Meeting (Crystal Palace).
July	Quarterly 100-mile Trials and Hill-Climbing Trials.
July	The Club's Race in France for Racing Carriages, Tourist Carriages, Voiturettes and Motor Cycles.
July 14.	Gymkhana at Sheen House Club.
September	Autumn Tour.
October	Quarterly 100-mile Trials and Hill-Climbing Trials.

CONTINENTAL EUROPE

May 10.	*Etampes-Chartres (100 kiloms.). Voiturettes *(Le Velo)*; second year.
May 17.	*Chartres-Etampes (100 kiloms.). Motocyclettes *(Le Velo)*; second year.
May 23.	*Paris-Bordeaux (568 kiloms.). Motocycles and carriages *(Le Velo)*; third year.
May or June.	Munich-Vienna (Austrian and Bavarian Automobile Clubs).

* Indicates held under the rules of the Automobile Club of France.

Diary of European Automobile Events

May to October.....	*Paris International Exhibition.—Great Display of Automotor Vehicles and Allied Trades (under the management of the Automobile Club de France). Automobile Fêtes every Thursday. May 14, 15, 16, 18, 19—Tourist Vehicle Races. June 18, 19, 20, 22, 23—Cab Trials. July 23, 24, 25, 27, 28—Speed Races *(l'Eventail)*. August 13, 14, 15, 17, 18—Voiturette Competitions. September 17, 18, 19, 21, 22—Light Delivery Van Competitions *(Poids Legers)*. October 8, 9, 10, 12, 13—Heavy Vehicle Trials *(Poids Lourds)*. Grand Motor Vehicle Procession to the Automobile Club of France Club House.
June 3.....	*Etampes-Chartres (100 kiloms.). Motocycles *(Le Velo)*; fourth year.
June 3 and 4.....	Bordeaux-Perigueux-Bordeaux (Automobile Club Bordelais).
June 10.....	Paris-Reims.
June 14.....	*Gordon Bennett Cup Race (Paris to Lyons); 560 kiloms.
June 24.....	Helenenthal-Siegenfeld (Baden) Hill-Climbing Trials.
June 24.....	Brest-Rennes-Brest (500 kiloms.).
July 1.....	Critérium de Provence (A. C. Salon).
July 5–7.....	*Paris-Brest-Paris (1,200 kiloms.) *(Le Matin)*.
July 9–14.....	International Congress on Automobilism.
July 13.....	Salon-Arles-Salon *(Critérium de Provence)*.
July 29.....	Paris-Dieppe (Motor Cycles).
July 29 to August 5..	Baden (Vienna) Motor Races, Gymkhana, etc.
Aug. 26 to Sept. 1...	Spa Races and Meeting (Automobile Club de Belgique).
September 1–2.....	*Paris-Ostend (333 kiloms.) *(Le Velo)*.
September 9.....	Baden (Vienna) Road Race (60 kiloms.).
October 19–23.....	Leipzig Motor Exhibition (five days).
October 28.....	Hill-Climbing Contest *(La France Automobile)*; third year.

* Indicates held under the rules of the Automobile Club of France.

A Map of the Electric Stations of France

THE Touring Club of France is occupied in the preparation of a map of France upon which will be indicated all the electric stations capable of furnishing "accumobiles" with the energy necessary for their resupply.

This map, drawn up under the direction of M. Le Doyen, honorary member of the council of administration, will be in outline, with the rivers picked out in blue and the railways in black (always a useful precaution). Only such localities as possess an electric station will be noted. Such localities will be connected with each other by straight lines, above which will be indicated the distances in kilometres. The lines will be in three colors. It is of importance, in fact, that the carriage electrician shall know the difficulties of the road that he is to enter upon, since the consumption of the energy stored up in his accumulators is in direct ratio of the obstacles to be surmounted. The colors will be red for even roads with level or slightly undulating stretches, yellow for moderately broken roads, and green for very hard roads.

The electric stations will be figured by special signs, indicating:

(1). Stations for charging ignition accumulators;

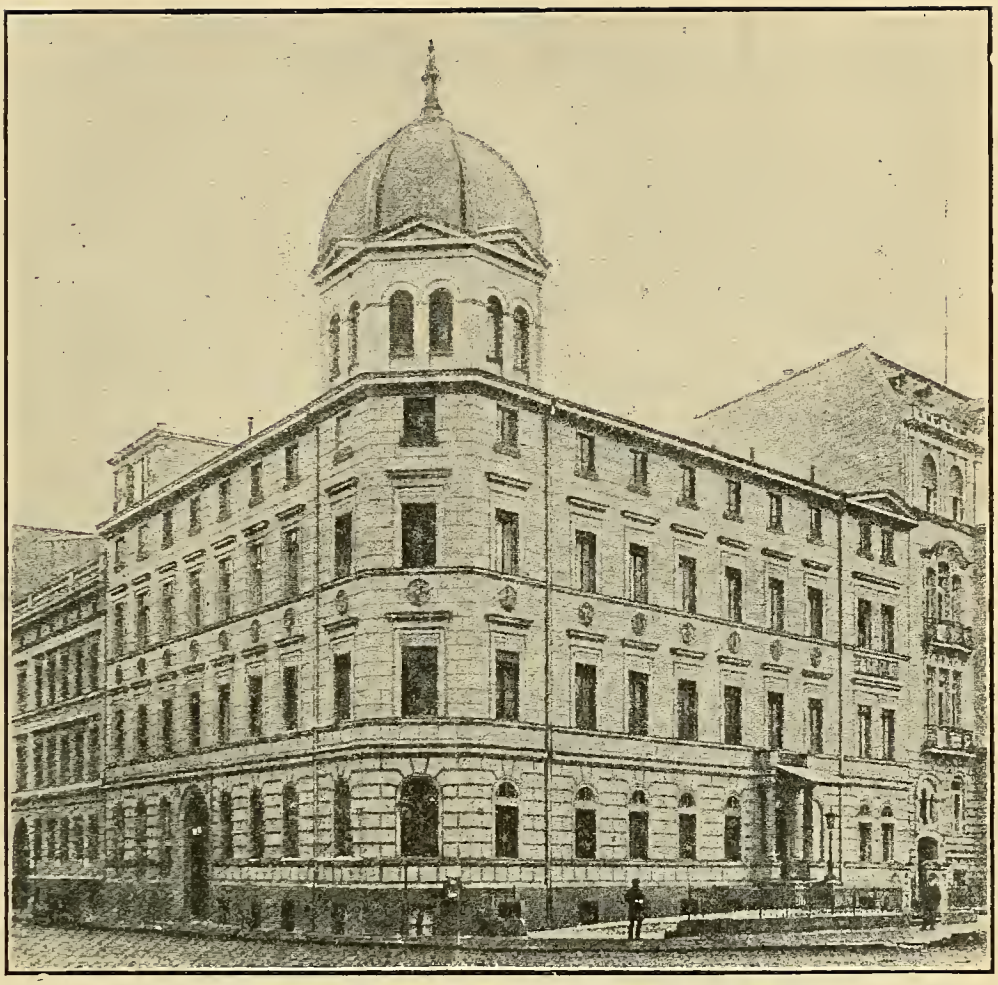
(2). Stations for charging carriage accumulators and installed for immediate operation;

(3). Stations that have at their disposal a sufficient or more than sufficient force in continuous current, but not as yet provided with the apparatus (rheostats, etc.) necessary for its utilization;

(4). Sources of alternating electric currents.

In order to make a success of this work, the club has addressed a circular to all lighting companies, engineers, manufacturers and *chauffeurs* who employ considerable electric force, and invites them therein to request of it a table of uniform charges, a copy of which it promises to put into their hands.

A preliminary tentative had already been made by the Touring Club, in its Annual (Section on Automobiles). With the aid that it is certain to meet with, it will once more have fulfilled its role by favoring the development of the new mode of locomotion and by removing the material difficulties that oppose themselves to the practical side of touring in the electric carriage.



The New Home of the Deutsche Automobil-Klub

The Deutsche Automobil-Klub

OUR illustration shows the new quarters of the Deutsche Automobil-Klub, as seen from the Zoological Garden, and therefore as it would appear to a person standing in a direction south of the Reichstag Building.

In its exterior the house at present offers little that is worthy of remark. The direction of the adorning hand that is to be laid upon it will occur at a later period.

After passing through the main entrance we find ourselves standing upon a spacious floor. To the right are arranged the rooms that are to be used by the club as offices, while those to the left, after the completion of their internal decoration, will be

leased to a person who will conduct therein an up-to-date restaurant.

A very easy stairway invites the visitor to take the trouble to ascend to the upper story, in which are located the meeting and amusement halls. Industrious hands, busy with these at present, are endeavoring to place them in a state worthy of the club. Herr Stobwasser has been good enough to superintend the arrangements. As the second story is not needed by the club, it has been rented to private individuals. The ascent to this is made from Dorotheen street, on which opens a large door, from which also access may be had to the club's carriage-houses, which are grouped in an interior court within easy and convenient reach of the automobiles. Upon the ground floor are located the apartments of the janitor of the building.

The energetic President of the German Automobile Club, whose portrait we present herewith, was born on the 6th of September, 1847. He is the eldest son of His Serene Highness, the late Duke Victor Moritz Karl Franz von Ratibor and the Duchess Amalie, *née* Princess von Fürstenberg, who was born at Rauden, and died there on the 17th of January, 1899.

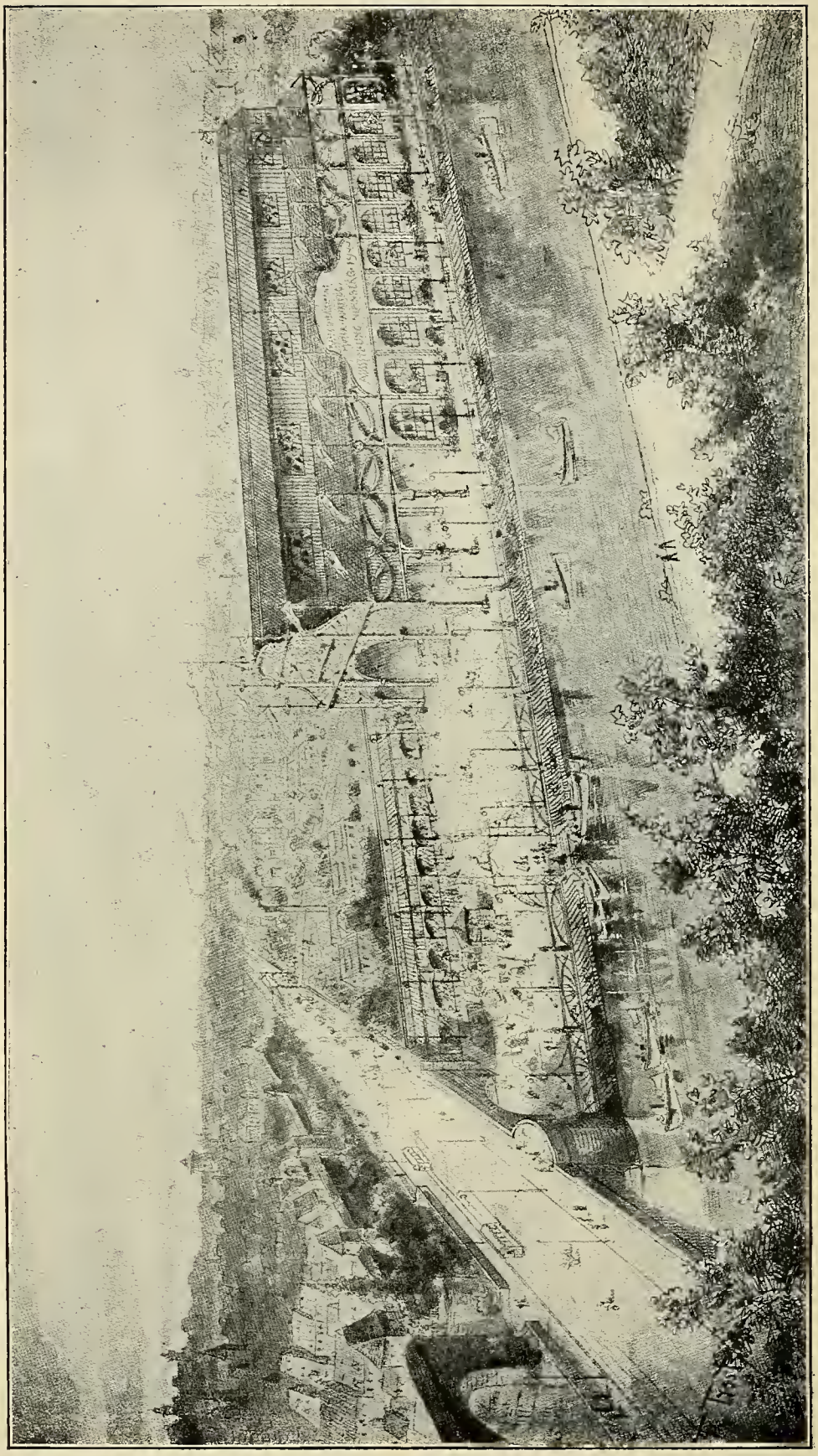
Duke Victor Amadeus von Ratibor, President of the Deutsche Automobil-Klub

Duke Victor von Ratibor studied at Bonn and Göttingen and took a Doctor's degree. In the year 1869 His Highness entered the regiment of Hussar Guards as Second Lieutenant, and took part therewith in the campaign against France. On June 19, 1877, while the Duke was attached to the German Embassy in Vienna, he married Countess Marie Breunner-Enkevoirth, the eldest daughter of August Johann Breunner-Enkevoirth, Count of the Empire. From this union sprang Hereditary Prince Victor, Prince Hans and two princesses--Agathe and Margarete. The princes indulged with ardor in the sport of cycling, the practice of which was favored by the beautiful parkway in idyllic Rauden, the

dwelling place of the ducal family. Soon after his marriage the Duke resigned his position in the army and thenceforward made his residence at Rauden, in order to familiarize himself with the administration of the property. After the death of his father in 1893 the Duke entered the Fideikommiss. His Highness is a hereditary member of the Upper House and a knight of the highest rank. Since 1897 he has been President of the Provincial Diet of Silesia, and, since 1898, a Colonel in the army. The Duke takes a very deep interest in sporting matters. Among other things he is President of the German Hunting Club, a prominent member of the Silesian Provincial Committee of the German Navy Club and of the Society for River and Canal Navigation. After the example of his father, who was always a patron of racing affairs, the Duke accepted the protectorate of the Upper Silesian Cycle-Racing Society and also of District 37 (Upper Silesia) of the German Automobile Association.

In the German Automobile Club His Highness presides over an association of sporting people which is capable of coping with the greatest of foreign clubs in every relation, and is destined to make the German name highly respected in automobile circles.

Insignia of the German Automobile Club



Universal Automobile Exposition, Nuremberg, June 1st-July 1st, 1900

Universal Automobile Exposition at Nuremberg

A UNIVERSAL Automobile Exposition will be opened at Nuremberg on the first of June and be continued until July first. A splendid site having been selected, all the arrangements having been completed, and funds to the full amount required having been secured, work on the exhibition building and grounds was at once begun and is now being actively pushed.

The building, which is illustrated herewith, will occupy a superficial area of 21,520 square feet. From the grounds, which, when laid out, will offer numerous attractions, will radiate several lines of tramways provided with both open and closed cars that will carry the visitor to the most interesting parts of the city.

The exhibition will take place at a most auspicious season, when European travel is most active. At this period falls the season of Pentecost, with its accompanying holidays, and during the progress of the exhibition will be held the Bavarian Music Festival, which, it is calculated, will last eight days.

A considerable reduction in the freight tariff upon products designed for the exhibition has been secured, while the charges for wall and floor space, and for the use of the solid carriageway by automobiles have been placed at a very reasonable figure.

The fact that the various committees are composed of men who have had a wide experience in matters pertaining to exhibitions guarantees the one under consideration a successful outcome.

The Exposition site is located upon a spot already known from Richard Wagner's "Meistersingern," that is to say, upon the shore of the Pegnitz, directly at the place where the river leaves the flowery meadow to make its entrance into the interesting old inner town, through two separate branches, after passing under stately bridge-arches and between masonry walls, which, in olden times, were often placed by it deep under water as it crossed the city moats.

Upon the whole, the site is one of the finest that could be imagined.

In Tow

The New Sport Abroad

(By Our Own Correspondent)

TO begin far away: It is extraordinarily interesting to see what a field the automobile has already occupied in our vast African empire, and on the other hand what an impetus to the development of the French Soudan the automobile is giving. Thanks to the automobile a splendid connection between the Senegal and the Niger has been established and a regular motor-carriage postal service has been established between Kayes and Bamanko, the latter town being on the Niger. The dry nature of the Soudan country is well adapted to automobile requirements, and our authorities have been constructing admirable roads there with the customary French thoroughness, born of long experience in that respect. M. Chaudié, the Governor-General of l'Afrique Occidentale, lately arrived in the valley of the Niger to organize the new civil and military jurisdictions consequent upon recent readjustments, and likewise to inaugurate the new and important transportation service for passengers and merchandise by means of automobile voitures and wagons. On January 22 the Governor-General left Kati, a little town situated several kilometers from Bamanko, and on the 24th arrived at Kita, 180 kilometers away, making the distance in two stages of six hours each—an average of 15 kilometers an hour. From Kita he continued by automobile to Toukouto, the present terminus of the railway from Kayes, arriving there on the 27th, and there taking the train. Five days were sufficient to take the Governor-General from the Niger to Kayes, a journey that by the ordinary means of locomotion has heretofore occupied thirteen to fourteen days. At Kita the Governor-General gave a dinner to the various functionaries, army officers and notables there. Reviewing the various elements that were contributing to the value of our great Soudanese possessions the Governor-General, in his speech, paid special attention to the factor of motor-traction, and felicitated warmly the promoter of the automobile in Africa, M. Felix Dubois, on the success of his work. He also paid a deserved tribute to Captain Palabre, the constructor of the route. On his return to Kayes M. Chaudié expressed to the European colony there his great satisfaction with the new mode of transportation which had taken him so comfortably on a journey that on his previous visit had occupied thirteen days.

The value of the automobile for military purposes was the subject of some notable remarks by the Minister of War, General de Gallifet, before the Chamber the other day. He said that particular attention had been given to the problems connected therewith by some of the ablest officers in the army, and excellent results were to be expected.

A retrospective museum of travel and of "tourism" is to be a most attractive feature of the Exposition. It will be a department in the Palais du Génie civil on the Champs de Mars. Efforts have been made to secure a representation of everything possible relating to the history of travel. Examples will be shown of the primitive forms of the diligence, the coach, the wagon, the bicycle, etc. There will also be important collections of maps, prints, caricatures, etc., relating to travel, and the various features will be brought down to present conditions, setting forth the conveniences and comforts of to-day. The automobile, naturally, has a most important place in this department. M. Manceaux Duchamin, 12 rue de Hambourg, is the leading member of the committee on installation.

The horse-census of Paris for this year has a special interest by reason of the growth of the automobile. Contrary to expectation, the number of horses has increased in the past year. The number available for service in case of mobilization of the army is now 98,284, against 93,652 the previous year. Although on various tramway lines mechanical traction has been substituted for animal the number of horses belonging to the great Omnibus Company has increased from 15,833 to 16,838. The various activities in connection with the Exposition are probably responsible for much, if not all, of this increase.

The appearance of that useful publication, *L'Almanach des Sports,* for the twelfth year, deserves mention. Under the direction of Maurice Leudet, it makes a handsome volume of 500 pages, profusely illustrated with original drawings, reproductions of photographs, etc., and with departments devoted to the various branches of sport, each edited by some special authority in his respective field. The automobile department is edited by Paul Meyan and the bicycle by Maurice Chérié. It is almost an encyclopædia of physical culture.

M. Serpollet has installed at his factory in the rue Stendhal a section of track with a 19 per cent. grade for testing his vehicles. Equipped with his celebrated steam motors they find no difficulty in making the tremendously steep ascent and then descending the grade in all security, curbed by an effective brake.

The automobile industry in France is growing by leaps and

bounds. In 1897 the value of imported "adult" automobiles, as they might be called, was 199,850 francs, while that of the exported vehicles amounted to 623,690 francs. But two years later the imports amounted to 458,000 francs and the exports to 4,260,000. The motor-cycle industry was already well developed in 1897, when the imports amounted to 8,400,140 francs and the exports to 10,076,980 francs. In 1899 the imports had increased only by 422,000 francs and the exports reached 11,280,000 francs.

An experience of the celebrated *chauffeur*, Béconnais, in his recent speeding test on a motor-tricycle—when he made two kilometres in one minute, 42⅕ seconds—indicates that the automobile may yet distinguish itself in fox-hunting! Crossing a tramway line the machine made a leap of five metres and landed on "all threes" without mishap.

A novel species of automobile race took place in February under the auspices of France Automobile. The classification was by catalog price, instead of by groups of specifically named vehicles, like voiturettes, etc. Group A consisted of vehicles costing to purchasers 3,000 francs and below; Group B between 3,000 and 6,000; Group C between 6,000 and 9,000; Group D between 9,000 and 12,000; Group E between 12,000 and 15,000, and Group F all over 15,000.

The Ministry of War has assigned 157 square metres in the Palais des Armée de Terre et de Mer for the exhibition of military automobiles. The exhibit comprises three groups: Large vehicles built for speed, for despatch work, etc.; transport wagons for heavy artillery; a wagon for the general staff and its ordnance, ambulance and telegraph-service; and third, light vehicles, such as a tricycle with a Maxim gun intended to run to the front with the greatest speed.

A company has been organized for a system of automobile communication by omnibus between Puy-de-Dome, Cantal, Lozére, Haute-Loire, Creuse, Aveyron, Indre, and Haute-Vienne, and perhaps also between La Loire, l'Ariége, le Gard, le Lot, and la Corréze. Our highways are so good all over the country that we may expect to see such lines in the near future forming a network of local transit in every district.

M. Charles Jean, the civil engineer, recently contributed to *Le Génie-Civil* a careful study of the transit conditions in and about Paris. He concludes that the future of local transit depends upon automobilism without rails, since it will be necessary to confine all rail-traction within the city to routes either carried underground or elevated above the surface.

The racing season at Nice was opened early in February by

the contest for the Chaucard cup. It was so early in the season and the weather was so unpropitious that there were only three participants: M. Pinson, M. Gondoin, and "Dr. Pascal"—the latter a pseudonym for Baron Henri de Rothschild. M. Pinson was the winner, M. Gondoin meeting with an upset and "Dr. Pascal" falling behind after taking the lead at first.

The automobile festivities at Nice this year were a great event. They began on March 25 with a floral parade, which was favored by perfect weather and consequently the crowd of spectators was enormous. The vehicles participating were superbly decorated —some with violets, some with lilacs, and others with roses.

Nice, Promenade des Anglais

The various designs included many delightful and unique conceptions. For the long distance races and runs there were two different courses. The racing course for March 26 was from Nice to Marseilles by way of Brignoles, a distance of 201 kilometres, leaving Nice at 7 o'clock in the morning. The second course was for tourists, from Nice to Draguignan, leaving Nice at 11.30 in the morning. On March 27 the courses lay from each of these places back to Nice. The great interest, of course, was centred in the race to Marseilles and return. There were many entries and some of the most famous *chauffeurs* were included. The victors were René de Knyffe and Béconnais, and both made extraordinary records. When Charron went over the same course of

201 kilometres from Nice to Marseilles in 1898 in 6 hours and 53 minutes it was considered a remarkably fine performance. But this was lowered fifty per cent. by de Knyff, who made the distance in his automobile in 3 hours, 25 minutes and 30 seconds. But even this time was exceeded by Béconnais on his motocycle, who covered the distance in 3 hours, 23 minutes and 11 seconds. These speeds were the equivalent of an average of a kilometre in but a small fraction more than a minute. The motocycle record for this course in 1898 was 8 hours and 23 minutes. Béconnais has therefore lowered it 65 per cent. in two years. The fastest express trains between the two cities have taken a good four hours to make the distance which these two automobilists have covered on the common highway in less than three and a half hours.

The great long distance tour of a thousand miles through England and Scotland, instituted by the Automobile Club of Great Britain, will be in progress when this reaches your readers. It will last through the eighteen days from April 23 to May 11. The first day will be devoted to the run from London to Bristol. On April 25 the trip will be made from Bristol to Birmingham by way of Gloucester and Worcester; April 27 Birmingham to Manchester by way of Stafford, Newcastle and Cougleton; on April 30, Manchester to Carlisle by way of Bolton, Charley, Preston, Lancaster, Kendall, Cherwick and Bothal; May 1, Carlisle to Edinburgh; May 3, Edinburgh to Newcastle-on-Tyne; May 5, Newcastle to Leeds; May 8, Leeds to Sheffield; May 10, Sheffield to Northampton; May 11, Northampton to London. The alternate days, as a rule, will be devoted to an exhibition in the city where the tourists stop over. The exhibition in Bristol will thus take place on April 24, in Birmingham April 26, in Manchester April 29, in Edinburgh May 2, in Newcastle May 4, in Leeds May 6 and 7, and in Sheffield May 9. The tour will constitute a trial in which three classes will be represented. The first class represents vehicles entered by manufacturers or their agents, the second class is composed of privately owned vehicles entered by members of the club or persons introduced by members, and the third class special single parts or accessories entered by manufacturers or their agents. In classes one and two the vehicles entered follow something like the French arrangement, Division A. composed of those costing up to £200; B., between £200 and £300; C., £300 to £500, D. everything over £500. and E. motocycles. In Class 3 the following sub-categories will be represented: pneumatic tires, solid-rubber tires, wheels, axles. Tricycles are to carry one person, quadricycles two, and all other carriages the number for which they were designed, unless they

weigh over 1,500 pounds net, when they shall carry three persons. A thousand pounds sterling is devoted to prizes, to be awarded by a jury of experts. There will be no speeding whatever, British laws forbidding such a use of the public ways. For those members who care for road-racing the Automobile Club of Great Britain is to hold a long-distance race in Northern France, from some point on the coast to Paris. On the return from the great tour through England and Scotland the vehicles competing will be exhibited at Prince's Skating-rink, Knightsbridge, May 12 to 19.

At Lincoln, England, a local service is to be instituted by a Motor-Bus and Parcel Delivery Company.

An important work on "Motor Vehicles and Motors," from the pen of Mr. W. Worby Beaumont, with chapters by Mr. Dugald Clerk, and a large number of illustrations, is announced at London.

You will remember that there was a great deal of talk a few months ago about the projected automobile tour from Hong Kong to Paris for this year by Dr. Lehwess of the Automobile Club of Great Britain. It is now announced that he has been compelled to postpone the journey until the spring of 1901, having found it impossible to complete the necessary arrangements in season for this year. While there is no occasion to question the sincerity of Dr. Lehwess, it is manifest that the scheme is so impossible that the postponement will necessarily be an indefinite one.

The Prince of Wales has joined the ranks of the automobilists and has recently purchased a Daimler carriage of six horse-power. This will give a great impetus to automobilism in England. The Prince has had considerable experience in riding with friends in both France and his own country, and was so pleased with the new form of locomotion that he decided to have his own carriage and run it himself.

A feature of the international exhibition to be held at the great Scotch City of Glasgow next year is a special course for automobiles. It will have for pavement a layer of cement no less than 15 centimeters in thickness. The track will be built with reference to a speed of 56 kilometers, or 35 miles, an hour. The grand stand will have seats for 25,000 spectators. In the judgment of continental experts the design of the track with reference to a speed of 56 kilometers keeps the limit too low for the good sport that we are here accustomed to in that particular. They think it would be better to build it with reference to a speed of 112 kilometers, or 70 miles.

The New Sport Abroad

A recent number of the *Autocar* has a curious story of a revenge played on an automobile by a number of horses. The vehicle in question had a notable history, for it had been in use in Cape Colony, the Orange Free State, and the Transvaal. A gentleman had driven to Dulwich in it, putting it up at a livery stable, where it was placed in a coach-house. There came a heavy snowfall and this brought so many horses to the stable for temporary accommodations that several of them were put into the coach-house. "Finding an utterly lone and unprotected autocar in their midst these long-suffering animals appear to have said the one to the other, 'Lo, our enemy! The cart-thing with the caged horse, that skirls, and girrs, and steams, and so frightens the people who sit in carts behind us that in their frantic terror they pull our heads backwards until our necks are nearly broken, and saw our mouths up and down and criss-cross with the steel rod until we suffer much pain. It is not good that our people should be frightened, for in their fright they become mad, and we are much hurt. We will avenge our people, and our sore mouths. Lo! we will bite it.' And one horse straightway bit a mouthful out of the mudguards, and gnawed the end in, removing all the paint and varnish; another whittled free on the upholstery, braid and horsehair stuffing of the seats; while the third mangled the backrests, and chewed down half of the entry door. So did the equines avenge themselves for the many pains they had suffered when the caged horse had frightened their masters."

The third annual German bicycle fair will take place at Leipsic in the last half of next October, and connected therewith will be an international automobile exhibition. Communications are to be addressed "An das Ausstellungs-Komitee zu Händen des Herrn Willy Werner, Leipzig, Salomon-strasse 16."

A club representing a federation of the various automobile clubs in Germany was founded in Heidelberg on February 14. It is called the Alldeutscher Automobil-Club (All-German Automobile Club. There were present representatives of the Deutscher Automobil-Club, the Mitteleuropäischer Motorwagenverein, the Rheinischer Automobil-Club, the West-deutscher Automobil-Club, the Wirtembergischer Motorwagenverein, the Fränkischer Automobil-Club, and the Bayrischer Automobil-Club. It was agreed that all questions of general importance should be considered by a committee representing all the interests connected with the club. The Deutscher (German) Automobile Club is to stand at the head of the new organization, and have special charge of regulations for racing.

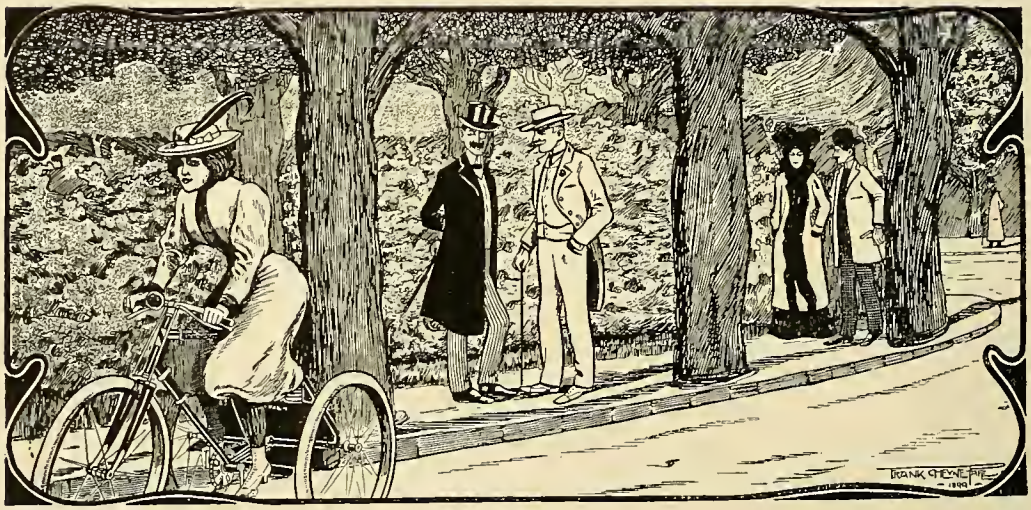
The Automobile Club of Turin has instituted a race for an Italian cup, limited to the automobilists of that country. Prizes to the value of 2,000 francs are offered.

The recently organized Automobile Club of Rome has one of the most historic of backgrounds for its activities in the scenes of the ancient sport-loving capital whose streets once resounded with the clatter of chariots. The club's headquarters are at 20 Piazza San Marco. Your manufacturers will be interested to learn that the club calls for trade-catalogs.

The Swiss Automobile Club was formed last December, and it now has over 300 members.

In St. Petersburg at the beginning of 1899 there were only 14 automobiles, all motor-tricycles; at the end of the year there were 52. One of the most notable events of the season was a long-distance contest from St. Petersburg to Moscow, in which M. Masi made the distance of 650 wersts in 26 hours and 57 minutes.

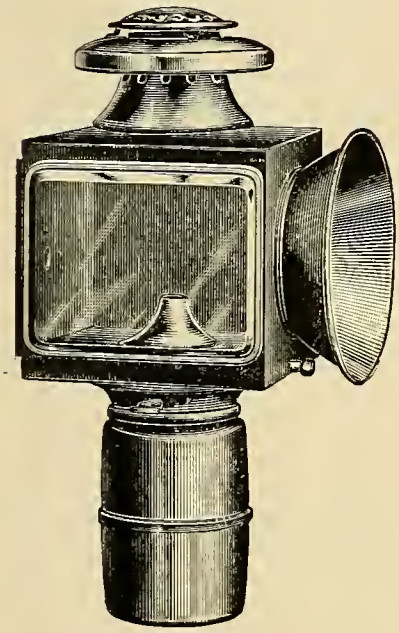
The Vienna automobile exhibition is to take place in May under the auspices of the Austrian Automobile Club. In the same month Amsterdam will have an automobile exhibition in connection with a bicycle show.



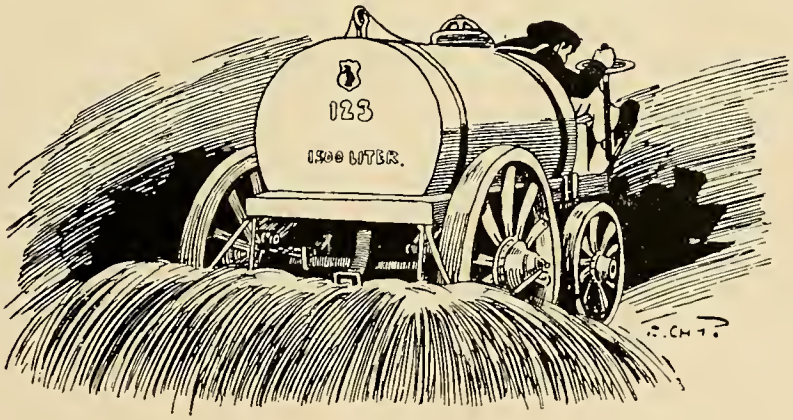
A Chauffeuse in the Bois de Boulogne

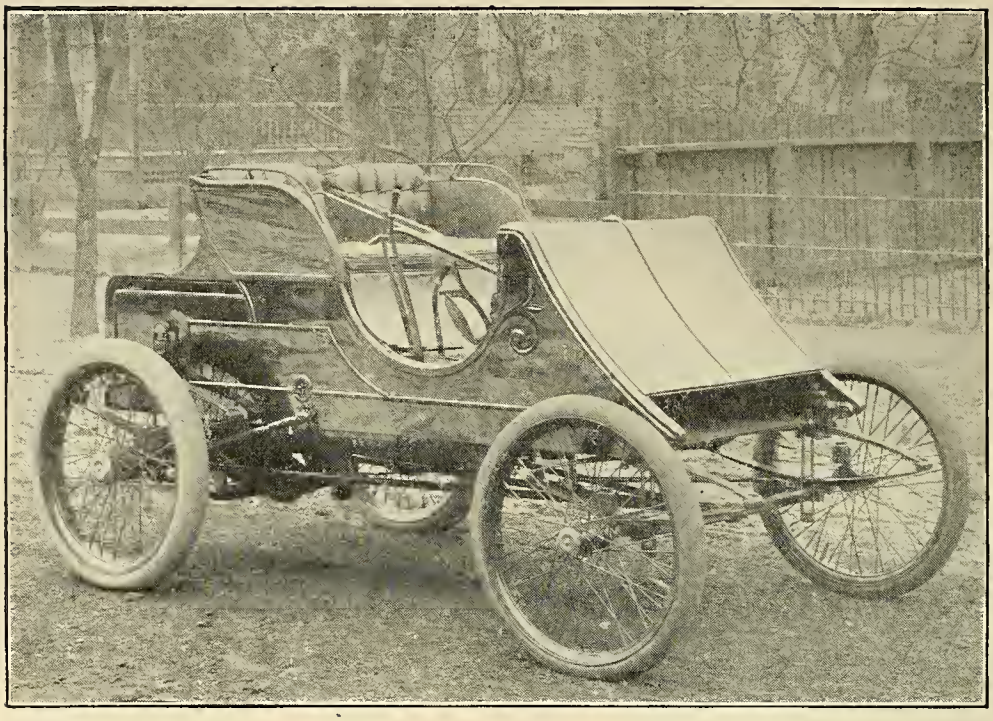
The Solar Carriage Lamp

THE Solar carriage and motor vehicle lamp illustrated herewith, is the product of the Badger Brass Manufacturing Company, of Kenosha, Wis. It has the same system of generation that has made the Solar bicycle lamp popular with wheelmen. It has been adopted and used by a number of leading motor vehicle manufacturers during the past year, both in this country and abroad, and has been found to meet all requirements. It is made wholly of brass and is handsome in design and finish. It is clean and simple in both operation and construction and burns from six to eight hours at a charge. The Special Automobile lamp is finished in all nickel, all brass or black enamel and nickel. It is fitted with a socket on the back to fit a medium-sized finger iron bracket and is intended to be fastened in the middle of the gear or frame. It has red and green side lights. The height is 10 inches. It is fitted with a front lens and throws an intense white light covering all the road.

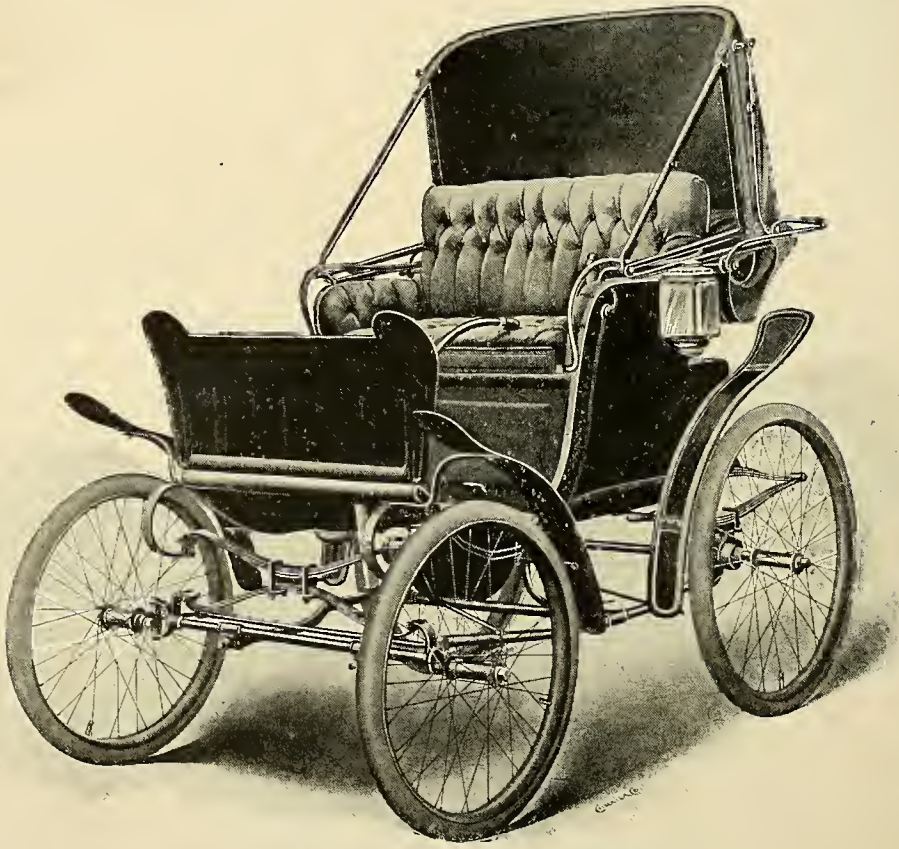


The square carriage lamp is finished in black enamel, with nickel trimmings. It is fitted with socket on side to fit medium size finger iron bracket made in rights and lefts. Height is 12 inches. It is fitted with lens in front and heavy beveled plate glass sides and rear red signals and built to fill demand for square style lamps. This lamp is suitable for all styles of two-seated vehicles and for Spiders, Stanhopes and motor vehicles.

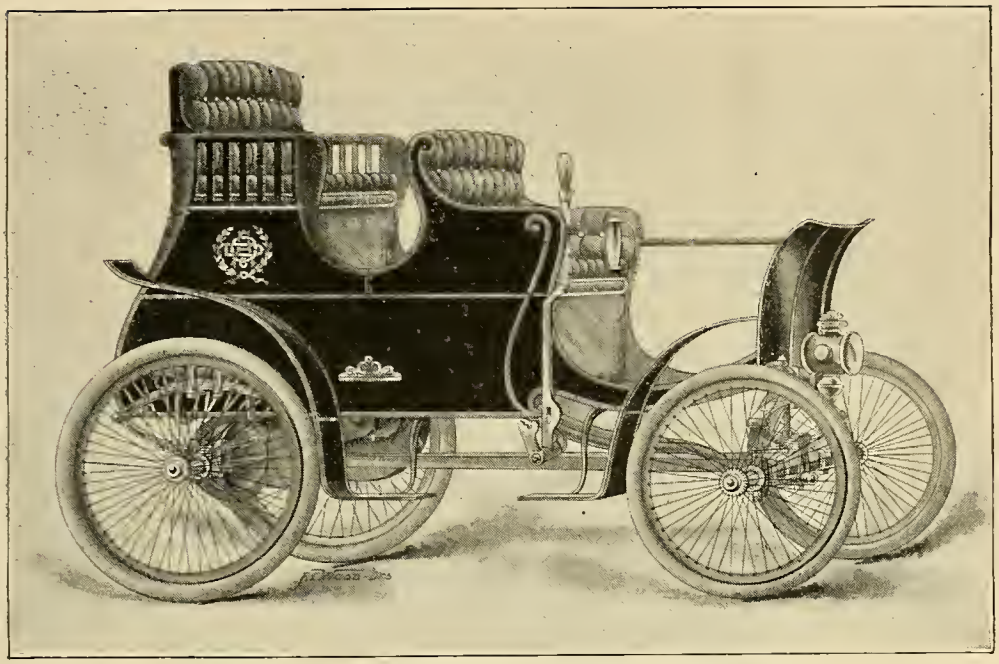




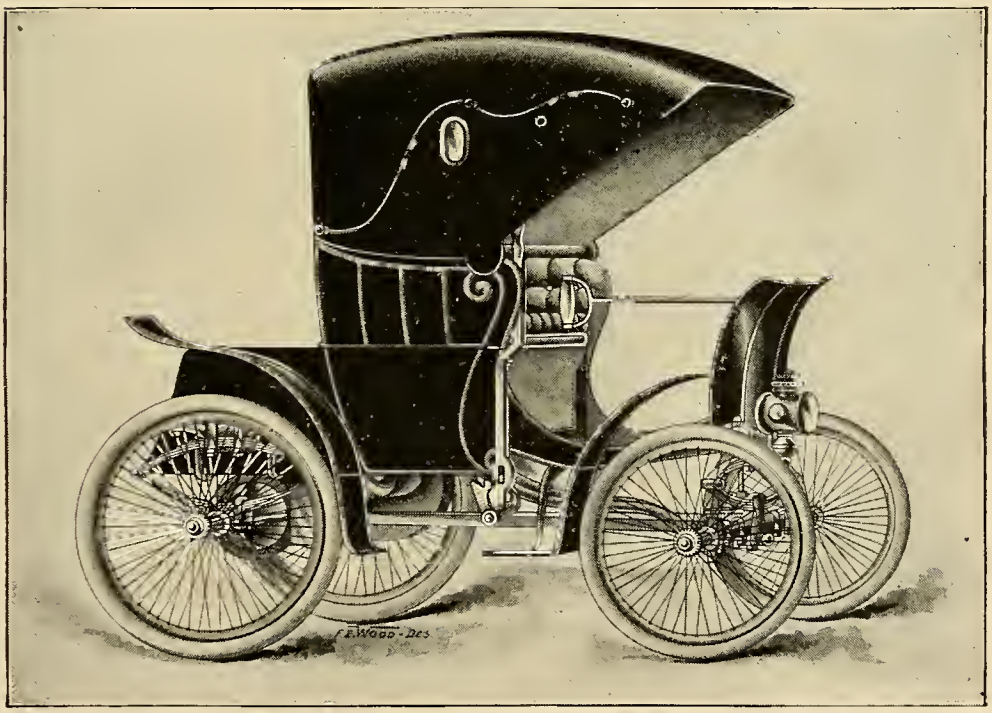
Winton Racer



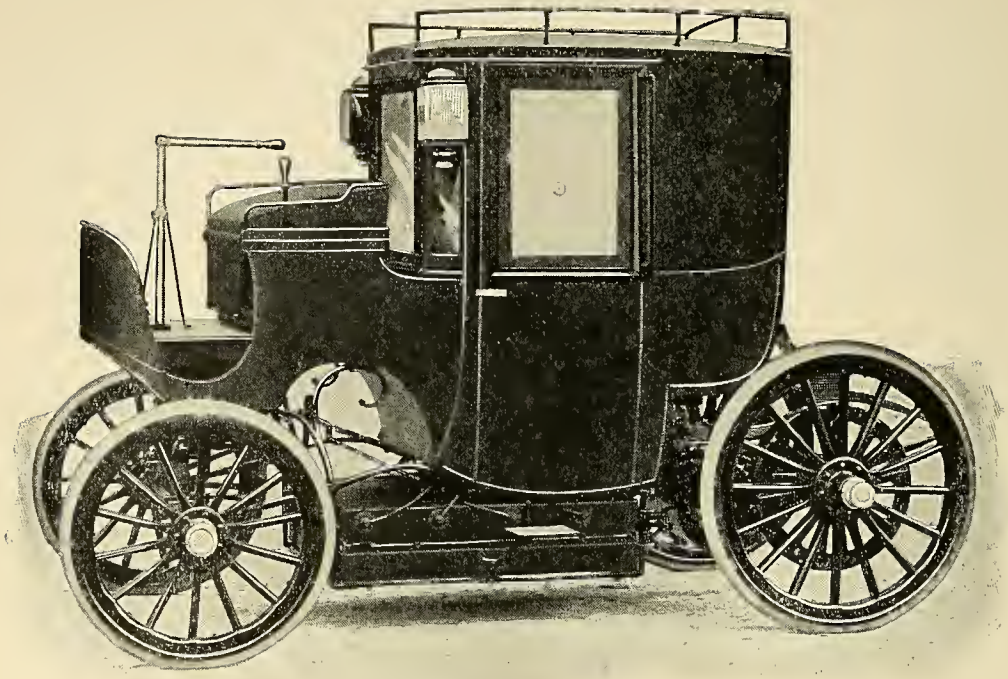
Kensington Stanhope (Buffalo)



Detroit Automobile Company's Surrey



Detroit Automobile Company's Phaeton



Electric Automobile Service

THE BALTIMORE & OHIO RAILROAD THE FIRST RAILROAD TO INTRODUCE IT

The Baltimore & Ohio Railroad has established Electric Automobile Service at Washington, D. C., in connection with its train service, being the first railroad to introduce this mode of transportation regularly to and from its railway station.

The automobiles are of the latest electric pattern manufactured by the Electric Vehicle Co. of New York. They are absolutely noiseless in regard to machinery and running gear, and are provided with luxuriously deep cushioned seats, with electric lights and time pieces. Two small trunks can be carried on the supports at the rear of the vehicle, and the top of the cab provides ample room for small traveling bags and hand luggage.

The departure from the old style conveyance is marked, and is much appreciated by the traveling public in Washington.

W. Lennard Foote Tire

THIS invention relates to tires for the wheels of vehicles, including bicycles; an object of the invention is to devise a pneumatic tire which shall be durable and easily applied by an unskilled person.

A further object is to obtain all the advantages of an inflated air-tube in a vehicle-tire without having the air-tube in contact with the roadway, thereby also avoiding the possibility of the inflated tube being punctured when the vehicle is in use.

In the present invention use is made of a cork base adapted to be received by the groove in the rim of the wheel, and in this respect the invention resembles that shown and described in the letters patent, granted March 21, 1899, No. 621,451; but in the patented structure there is no pneumatic tube employed as in the present instance, and there are other important novel features embodied in the new structure.

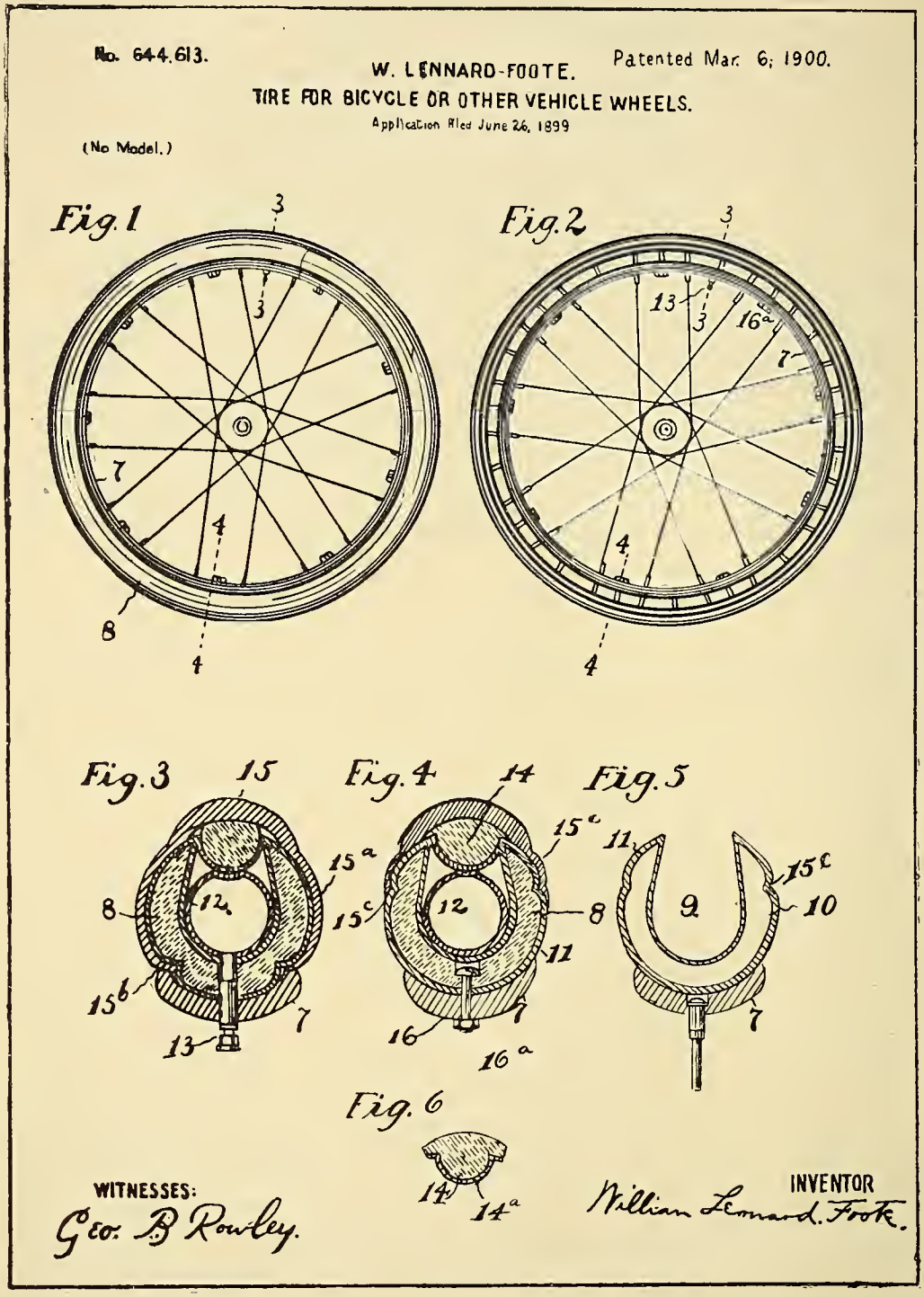
In the accompanying drawings, forming a part of this specification, and wherein like features are indicated by like numerals of reference in the several views, Fig. 1 is a side view of a vehicle-wheel—a tire composed of a continuous base of moulded cork. Fig. 2 is a similar view with the cork base composed of sections. Fig. 3 is a cross-section on the line 3, 3, of Figs. 1 and 2 close to the valve of the pneumatic tube. Fig. 4 is a cross-section on the line 4, 4, of Figs. 1 and 2, showing the bolts by which the tire is clamped to the wheel-rim. Fig. 5 is a cross-section through the cork base and wheel-rim, showing the connection of the spoke to the rim; and Fig. 6 is a detached view of the core resting on the periphery of the cork base and being interposed between the air-tube and the tread of the tire.

Referring to the drawing, 7 indicates the usual grooved rim of the vehicle-wheel, and 8 a cork base seated in the grooved rim 7. The cork base is provided with a deep channel, 9, and has an exterior surface adapting it to seat snugly in the groove of the rim 7. The cork base may be made either in a continuous piece, molded from cork waste, or in sections of suitable length. When the base is made in sections, there may be placed between the joints of the sections a thin plate or washer, 10, of raw hide to add rigidity and strength to the base.

The cork base is provided with a covering, 11, of canvas adapted to receive a varnish and serving to protect and harden

the base. The ends of this covering are brought together at the bottom of the channel 9 and firmly cemented in place.

Within the channel 9 of the base 10 there is arranged a rubber



tube, 12, which is adapted to be inflated through the valve 13, connected to the tube and extending through the cork base and wheel-rim. Resting on the periphery of the cork base 8, over

the top of the channel 9, is a core, 14, which extends into the channel sufficiently to permit the tube 12, when inflated, to bear firmly against it. The core, 14, may be made of cork, rubber, leather, or other suitable material, but preferably of cork, on account of its lightness.

The core 14 may also be provided on its surface with a covering of canvas, 14*a*, which serves to protect and strengthen the same.

The tread or outer casing, which is in contact with the roadway, is indicated at 15. It is made of rubber; this tread 15 is of a desirable thickness and preferably of the conformation shown in cross-section in the drawings, and it is placed in position over the core 14 and secured in place by having its side extensions, 15*a*, sufficiently long to extend down to the wheel-rim 7 and enter suitable grooves, 15*b*, formed in the cork base just within the edges of the wheel-rim 7, the rim 7 being sprung back to permit the ends of the extensions, 15*a*, to be secured within the grooves. The ends of the extensions 15*a* may also be cemented within the grooves 15*c*, instead of having the extensions 15*a* sufficiently long to reach down to the wheel-rim they may terminate just below the thickened part of the tread 15 and be secured to the cork base by being cemented in the grooves, 15*c*, formed in the base, as shown in Fig. 4.

The extensions, 15*a*, of the tread serve not only to hold the tread in place, but also to protect the cork base against injury by stones or the like on the roadway. When the tube, 12, in the channel of the base, 8, is inflated and forced against the core which fills the opening to channel 9, a cushioning support for the tread 15 is provided, since the tread 15 bears directly on the core 14, which is elastically supported by the pneumatic tube within the channel of the base of the tire.

The tire is secured to the rim of the wheel by small bolts, 16, fastened to the base 8 and passing through the rim 7 and provided with screw-nuts 16*a*, as shown in Fig. 4.

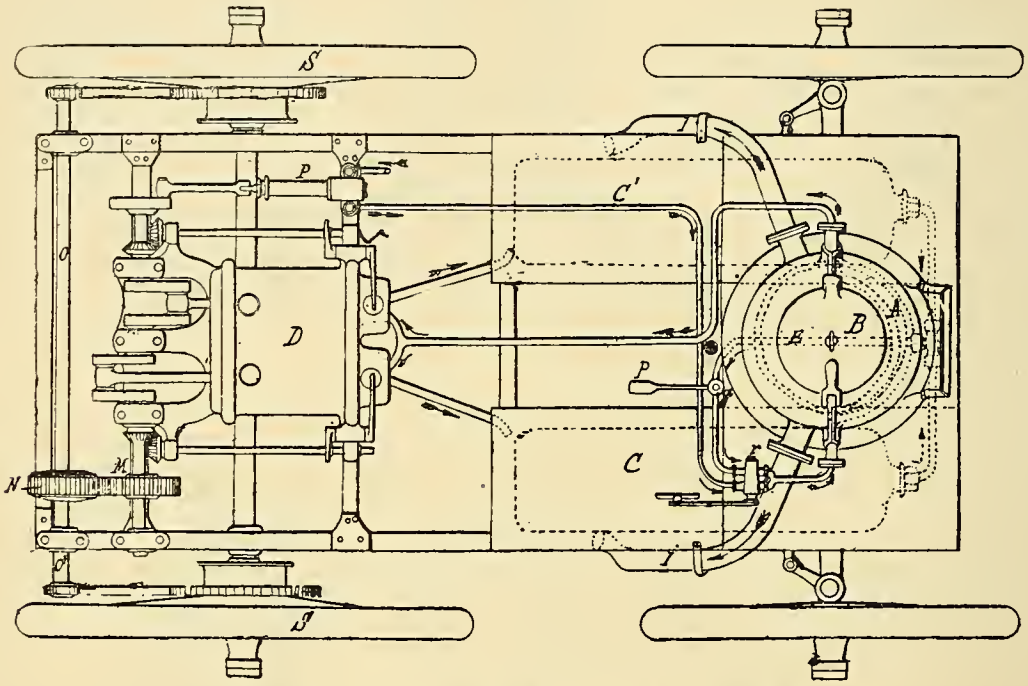
The base of cork is light as well as elastic, both of which are desirable qualities in a wheel-tire. The pneumatic tube being incased within the base is completely protected against puncture, and the core 14, interposed between the protected pneumatic tube and the tread 15, is of sufficient thickness to prevent puncture of the pneumatic tube by any device that might accidentally enter the tread 15. All the advantages of an exposed pneumatic tire are obtained by this invention, with the obvious additional advantages due to its novel construction.

A Carbonic Acid Automobile

By G. Chauveau

FRENCH patents have been granted to Rassinier and Commelin for the use of carbonic acid gas as a motive power for automobile vehicles. The claims also embrace the employment of compressed air or any other fluid under pressure.

Fluids, such as carbonic acid gas or the air of the atmosphere, lose their heat in expanding from a compressed state, the amount of loss being greater when the pressure to which they are sub-



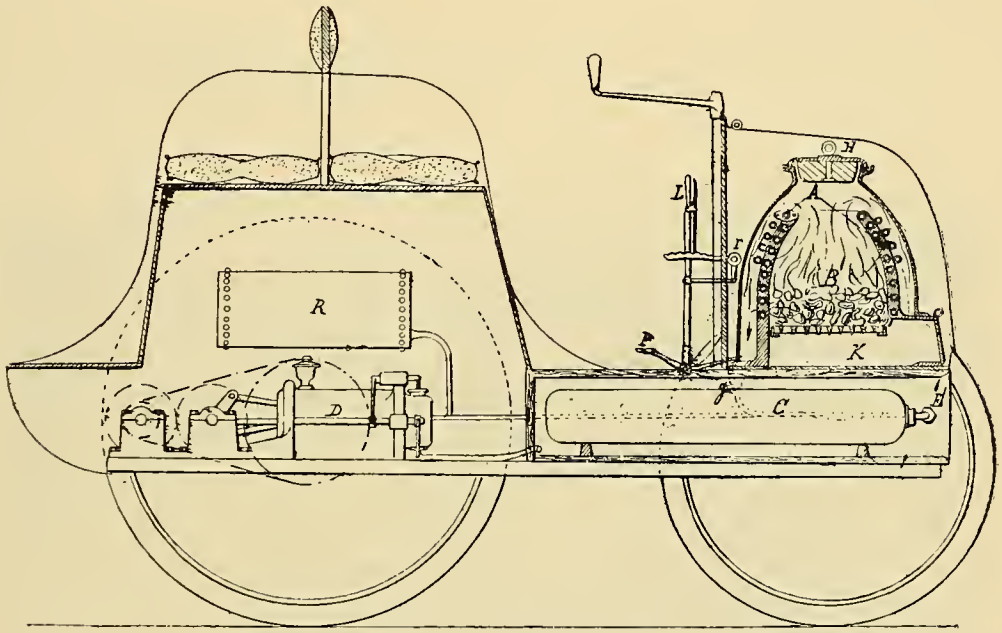
Plan View of Carbonic Acid Automobile

jected is greater. To devise a means which would permit a normal expansion and prevent the loss of heat has been the aim of many inventors. From the innumerable failures and fruitless attempts it might well be thought that the problem was not easily solved. The difficulties which have been met with seem to have been very ingeniously overcome in the invention of Messieurs Rassinier and Commelin.

In the 3 or 4 horse-power vehicle represented in the accompanying elevational and plan views, a coiled, soft-steel pipe with an inner diameter of 6 to 8 mm. (0.24 to 0.32 in.), an outer diameter of 16 to 18 mm. (0.64 to 0.72 in.), and a length of 20

metres (65.6 ft.) is connected at its lower end with a feed-pump *P* driven by the motor *D*, and by a branch-pipe *E* with the carbonic acid cylinders *C*. The carbonic acid is introduced whenever desired by opening a valve *g*, controlled by a pedal *p*. The fire-box B^3, surmounted by the coiled pipe *A*, receives its fuel through the opening *H*. The products of combustion escape by way of the chimneys *I*; ashes are received by the ash-box *K*; water is supplied by the reservoir *R*, for a purpose which will be later stated.

The motor *D* is a double-cylinder, single-acting engine with no flywheel. To overcome the dead centres more readily three



Side Elevation of Carbonic Acid Automobile

cylinders will probably be employed. The motor-shaft drives the gear *M*, meshing with another gear *N*, controlling the differential mounted on the shaft $o\ o^1$, with which the wheels *S* are connected by a chain-gear.

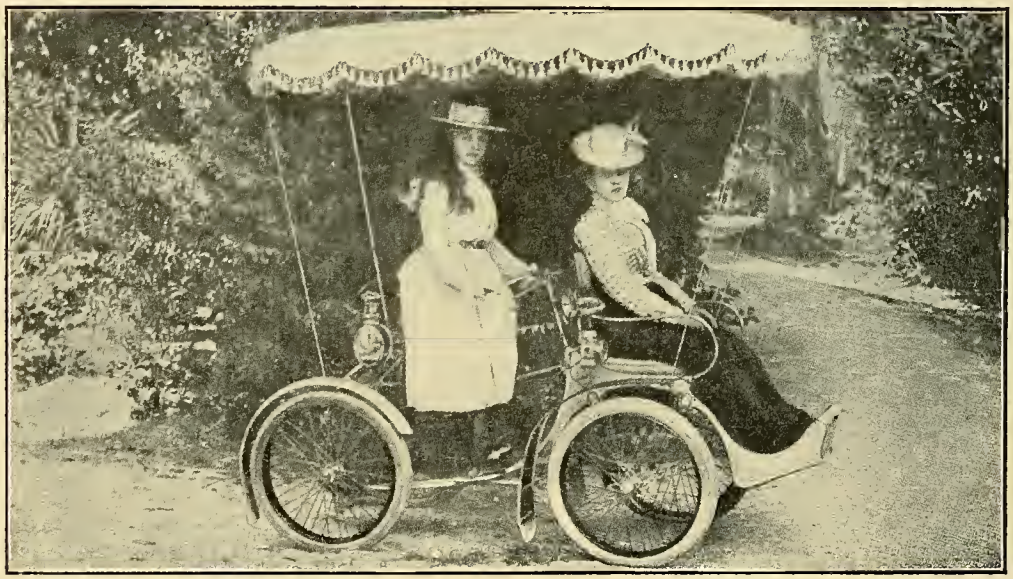
Fire having been made and the parts heated to the desired temperature, the valve *g* is opened to allow a certain quantity of carbonic acid to flow into the worm or coiled tube *A*. The admission-valves being opened by means of the lever *L*, the motor will begin to operate. But as soon as the motor has started the pump *P* will begin to force water into the coil *A*. The mixture of steam and carbonic acid thus produced acts as the motive agent. The speed of the motor is controlled by regulating the proportions of the mixture of carbonic acid and steam and its pressure, through the medium of the hand-lever *L* (controlling

the expansion) and the pedal-valve *g* (controlling the pressure). A gauge is provided to indicate the pressure.

The fire-box with its coil of pipe constitutes in effect an instantaneous generator of steam. To increase the pressure the pedal-valve is operated to mingle more carbonic acid with the steam.

AN IDEAL MOTOCYCLE

The objection has often been urged against the motocycle that it is not a practical vehicle. It is cetrain that if we take into consideration the machines with which such riders as Beconnais, Baras, Osmont and Roland have participated

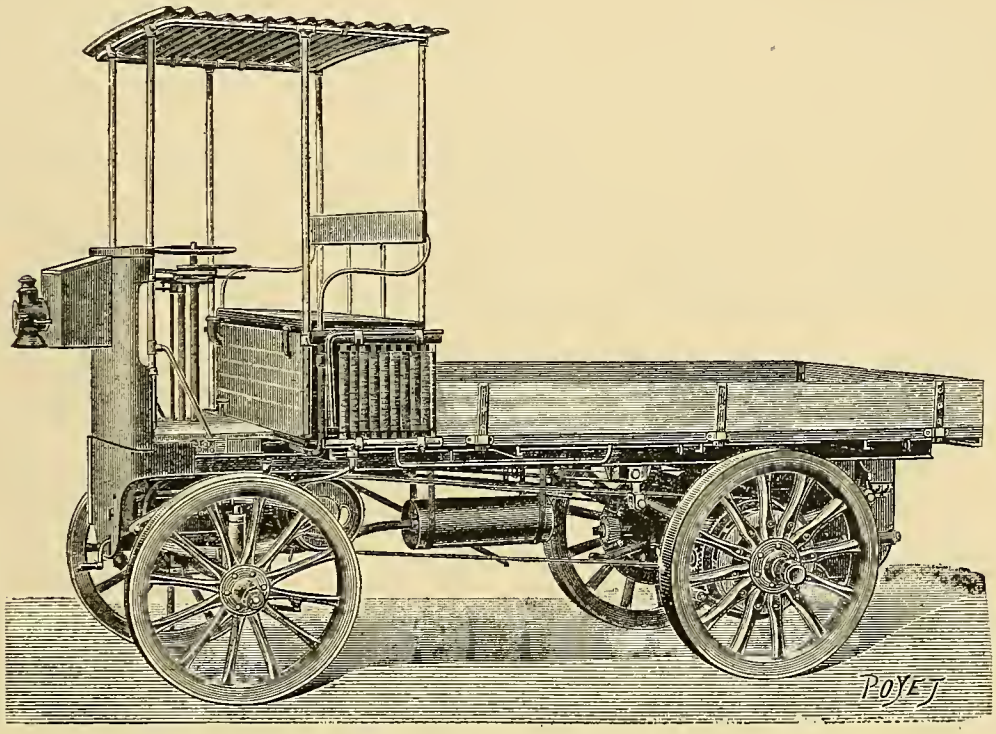


An Ideal Motocycle

in races, and in which the saddle is reduced to the most rudimentary state and the front seat is still more simplified, and sometimes consists of a mere board, we shall be obliged to admit that they do not form the ideal of a carriage for taking a pretty woman out for an airing. But a glance at the accompanying figure will show that with a comfortable fore-carriage, with ample fenders and with a handsome canvas canopy overhead to protect the complexion of the fair riders against the burning rays of the sun, the quadricycle may constitute an elegant carriage.

A Chainless Gasoline Truck

WE illustrate in the accompanying engraving an automobile truck constructed by Messrs. Dietrich & Co., of Luneville, and designed to carry, upon a level, an effective load of 5,500 pounds at a speed of 8½ miles an hour, and to climb all acclivities up to a gradient of 12 per cent., at a speed of 2½ miles. If the road is good, and the gradients do not exceed 5 per cent., the load can be easily increased to 6,600 pounds.



The dominant idea of the manufacturers has been to construct a vehicle that shall be practical, simple and strong, easy to dismount and keep in repair, and provided with a motor of sufficient power to permit of making an easy start upon the steepest up-grades. The vehicle consists essentially of a rectangular metallic frame, strongly cross-braced, and resting upon the axle of the forecarriage through the intermedium of elliptic springs, and upon that of the hind-carriage through springs with rollers.

Beneath the frame and between the front wheels, which are the steering ones, is installed the gasoline motor, which is of ten horse-power measured at the brake. Above is placed the driver's

seat, which is protected by a corrugated iron roof and back and side curtains. Within the driver's reach are grouped the starting, braking and change of speed levers, as well as the steering hand-wheel.

The transmissions, which occupy the rear of the carriage, consist of tempered steel gearings, which are fixed upon two horizontal shafts and permit of obtaining speeds of 2½, 5 and 8½ miles, and a backward running of 2½. The first shaft is actuated by the motor through a belt. The second, which carries the differential gear and a band brake, transmits its motion to the rear driving wheels through a system of gearings and jointed shafts that take the place of chains.

This entire combination is protected against dust by iron plate casings that may be easily removed in order to inspect the mechanism. A second brake, which is very powerful, and capable, when necessity requires it, to control the power of the motor, acts upon the toothed wheels of the rear drivers.

Under the driver's seat there are placed: a tool-box; a tank holding 15 gallons of gasoline—a quantity sufficient to permit a run of 90 miles; and a tank capable of containing 8 gallons of water—a supply sufficient for one day's running. Two radiators placed on each side of the truck condense the steam coming from the motor and return the water directly to the latter without the intermedium of a pump.

To the dashboard are fixed: (1) a reservoir of oil for the lubrication of the motor, which uses about a pint an hour; (2) a reservoir of gasoline for supplying the burners; and (3) a lamp.

The lubrication of the mechanism is effected through the intermedium of oil cups provided with siphon wicks.

The effective load is placed upon the floor, which is of oak and rests upon the frame, back of the driver's seat, and is thus almost entirely supported by the driving wheels.

The height of the front wheels is three feet, with a rim of three inches, and that of the hind wheels 3.28 feet with a rim of 3.8 inches. The diameter of the front axle journals is 2 inches, and that of the hind ones 2.4. The hubs are bushed with bronze. The gauge of both the front and rear wheels, from axis to axis of the tires, is 4.1 feet. The distance between the two axles is 7.4 feet.

The truck is 11.8 feet in length and 6 feet in width. The dimensions of the floor that supports the effective load are 8.2 × 5.25 feet.

The weight of the vehicle, empty and in running order, is about 3,960 pounds.

A Charging Station for Accumulators

THE slab of white marble, diagrammatically represented in Fig. 1, carries all the apparatus necessary for controlling a charging-dynamo and the four charging-divisions. The apparatus and contrivances required for the regulation of the dynamo are a field-rheostat *L*, two fuses *J* and *J*, a cut-out *I*, an automatic circuit-breaker *K*, an ammeter *G*, and a voltmeter.

Each of the groups of apparatus for the charging-divisions is composed of two fuses *E* and *D*, a cut-out *C*, a rheostat *R*, an

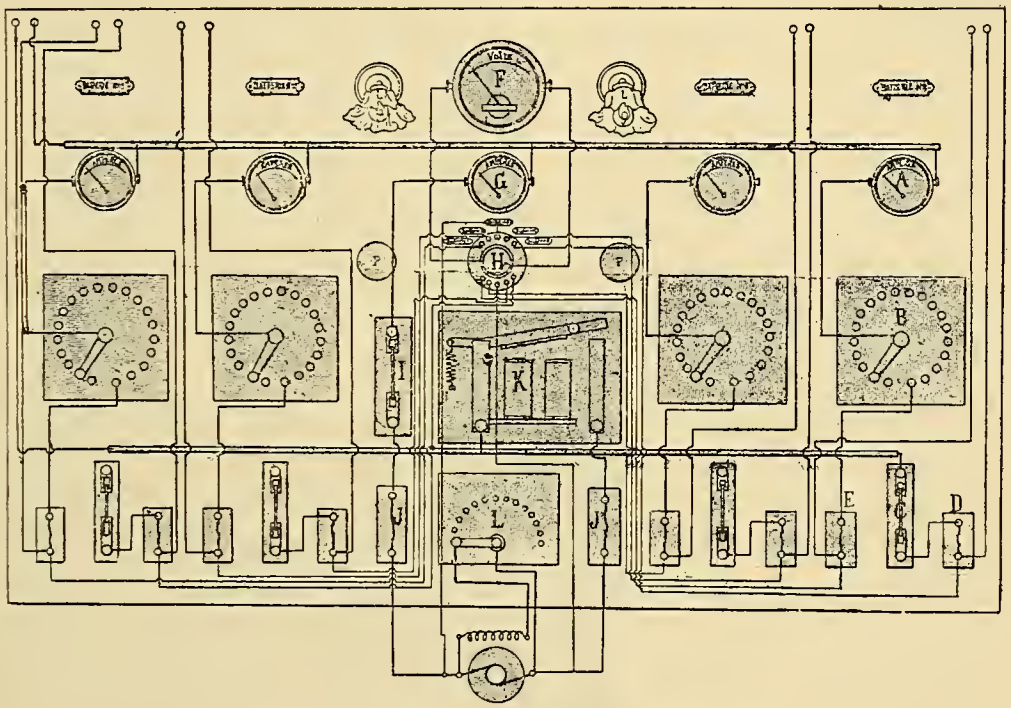


Fig. 1. Diagram of Switch-board.

ammeter *A*, and, lastly, a voltmeter. The same voltmeter can be used for the machine and each of the charging-divisions, by employing a special commutator *H*, shown below the ammeter *G*. By means of the commutator, the voltmeter can be connected with the terminals of the machine and of the battery.

Before describing the operation of the switch-board, a few words on the apparatus of which it is constituted will be necessary:

Cut-outs.—The cut-outs, *I* or *C*, shown in detail in Fig. 2, serve to interrupt the current by breaking the circuit. They are composed essentially of two pieces, carried by an insulated base. A good cut-out should have large contact-surfaces, and should permit a very quick breaking of the circuit at two or more points, so as to prevent arcing.

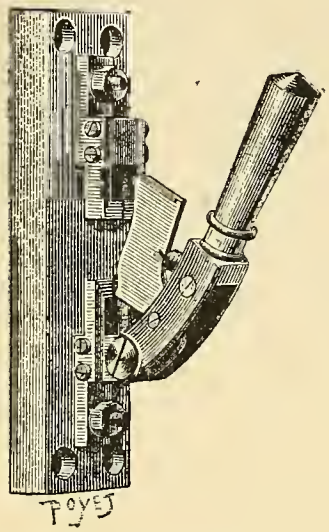


Fig. 2. Cut-out

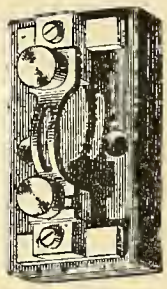
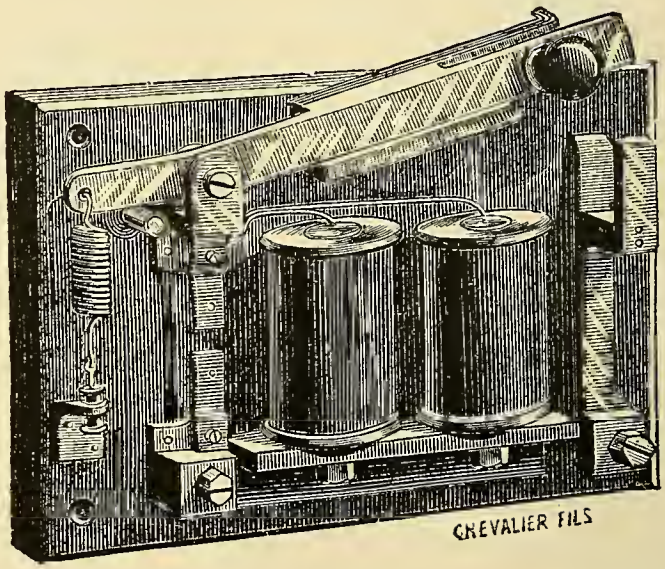


Fig. 3, Lead Fuse

Fuses.—Fuses (Fig. 3) are devices for automatically breaking the circuit if the intensity of the current become dangerous. Every one knows that when a current of a given intensity flows through a metallic conductor, a certain amount of heat is produced, owing to the resistance offered by the conductor. If the intensity increases the conductor will melt, if sufficient heat be produced. If the circuit be composed in part of a metal having a lower fusing point than the metal in the rest of the circuit, the excessively strong current will first melt the metal of low fusing-point, thus breaking the circuit and preventing the destruction of the rest of the circuit. Upon this principle fuses are constructed, the metal used in their composition being lead, which has a comparatively low fusing-point. Fuses are composed primarily of insulated terminals connected by a strip of a fusible alloy consisting of two parts of lead, one part of tin, and a few traces of phosphorus. It will be seen from the engraving that the fusible strip



Fig, 4. Automatic Circuit-breaker

is grate-formed, so as to insure the equal distribution of heat to all parts and prevent the overheating of one part alone.

Automatic Circuit-breaker.—The automatic circuit-breaker serves the purpose of preventing a battery from discharging into the dynamo, when the electromotive force of the dynamo falls below that of the dynamo, owing to a slackening of the speed of the driving-engine, loosening of the belt, or some other accident. If the dynamo voltage fall below that of the battery, the current flows back with extremely disastrous results for the dynamo. The circuit-breaker is therefore used to cut off the current upon the very first indication of a change in the current's direction.

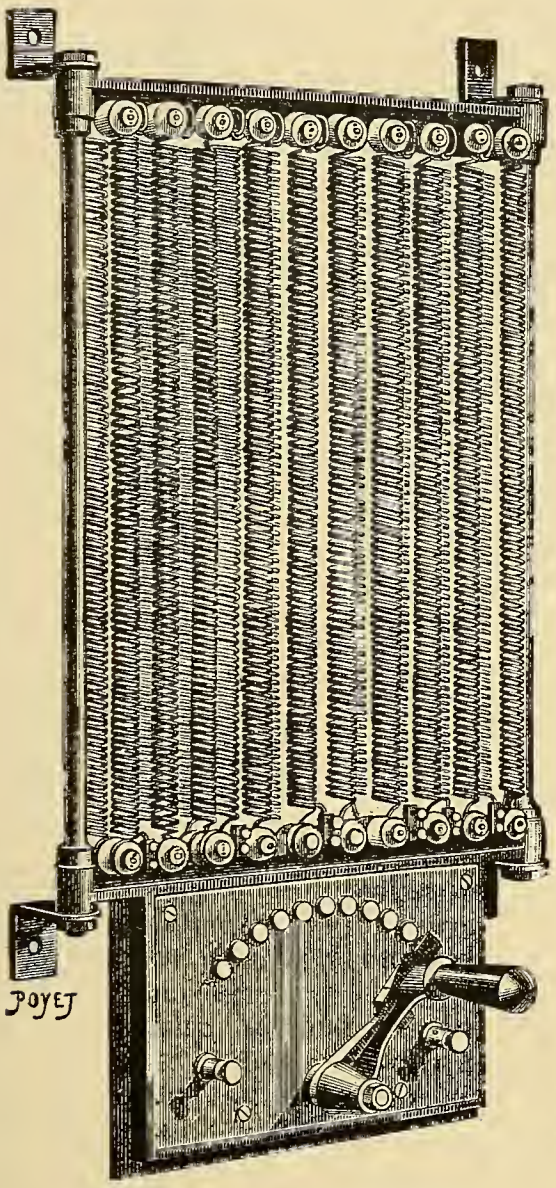


Fig. 5. Dynamo Rheostat

In the apparatus shown in Fig. 4, the charging-current from the dynamo passes from the left terminal through two electro-magnets grouped in parallel and formed of insulated copper. The current enters this winding by way of soft-iron cores secured to a strip of copper, which also carries the left terminal.

The two windings, on leaving the coils, are conducted to the pivot of a lever. When the lever is depressed, it closes the circuit, by coming in contact with a fork mounted to the right and carrying the second terminal. Under these conditions the electro-magnet will attract the armature mounted on the under surface of the lever and hold it in this position so long as the current is of the normal electromotive force.

Rheostats.—Rheostats are apparatus which are placed in series on a circuit to vary its resistance, and hence the intensity of

the current. Fig. 5 shows a rheostat for controlling the fields of a dynamo. It consists of a series of resistances connected with contacts over which a switch-handle plays. The current enters by the handle, passes through a contact and into one or more of the resistances, depending upon the position of the handle on the contacts. By passing the current through few or through many of the resistances, coupled in series, the resistance of the circuit can be varied, as well as the intensity of the current, and hence the excitation of the dynamo. The average current passing through the rheostat has a strength of about 3 ampères and a total resistance of about 40 ohms.

The rheostats *B* used for regulating the intensity of the current sent into the battery are similarly constructed; but their resistance is calculated for intensities varying from 5 to 30 ampères, during the charging of the battery. The rheostats *B* have 20 contacts, one of which is dead. When the switch-handle is on the dead contact, the circuit is broken. The rheostat *L* should not have a dead contact; because the breaking of a current at this point would be followed by dangerous results.

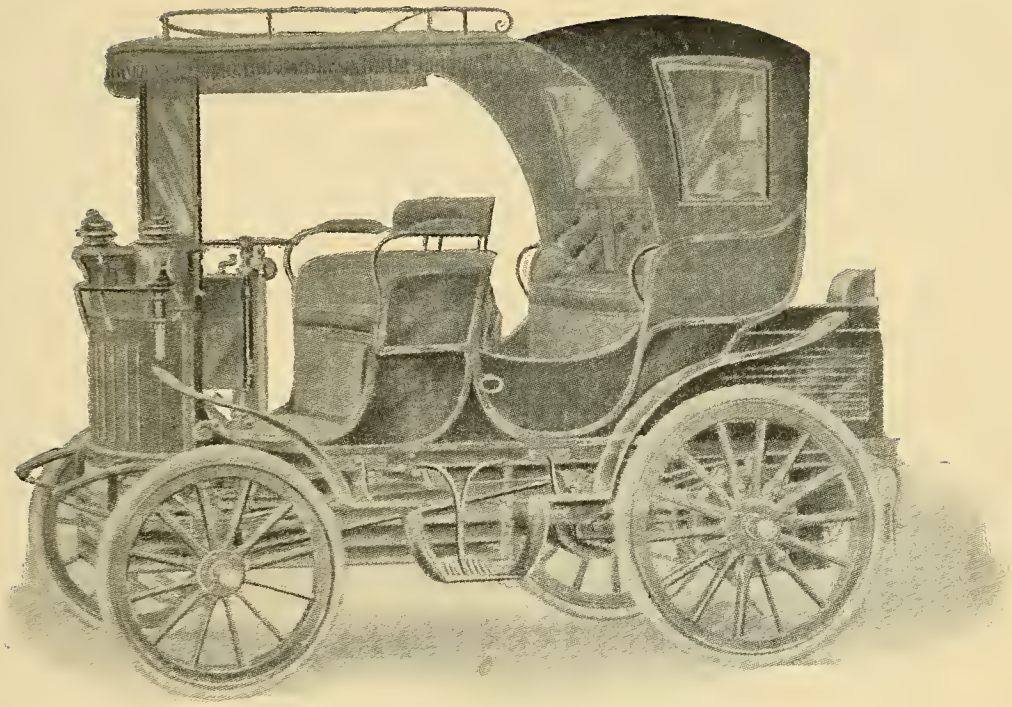
With the apparatus thus clearly before us, we can now proceed to examine the operation of the switch-board.

One of the poles of the dynamo, by means of the fuse *J*, a cut-out *I*, and an ammeter *G*, is connected with a large copper bar which is secured to the rear face of the board. The other pole, by means of the fuse J^1 and of the circuit-breaker *K*, communicates with a second bar of copper similarly mounted at the lower part of the board. With these two copper bars the various apparatus of each of the four charging-divisions are connected. For battery No. 4, for example, a circuit is formed consisting of the ammeter *A*, rheostat *B*, fuse *E*, etc. From the lower bar, another circuit branches consisting of the cut-out *C* and fuse *D*, and running to a plug from which the current is taken.

The two plugs which supply the current are wired to a small board, in front of which the carriage is located. The terminals of the small board are directly connected with the terminals of the battery.

A RULING ON AUTOMOBILES

According to a decision of the Treasury Department, owners of automobiles who wish to take them abroad will have to pay a duty when they return with them. This affects Americans who will take automobiles to Paris.



Gardner Serpollet Eight Horse Power Cab

The Gardner-Serpollet Carriage

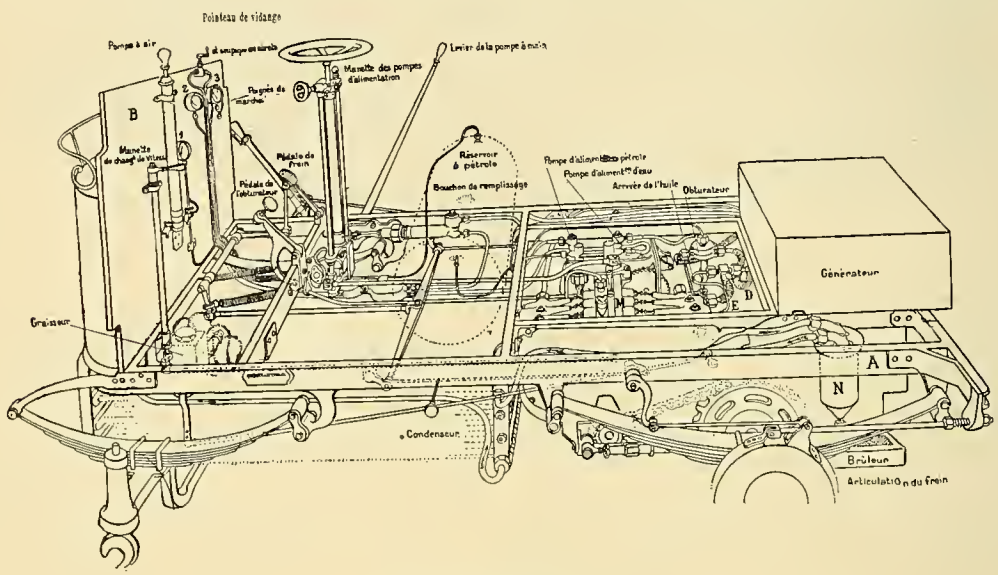
THE name of Serpollet is intimately associated with the development of steam automobilism. In 1887 Serpollet built a steam-tricycle in which coal was used as fuel. Four years later he constructed several superheated-steam carriages which proved remarkably successful. A few of these old vehicles are said to be still in use. At that time (1891) Serpollet enjoyed the distinction of being the only *chauffeur* to whom the authorities of the City of Paris had accorded the privilege of driving an automobile through the streets. He also took part in the early motor-carriage contests, among others in the Paris-Bordeaux race. Although he devoted his attention to the building of tramways for the City of Paris after his automobile experiences, he never abandoned the idea of producing a practicable steam-carriage. Coal, he soon discovered, could not be used as a fuel in automobiles. Then he tried oil. For three years he labored to devise a means for employing petroleum. His work finally culminated in the system of burners which is now used on all his vehicles. With the assistance of his friend, Gardner, he erected a plant for the manufacture of steam-automobiles, which is one of the most admirably equipped in France.

The Serpollet carriage is distinguished by the use of superheated steam, of petroleum as fuel, of a single-acting engine and of an ingenious system for distributing the petroleum by means of automatic pumps. The impossibility of an explosion and the automatic means for controlling the operative mechanism are features which are also worthy of mention.

Superheated Steam: Its Merits

First of all it will be necessary to state as concisely as possible what is meant by the term "superheated steam."

Steam produced within a boiler of the ordinary type is called "saturated steam," because it is in contact with the water from which it is generated. If this steam, before entering the cylinder



Plan of Truck

of the engine, be passed through a superheater (an apparatus somewhat similar to a multi-tubular boiler, heated either by the waste gases of a boiler or by a special furnace) it is converted into superheated steam. Its volume increases with the intensity of the heat; and its energy increases with the degree to which it has been superheated. Its economy increases in like proportion.

In order better to explain the reason of this economy, we shall resort to a concrete example. One kilogram of saturated steam at a pressure of 5 atmospheres (159° C.) represents a volume of 317 litres. In order to produce this amount of steam (starting with water at a temperature of 0° C. and at atmospheric pressure), 100 calories are required to raise 1 kilo. of water from its freezing-point 0° C. to its boiling-point 100° C.; 537 calories to transform this water at 100° C. into steam at 100° C.; and 18

calories to raise this steam to 5 atmospheres pressure. Altogether 645 calories are expended.

If this steam be superheated to double its volume, its temperature must be increased by 273° C., giving 159° C. + 273° C. = 432° C. The specific heat of steam under constant pressure being 0.475, it follows that 273 × 0.475 = 129.675 calories will be required. Hence 645 + 130 = 775 calories are employed to produce 317 × 2 = 634 litres of superheated steam.

To generate the same volume of saturated steam,

$$645 \times 2 = 1{,}290 \text{ calories}$$

are necessary, showing that there is a saving of 515 calories or of 40% of fuel for superheated steam.

The Serpollet boiler contains no reserve water and produces its superheated steam directly. Superheated steam has the advantage over saturated steam, as we have seen, of saving from 30 to 35 per cent. (theoretically 40%) of the fuel and of performing an amount of work equal to a weight of water about 50 per cent. less than that employed with saturated steam. Hence the amount of water to be carried is reduced 50 per cent., and the amount of coal 30 to 35 per cent.

These are the advantages of using superheated steam as a motive agent. In automobiles, in which the dead weight and the cost of fuel are the chief factors to be considered, it is evident that the superheated system is the only system which can be economically employed.

The frame of the Serpollet carriage consists of two longitudinal steel beams *A*, V-shaped in cross-section and supported by four springs mounted on wheels provided with pneumatic tires. In the front portion of this steel frame are carried a water-tank of 60 litres (13.4 gals.) capacity, and a board *B* upon which the various pressure gauges, an air-pump (the use of which will be explained further on), and a speed-changing lever are mounted.

The steering-hand-wheel is carried by a standard on which are secured a speed-changing hand-lever and a lever serving to control the water and oil feeding pumps. The petroleum-tank, containing 50 litres (11 gals.) of oil, is located in the centre of the frame.

On the frame are also carried the condenser, the motor *M*, two pumps for feeding oil and water, the steam-regulator actuated by a pedal, the generator (or boiler) schematically shown as a parallelopipedon in the rear of the carriage, and the burner. At each side of the steam-generator is a separator *N*, which removes the oil from the exhaust-steam before it enters the condenser.

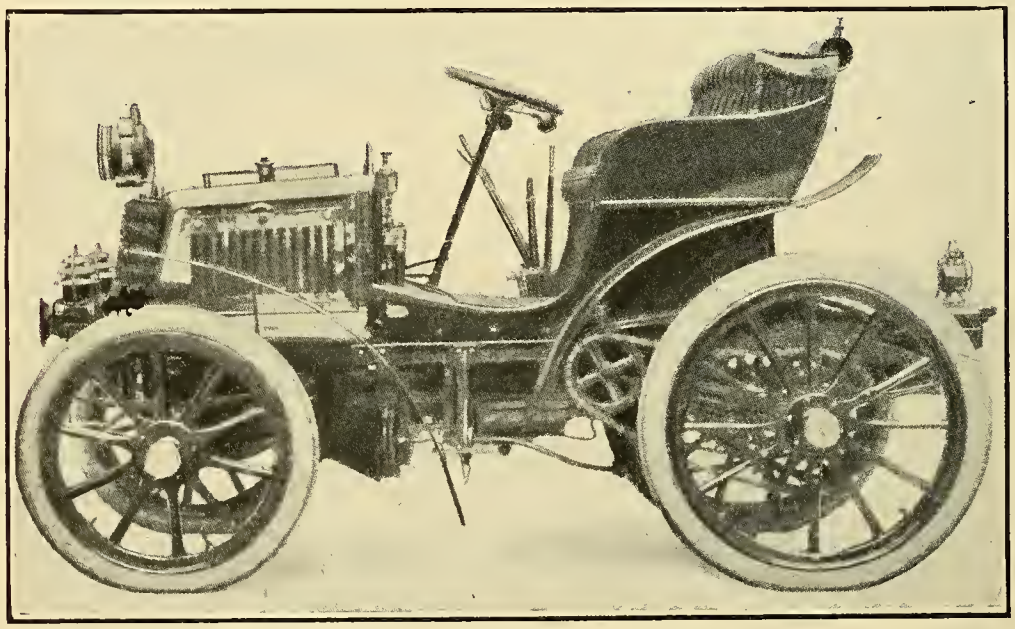
The hand-pump on the board *B* serves the purpose of forcing air into the petroleum tank under a pressure of 100 grammes. This pressure is sufficient to cause the liquid to open a flap-valve in the automatic pump and to flow in a small stream to the burner, where it maintains a low flame when the carriage is stationary or is descending hills.

Three gauges are provided. The first (1) indicates the pressure of the air in the petroleum-tank during a stop; the second (2) indicates the pressure of the petroleum vapor in the worm of the burner, when the carriage is in motion; and the third (3) indicates the steam-pressure.

A cock carrying an automatic safety-valve is secured to the board *B*, to enable the *chauffeur* to empty the generator.

A NEW PANHARD

This is an illustration of a new twelve horse-power Panhard. The novel feature of it is the brake, which is hydraulic in the sense that the brake drum is formed by a rectangular section ring,



which is water cooled, and has the strap so actuated that a pull is obtained on each end, and the brake acts whether the car is running forward or backward. The four cylinders are 90 mm. diameter and 90 mm. stroke.

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Editorial Comment

This Season's Output

The automobile output for the present season in the United States ought to make a very considerable total and give earnest for the extensive preparations set on foot last year. While a good proportion of the various manufacturing companies announced with high-sounding titles and florid prospectuses existed mainly to allure credulous investors by the glamor of a fascinating and popular novelty—and should therefore have been nipped in the bud for unlawful use of the mails—there has been a vast amount of really solid work. The great companies have had much to do in the way of installation of their plants, experimentation, etc., before coming down to actual commercial manufacturing. But, in view of the widely heralded accounts of the preparations in hand, the public has been growing a little impatient of the lack of visible results in the tremendous movement that was so soon to revolutionize the world of highway transportation. Rapid as the change may be, however, it must nevertheless be gradual, and we shall almost imperceptibly see our street traffic transferred from an animal-traction basis to that of mechanical traction. Already the fruits of the extensive prepara-

tions made are becoming visible, and the beginning of the twentieth century will be likely to see the change far advanced that, within a very few years, must make the ratio of horse-drawn vehicles to automobiles equivalent to that borne by horse-cars to electrics on our street-railways. And the change will be likely to be even more rapid than was that from horse-cars to electrics. This year we may expect to see the gigantic manufacturing plants newly created for the purpose go a long way towards filling the tremendous orders—for many thousands of vehicles in the aggregate—placed with them several months ago. Another great source of supply will be the existing carriage-manufacturing establishments, which are very wisely going into automobile production all over the country. In Amesbury, for instance, the leading carriage-manufacturing town in Massachusetts, they are going into motor-vehicle work very extensively. Another very large contribution to the total output will be the production of the numerous minor plants established for automobile manufacture in countless cities and towns all over the country. On every hand one notes a new automobile factory, until it would seem as if there could be scarcely an industrial community of any consequence in the entire country without at least one establishment of the kind. Many of these have been bicycle factories, and their plants have been easily adapted to automobile requirements. The great bicycle monopoly has made manufacturing unprofitable for the many minor concerns, and very fortunately for them the development of the automobile has come just in time to present a new and more lucrative field in place of their lost one. And unlike the bicycle—enormous though the demand for that has been—there is little danger of the business being overdone for many years to come, for the demand will long continue ahead of the supply. Although the individual output from these minor concerns will be small, amounting in most cases to no more than a few dozen vehicles apiece in the course of the year—the grand total from that source will be something very considerable. And from these plants, largely owned and operated by trained mechanics, we may expect to see American ingenuity make some of the most valuable contributions to the practice of the art.

Automobile Coal-delivery

Particularly welcome will be the delivery of coal by automobile. A coal-wagon is at present a terror. When it reaches its destination it requires a deal of maneuvering to get it into place—backing and filling, blocking up the street by drawing square

across it, the horses prancing and clattering over the sidewalk to the discomfort and even fright of pedestrians. The suburban resident stands in particular dread of the coal team, which usually cuts up and tramples his lawn, spoils the surface of his driveway, injures paths, ruins flower-beds and mutilates shrubbery, and leaves a scene of general devastation behind. So great is this destruction that the suburban resident is apt to forego the benefits of getting in his winter's coal in the summer, when it is cheap, and put off the evil day as far into the autumn as he dares, so as to bring the infliction of the inevitable injuries at a time when their effect will not seem so disastrous. What a blessed change it will be when an automobile coal-wagon backs up unerringly and without any fuss whatever to just the right spot at the cellar-window, or quietly draws up alongside the curb of the city street, in place of the frantic alarms and the school of profanity that holds a brief but most effective session for the benefit of the children when the drivers endeavor to thwart the horses in their wild attempts to back the heavily loaded cart in every direction but the right one!

Automobile Plows

Renewed attention is being given to the automobile plow. There have been steam plows in operation for many years, and from time to time there have come reports of their successful introduction on the great farms of the Far West and in California. Dr. Gatling, the inventor of the famous machine gun, has lately been giving his attention to the motor-plow. His work in this direction may perhaps be of greater benefit to mankind than his inventions for the destruction of human life. He does not exactly beat the sword into the plowshare, but he converts the multiple-gun into the automobile-plow, so to speak. The English inventor, Mr. J. E. Stevenson, of Derby, who has given much attention to this subject, states that there are great difficulties in the way. He spent $100,000 in perfecting a steam digger, which was a great mechanical success but was too costly to put onto the market. The machines are in practical operation and are said to give a wonderfully increased fertility to the soil operated upon. The first attempts in such a direction naturally result in complex and expensive apparatus. Due simplification will follow in the course of time. An automobile plow will always be an expensive implement as compared with the ordinary plow. But its efficiency will be so much greater that it will be economy to employ it. When perfected, perhaps the best course to pursue in making use

of the invention will be for a number of farmers in a neighborhood to co-operate in purchasing an automobile plow and use it in turn. Or a profitable business might be done by the owner of such a plow in contracting to plow the fields of farmers for them. One such plow should do the work of many ordinary plows with animal traction and do it with much greater trueness. It would confer a great boon upon the horse by relieving him of much of his very hardest and most wearing toil, while, as aforementioned, the deeper plowing of which it would be capable would develop much greater fertility in the soil. We may look to see the successful application of the automobile principle at no distant day not only to the plow, but to various other agricultural operations, such as sowing, cultivating, and harvesting, with consequent economy in agricultural methods and a great lightening of both human and animal toil.

Alcohol in Automobile Practice

Some important facts in relation to the use of alcohol in explosion motors for automobile practice have been developed by experiments conducted in France and Germany, and in the latter country alcohol is so cheap as to make it probable that it will be substituted for gasoline there to a very considerable extent. For this country the matter has at present only a theoretical interest, for with the exorbitant price of alcohol here its use for such purposes would be impossible. But should the effort to have the tax removed from alcohol used in the arts succeed the question would at once become practical. Alcohol costs only ten cents or so a gallon to manufacture here, so that but for the outrageous tax on its use in the arts it could be sold much cheaper than in Germany, even. That it is taxed is something greatly to our industrial detriment. Many important forms of manufacturing are impossible here on account of the prohibitive tax on alcohol. With free alcohol in the arts they would at once be established, greatly to the advancement of our prosperity. Alcohol in automobile practice here would give a wholly agreeable form of combustion material for explosion motors and would greatly promote the manufacture of that type of vehicle in this country. Even at a somewhat higher cost, many automobilists would prefer alcohol to gasoline on account of the repugnant odor of the latter. The matter is one of more immediate interest for Germany than for France, because of the greater cheapness of alcohol in that country. But if the price of benzine keeps on increasing as it has been it will soon

become a practical question in France also. In Germany alcohol is very cheap, and so it looks as if its use in automobile work might become popular there. The German periodical *Kraft und Licht* (Power and Light), gives in a recent number some important details of recent experiments with alcohol. These experiments have been conducted both with stationary engines and with automobiles. Following is a comparison of the two materials according to the analysis of Müntz:

	Petroleum Essence.	Alcohol.
Chemical composition	C 84.3	41.5
	H 15.7	13
	O 0	45.5
Specific gravity, at 15 C	0.708	9.834
Boiling point	88 C	78.5 C
Heat units (kilogram calorics)	11,356	6,522
Relative amount of same	100	207
Corresponding heat units	100	100

The heat units of the alcohol used in the experiments was somewhat less than in absolute alcohol. In 1897 the experiments made by Prof. Ringelmann of the Agricultural Institute of Paris were not encouraging for alcohol. At the School of Agricultural Industry at Douai, Levy found that one liter of 90 degree alcohol produced 3.5 horse-power hours, while a liter of benzine produced 6.12 horse-power hours. On the other hand, very recent experiments by a motor-constructor showed that with 90 per cent. alcohol a specially prepared motor of 5 horse-power produced from 6 to 6.5 horse-power. Engineer Mora obtained like results.

In Germany, Petreano lately obtained highly favorable results with alcohol. He used an Otto motor provided with a special vaporizer that utilized the heat of the exhaust. With 92 per cent. alcohol the motor used an average of only 540 grams a horse-power hour. Like results were reached with experiments in Berlin. With 90 per cent. alcohol a small Gnome motor used only 300 grams a horse-power hour. Animated discussions have resulted from these various experiments. Friends of alcohol maintain that with Ringelmann the vaporization was defective, and the friends of benzine regard the price of alcohol as too high to make it practicable.

Particularly interesting are the experiments with alcohol for automobile work. The quality used was ordinary 90 per cent. and 95 per cent. alcohol, and also a special carbureted alcohol devised by Dusart, with 30 per cent. of a certain form of hydro-

carbon mixed with 95 per cent. alcohol. Last November a Dion et Bouton motor-tricycle gave excellent results with this mixture. In December, at the instance of the Society for the Industrial Utilization of Alcohol, M. Krebs, of the Panhard et Levassor Company, experimented with a three horse-power Phœnix automobile, the only alteration being the widening of the opening to the carbureter. With the Dusart alcohol 4.2 horse-power was developed, and with ordinary 95 per cent. alcohol 3.6 horse-power; with benzine at full speed, 4.4 horse-power. According to Araschaquene it would be sufficient to abolish the tax on alcohol in order to cause it to replace benzine.

Perisse reported highly satisfactory experiments with ordinary alcohol tried with a Henriod automobile, although he regards the price as prohibitory for its use in France. He instances the Brist et Armant automobile that made the trip from Paris to Chantilly and back last April under the auspices of *Le Velo*—a distance of 136 kilometers, making the round trip in 8 hours and 8 minutes in bad weather, using 38 liters of alcohol, or an average of 0.30 of a liter a kilometer, corresponding to a cost of 0.21 francs.

In summing up the case, Perisse lays special stress on the advantage of alcohol in producing no disagreeable odor in the exhaust. He suggests experimentation in the direction of utilizing a specially prepared carbureted mixture to be consumed in motors particularly constructed with dimensions adapted to the requirements of alcohol. He recommends, in place of ordinary 90 per cent. alcohol denaturalized with 15 per cent. benzine and green malachite the use of 95 per cent. alcohol, or, better still, 98 per cent., denaturalized with some cheap form of hydrocarbon that in combustion would leave no mineral residuum. In the matter of cost Perisse assumes for France a wholesale price of .60 francs a liter. But in Germany the relative prices are 29 pfennigs (7¼ cents) for 90 per cent. alcohol and 42 pfennigs (10½ cents) for 95 per cent., while the cost of benzine runs from 46 to 60 pfennigs (11½ to 15 cents) a liter. So it is claimed that in that country alcohol would have the advantage in spite of the larger quantity required, according to the Müntz analysis. In Germany, therefore, the *Velo* long-distance trip would have cost, instead of 0.21 francs a kilometer, only about half that sum, or 0.087 mark (about 2.7 cents). In that country, therefore, alcohol should have a great future in automobile practice.

Editorial

Wheelman and Automobilist

The multiplying indications that the bicycle has lost none of its past popularity give increased force to the arguments for better highways. There is little reason to believe that the efforts of the League of American Wheelmen will be less successful in the future than heretofore, but the progress to be made by the League unaided must necessarily be somewhat slow. This fact, coupled with that of the demand, constantly growing throughout the country, for a greater number of smooth and serviceable roads, not only for wheelmen, but for the benefit of all who use four-wheeled vehicles, has led many persons to inquire, Why do not the wheelmen and the automobilists unite?

There are more reasons than one for the belief that such a union would be profitable and would result not only in assuring the continuance of the work for improved roads being done by the wheelmen, but also in expediting it. It is argued that the objects and requirements of the L. A. W. and the Automobile Club of America are coincident in all important respects. Each association is striving for fair treatment, so far as concerns its use of vehicles, and each, primarily, is working for the betterment of the roadways used by the public at large. Many conveniences now enjoyed to a limited extent by cyclists, as, for example, sign-boards here and there in various parts of the country, will appeal forcibly to the owners of automobiles.

Another consideration which argues for the co-operation of the two bodies in question is that the League of the wheelmen has, by reason of its greater age, acquired an experience in dealing with the problems of road construction which should prove extremely valuable to an organization engaged in promoting that work. It has encountered the difficulties which naturally attend such undertakings, and has discovered, at least in a degree, a way to overcome them.

On the other hand, the Automobile Club has set out with a show of ambition which should convince every one that it is prepared to labor industriously and long for the accomplishment of its purpose. Its membership at present contains the names of several men well known throughout the country, and seems likely in the near future to include scores of wealthy and influential citizens. The Club's scheme for a highway to extend across this continent, from Portland, Me., to San Francisco, Cal., with branch roads connecting important places not touched by the main thoroughfare, conveys an idea of the magnitude of its plans.

It is plain that the efforts of the two associations combined

could be relied on to accomplish great things in the way of road improvement. But, as both have many objects in common, whether they do or do not merge into a single organization, we may be sure that their exertions in behalf of good roads will be effective.—*The Sun.*

The mutual advantages of the suggested co-operation between the League of American Wheelmen and the organized automobile interests are so self-evident that it may be taken for granted that it will be carried into effect. A powerful influence in favor of the proposed national highway across the continent can thus be brought to bear in a way that ought soon to put the magnificent project on the road to prompt accomplishment.—[Ed.]

Technical Descriptions

There are certain difficulties in the way of the publication of technical descriptions of new improvements made by manufacturers, which many who are eager for such information do not appreciate. For example, one eminent manufacturer of automobiles writes us: "As to technical descriptions of our carriage, we think that for the general public such descriptions are confusing, and are apt to deter sales, rather than to make them. Of course there are a number of people who appreciate very much a technical description and want to know all about materials, sizes, etc. We are, however, impressed by the fact that the great majority of people look upon the technical description with distrust, and think they will never be able to handle or operate a carriage of that description." Another great manufacturer writes us: "You speak of a foreign publication having used drawings of our motor with regard to detailed construction. It is not our purpose nor desire to have these detail drawings subjected to publicity, and we presume they must have dug up some old patent records and drawings." Our American manufacturers do not, as a rule, follow the extreme of secrecy in regard to their operations that marks European manufacturers. With all manufacturers, however, there are elements of procedure and detail that it is desirable to keep from the public, and each must necessarily be judge of its policy in matters of the kind.

An American Steam Carriage at the Paris Exposition

The multitude of things calculated to command the attention of visitors at the Paris Exposition, which opened April 14, will,

of course, include those designed to excite interest in the enthusiast of the horseless vehicle.

Not the least of these in point of importance is the exhibition of automobiles of American manufacture.

In line with the American instinct of commercial invasion the Locomobile Company of America has taken its sterling product to France "where—we were told two years ago—the automobiles come from." This company has very properly divided its exhibit at the exposition into two sections, one of which is in the Champ de Mars, where eight locomobiles are shown immobile in a space of four hundred square feet. This area is surrounded by columns and arches from which swinging photographs and other decorative matter is suspended. The other section, which occupies four hundred and fifty square feet, and which comprises six carriages, is at Vincennes, adjacent to the track, where the locomobiles are exhibited in motion.

Automobile Export

The first shipment of electric automobiles to the Mexican Electric Vehicle Co. was made in the latter part of April. This company, which is a sub-company of the Electric Vehicle Co., will operate a system of public cabs and omnibuses in the City of Mexico under concessions granted in October, 1899, to Charles L. Seeger. The streets of Mexico, being absolutely level and paved with asphalt, are exceptionally well adapted to the use of electric vehicles, and the advent of the automobile in that gay capital is looked forward to with the greatest interest by the inhabitants.

An Up-to-date Runaway

A curious recent happening in Boston indicates that even as a runaway the automobile is vastly to be preferred to the horse! It appears that a lady had taken an electric cab to make some calls. While enjoying the drive she suddenly noticed that she was passing at considerable speed the door where she had given directions to stop. She signalled the driver and the latter managed to inform her that he had lost control of the power and could not stop. So he kept on out into Brookline, turning in and out of side streets to avoid traffic and running to and fro until the power was exhausted. Then the driver telephoned to headquarters for a relief-cab to tow him in, and the lady took a

street-car back to town, much annoyed at the loss of her afternoon but thankful for escape from serious mishap. Had such a "loss of control" over the power happened with a horse the chances would have been that the vehicle would have been dashed against something—either a post, a building, or another team—inside of ten rods, with serious injuries, if not death, as a consequence. But in this case not a thing was damaged, either animate or inanimate. So if we must have runaways, let us by all means have them by automobile!

Practical Details in Motor-cab Service

Mr. John Love, the founder of the Edinburgh Autocar Company, writes to the *Autocar* concerning his experience as managing director, giving advice as to practical details of operation which should prove valuable for all concerned in that field. He holds that where there is sufficient traffic and the business if conducted on proper lines, nothing should prevent it from succeeding, notwithstanding any fault in construction of vehicles. In such a service, he says, patience is one of the essential virtues. Directors and shareholders have no conception of the work entailed in training and selecting drivers; some men learn quickly, but many are thoughtless and careless, giving constant worry. When anything goes wrong they lay it to the vehicle, and not to themselves; for instance, they think they can drive at the same rate, without damage, over a bad pavement as over good. With common sense, half the battle would be fought. Drivers have to be checked for running along the street-railway track. for this soon cuts up the rubber of the tires. A competent machinist is needed for superintendence and to keep vehicles in repair. Spare vehicles are needed in a ratio of three out of nine. Spare parts are essential and no trip should be made without them. Mr. Love thinks that the driver should be responsible for his vehicle, and that he should oil, grease and wash it. Neither driver nor car should be overworked; six to eight hours a day in driving, and perhaps ten on Saturdays, and no work on Sundays. Working on these lines, Mr. Love says that he was particularly free from accident. But that was in Sabbatarian Edinburgh; in most communities Sunday work would be essential. But nevertheless follow the principle of having a sufficient number of employees so as to provide for one day's rest in seven would doubtless be economical in the end for the company as well as humanely considerate.

Editorial

The Horse in France

It is remarkable how the horse continues to hold his own in France. In this country the bicycle and the trolley-car have had a most depressing effect on the horse-market, and the development of the automobile is certainly not likely to retard that movement, even in France. The industrial growth of a country, however, is naturally accompanied by a growth in the instruments of industry. The horse, of course, still remains one of the chief of such instruments. This accounts for the fact that in Paris, with over 6,000 motocycles and more than 3,000 automobiles the horse-population has increased very considerably in the past year, as noted by our correspondent abroad in this issue.

Shall it be "Moto"?

The question of a short familiar name for the automobile has not been much discussed for some little time. A suggestion made, however, by the author, Mr. Nathan Haskell Dole, in a communication to the Boston *Evening Transcript,* is worthy of record. Mr. Dole recommends the adoption of the word " moto " for the purpose. It is certainly both compact and expressive, and since it is not offensive it is infinitely better in that respect than " bike " and " trike." But let us hope we shall not have the motocycle reduced to " motosike " !

Burglary and the Automobile

Modern improvements unfortunately are liable to perverted utilization as well as for the good of the race. It is only the low average of intelligence among the criminal classes that protects society from extreme harm in the employment of such instrumentalities. The bicycle has, to a considerable extent, become an adjunct in burglary, and we may expect to hear of the automobile being so employed at no distant future. The stealing of automobiles, however, is another thing from the stealing of bicycles. A stolen automobile would be much like a " stolen white elephant," so easily identifiable and recoverable it would be. A recent number of the *Autocar,* however, gives an amusing account of an attempt of burglars in Paris at an automobile manufactory one night. Possibly the burglars had plotted to borrow an automobile for use in their operations. It

appears that the caretaker at the Kriéger factory had his attention attracted by a peculiar noise. "He first of all went into the office and found the place ransacked, and then going into the yard where several valuable electric cars were standing he saw three men, each on a car, trying to make them go. As soon as the caretaker appeared the burglars went for him and tried to stick knives into him, but the knives would not penetrate the thick clothing which he had put on to guard against the rigors of a winter's night. The caretaker yelled, and the burglars made off. The unfortunate man's troubles were not even yet at an end, for while he was congratulating himself on his own escape and regretting the escape of the burglars, he saw one of the electric cars performing strange maneuvers on its own account. It made for the caretaker and knocked him down. The man got up, a little bit dazed at this unprovoked assault, and while trying to collect his scattered wits the car made another attack on him. This time it jammed him against the wall with so much force that he dropped in a heap. He was able to see a man, who had concealed himself in the car, get down and walk away laughing. The caretaker was discovered a little while afterwards lying unconscious, and suffering from severe bruises."

The "Fore-carriage" Principle

It is noteworthy that one of our highest authorities in physical science, Professor Elihu Thomson, who has given close practical attention to the automobile, has a high regard for the "fore-carriage" principle in motor-vehicle practice, saying that it is to be commended for its application of the motive power at just that part of the vehicle where it is most effective—pulling it like a locomotive, instead of pushing it.

MOUNTAIN AUTOMOBILE STAGE

A project is on foot to construct an automobile road from New York to the mountain region of New Hampshire. John D. Quackenbos, of New York, is the prime mover in the scheme and Governor Rollins and N. J. Bachelder are co-operating with him. The highway would go from New York through the northern part of Connecticut into the Berkshire region in Massachusetts and pass from Vermont to New Hampshire at Bennington. In New Hampshire it would touch the lake region at Sunapee and Winnepeauk, go up the west side of the mountains as far as Lancaster, and then east down through Dixville Notch to the seacoast.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Accumulators—

A serial article, by E. C. Rimington, on the construction and management of electric accumulators for automobiles. "The Automotor Journal," London, March, 1900.

The Majert accumulator fully described and illustrated. "The Motor Age," Chicago, Ill., March 22, 1900.

Description and illustration of the Westinghouse rotary converter for charging automobile storage batteries. "Electrical Review," New York, March 28, 1900.

An Australian Automobile—

More about the Sutton automobile by the inventor, Henry Sutton, A. I. E. E., of Melbourne, Victoria. "The Autocar," March 31, 1900.

Automobiles for Newpaper Delivery—

By E. E. Garritson. "The Automobile Magazine," April, 1900.

Automobilism in Europe—

The principal automobile events in Europe during the Exposition (races and contests). By C. L. Durand. "Electrical Review," New York, March 28, 1900.

Automobilism in Warfare—

(From the "Automotor Journal") "The Automobile Magazine," April 1900.

Carbureters—

The Longuemare heavy oil carbureter fully described and illustrated. "The Automotor Journal," London, March, 1900.

Description of the Goutallier carbureter. With one illustration. "The Automobile Magazine," April, 1900.

Cooling Device—

Apprin's cooling device for gasoline motors described and illustrated. "La Locomotion Automobile," Paris, March 8, 1900.

Electric Automobiles—

English electrical vehicles. Brief illustrated description of the Electric Motive Power Company's dog-cart. "Industries and Iron," January 26, 1900.

European types of electric automobiles. Illustrated descriptions of vehicles made by several of the more important manufacturers abroad. "Electrical World and Engineer," February 10, 1900.

Illustrated description of the Berthier carriage. "La Machine," Geneva, Switzerland, February 25, 1900.

Illustrated description of the Créanche carriage. "La Locomotion Automobile," Paris, March 8, 1900.

"American types of automobiles." A full description of the Riker vehicles. With illustrations. "Electric World and Engineer," New York, March 24, 1900.

Illustrated description of the Perret carriage. "Electrical Review," New York, March 28, 1900.

The Thresher electromobile brake described and illustrated. "Electrical Review," New York, March 28, 1900.

"American made electromobiles for 1900." An illustrated description of various vehicles. "Electrical Review," New York, March 28, 1900.

Illustrated description of Lombard-Guerin's automotor trolley. "Scientific American," New York, April 7, 1900.

"An Automobile Patrol Wagon." By H. H. Harrison. "The Automobile Magazine," April, 1900.

Electric Motors—

Description and illustration of the Eddy motor for automobiles. "Electrical Review," New York, March 28, 1900.

A brief description of the Rochester type C motor. With one illustration. "Cycle and Automobile Trade Journal," Philadelphia, April, 1900.

Electric Omnibus—

Description and illustration of the Siemens & Halske omnibus, now used in Berlin. This vehicle is a trolley-car and automobile combination. "Electrical Review," New York, April 4, 1900.

Electric Spark Indicator—

A new device. "The Automobile Magazine," April, 1900.

Evolution of the Motor Vehicle as Shown by Patents—

A technical article (serial) by Leonard Huntress Dyer. "The Horseless Age," New York, April 4, 1900.

Fore-Carriage—

Solignac's Electric Fore-Carriage. From "La Nature." Illustrates and describes an apparatus recently presented to the Société des Voitures Electriques, of Paris. Scientific American Supplement, February 24, 1900.

Governors—

Description of the Joy-Estcourt governor. With illustration showing governor as applied to a single cylinder automobile motor. "The Autocar," Coventry, England, March 31, 1900.

Hydrocarbon Automobiles—

Detailed description and illustration of the "Mees petromobile" and parts of this vehicle and its motor. "The Automoter Journal," London, March, 1900.

Description and illustration of the Ramus voiturette. "La France Automobile," Paris, March 8, 1900.

Brief description of the Gillet-Forest small carriage. One illustration. "La France Automobile," Paris, March 11, 1900.

A descriptive article, serial, on the De Dion-Bouton small carriage. With illustrations. "La France Automobile," Paris, March 15 and 18, 1900.

Illustrated description of the Belgian Duryea carriage. "The Motor Age," Chicago, March 15, 1900.

The latest Audibert-Lavirotte carriage described and illustrated. "La France Automobile," Paris, March 15, 1900.

The Tourand carriage described and illustrated. "The Motor-Car Journal," London, March 16, 1900.

Detailed description of the Hertel motor-carriage. With two illustrations. "The Motor Age," Chicago, Ill., March 22, 1900.

A brief description of the Wilford carriage, made in Belgium. With one illustration. "The Motor-Car Journal," London, March 23, 1900.

Illustrated description of the original Benz carriage, claimed to be the first hydrocarbon automobile ever built. "The Autocar," Coventry, England, March 24, 1900.

"A Gasoline Carriage for Physicians." By Dr. Clarke. "The Automobile Magazine," April, 1900.

Description of the "Luxor" automobile. With two illustrations. "Cycle and Automobile Trade Journal," Philadelphia, April, 1900.

A brief description of the "Eole" voiturette. "The Automobile Magazine," April, 1900.

Illustrated description of the Holley automobile. "Cycle and Automobile Trade Journal," Philadelphia, April, 1900; also "The Motor Vehicle Review," April 3, 1900.

The Automobile Magazine

Steam Automobiles—

Description of the Thompson steam phaeton, the first of its kind yet built in Australia. "The Automotor Journal," London, March, 1900.

Description and illustration of Skene steam carriage. "The Cycle and Automobile Trade Journal," Philadelphia, April, 1900.

The Malboro carriage briefly described. With one illustration. "Cycle and Automobile Trade Journal," Philadelphia, April, 1900.

Steam Lurry and Tipping Cart—

Illustrated description of the Mann lurry and tipping cart. "The Automotor Journal," London, March, 1900.

Steam Motocycle—

Copeland's original motocycle described, with one illustration. "The Motor Age," Chicago, Ill., April 5, 1900.

Description of the Milne & Killam motor. "Cycle and Automobile Trade Journal," Philadelphia, April, 1900.

The Automobile in Colonial Development—

By Sylvester Baxter. "The Automobile Magazine," April, 1900.

The Construction of a Gasoline Motor Vehicle—

A serial technical article by C. Bramwell. "The Motor Vehicle Review," Cleveland, O., March 13, 20 and 27 and April 3.

The Father of the Automobile—

A biographical sketch of Gottlieb Daimler by Edwin Emerson, Jr. "The Automobile Magazine," April, 1900.

The Jingle of a Joyful Jehu—

By Francis X. Reilly, Jr. "The Automobile Magazine," April, 1900.

The Light Road Carriage—

By Edouard de Norême. "The Automobile Magazine," April, 1900.

The New Sport Abroad—

A descriptive review, with illustrations. "The Automobile Magazine," March, 1900.

The Practical Automobile of the Future—

By E. E. Schwarzkopf. "The Automobile Magazine," April, 1900.

The Street Car of the Future—

An article by Waldon Fawcett, with illustrations. "The Automobile Magazine," March, 1900.

The Use of Balls in Motor Construction—

A technical article, by Henry Souther. "The Motor Vehicle Review," Cleveland, O., February 27, 1900.

Tires—

"Automobile Tires." An illustrated article, by H. Falconnet. "The Automobile Magazine," March, 1900.

A new form of tire for automobiles, invented by Mr. E. Kempshall. "The Automobile Magazine," April, 1900.

Transformable Heavy-weight Vehicle—

Description of Julien Bernard's heavy-weight vehicle. With illustrations. "L'Avenir de l'Automobile et du Cycle," Paris, January, 1900.

Transformer for Charging Ignition Accumulators—

A technical description, with illustration and tables. By A. Delasalle. "The Automobile Magazine," April, 1900.

Transmission Gearing of Motor-cars—

A comparative study by A. J. Wallis-Tayler, C.E. With illustrations. "The Motor-Car World," London, February, 1900.

Transmission Gearing of Motor Vehicles—

A technical article, with illustrations. "Cycle and Automobile Trade Journal," Philadelphia, March, 1900.

Night Scene
Returning from "Old Paris"
(Exposition 1900)

The Automobile
MAGAZINE

VOL. 11 JUNE 1900 NO. 3

At the Exposition of 1900

PARIS, May 15—The International Universal Exposition of 1900, announced by a decree of July 13, 1892, and decided by a law of June 13, 1896, was inaugurated by the President of the French Republic on Saturday, April 14.

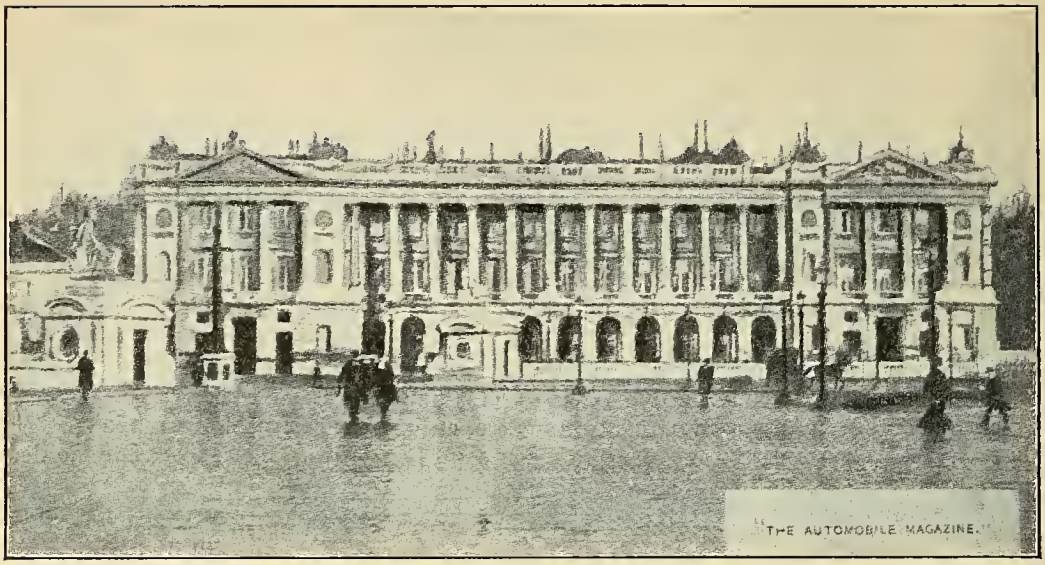
"The opening," says *L'Officiel*, "thus took place at the date originally fixed. In preserving this date, despite the delay that circumstances beyond control caused in the different parts of the Exposition, the government of the Republic knew that it was able to rely upon the absolute devotion of all those who were associated in the vast enterprise.

The imminence of the opening had, for a fortnight, been exciting the energies of every one to the utmost, and foremen as well as laborers ungrudgingly furnished the powerful effort that the country expected from them. Owing to such effort, the state of completion of the enterprise in all of its principal parts is such that *but a few days will suffice to finish the particular installations.*"

L'Officiel itself admits that "an Exposition has been inaugurated, but an exposition in which *working as yet is exhibited!*" This is doubtless by tradition, since precisely the same was the case in 1889. The last Exposition was opened on May 6, although the work was not far advanced, since it was not till June 15, that is to say, about five weeks after the official inauguration, that the completion of the installations was celebrated.

Class 30, that which interests us more particularly, *will be* installed on the Champ-de-Mars, in the Palace of Engineering and Transportation, situated on the Avenue de Saffrenside.

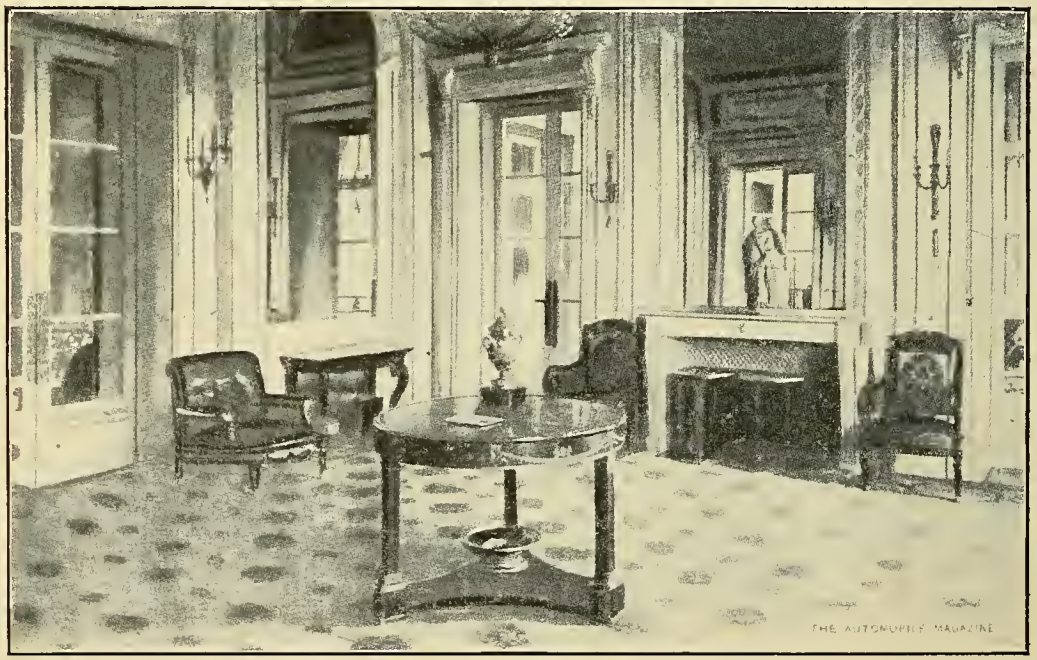
A series of bas-reliefs upon the façade of this palace narrates the history of all the methods of transportation and locomotion



Automobile Club of France

devised by human industry. From the primitive voyages on foot and horseback to those more modern ones for which we utilize the railway, the bicycle, the automobile and the balloon, all are represented in remarkable sculptural forms worthy of attracting the attention of visitors.

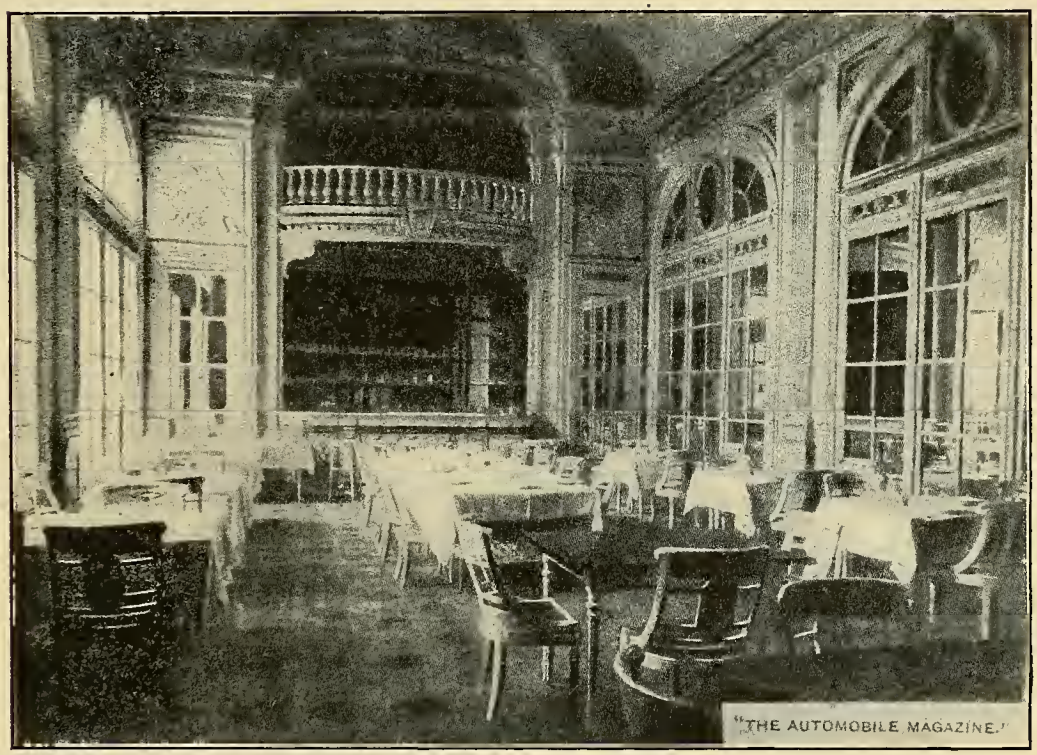
It was befitting that such history should be thus glorified; for is not our *fin de siècle* the epoch of marvellous and radical transformations in every method of moving about?



A Salon, Automobile Club of France

The hippomobile hack No. 1 of the Compagnie Générale des Voitures, and a few packing cases that must doubtless conceal something (but what?), alone represent to our eyes the most modern instruments of locomotion and transportation.

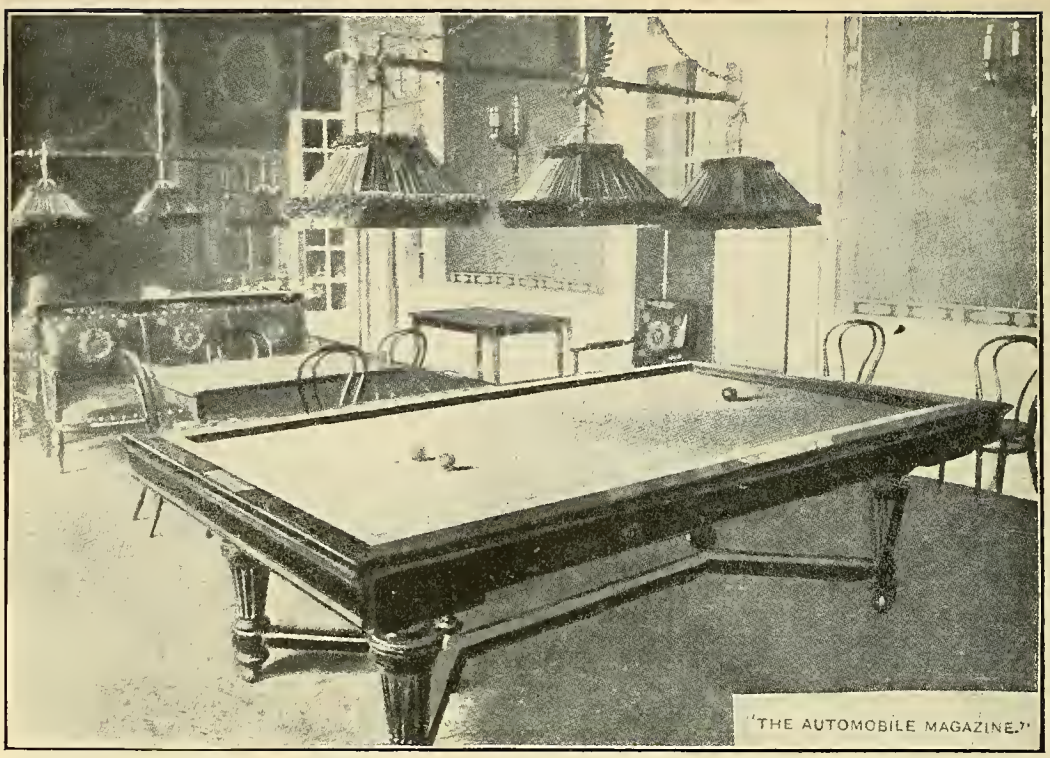
At the Vincennes annex it is worse still. This has been opened to the public, it is true, but only that the pledge given by M. Bouvard to the Municipal Council might be kept. Nothing is finished here, and even the entrance cottages have not been constructed. Nevertheless, visitors may see something like a hundred cars and locomotives of all systems on exhibit in the



Dining Room, Automobile Club of France

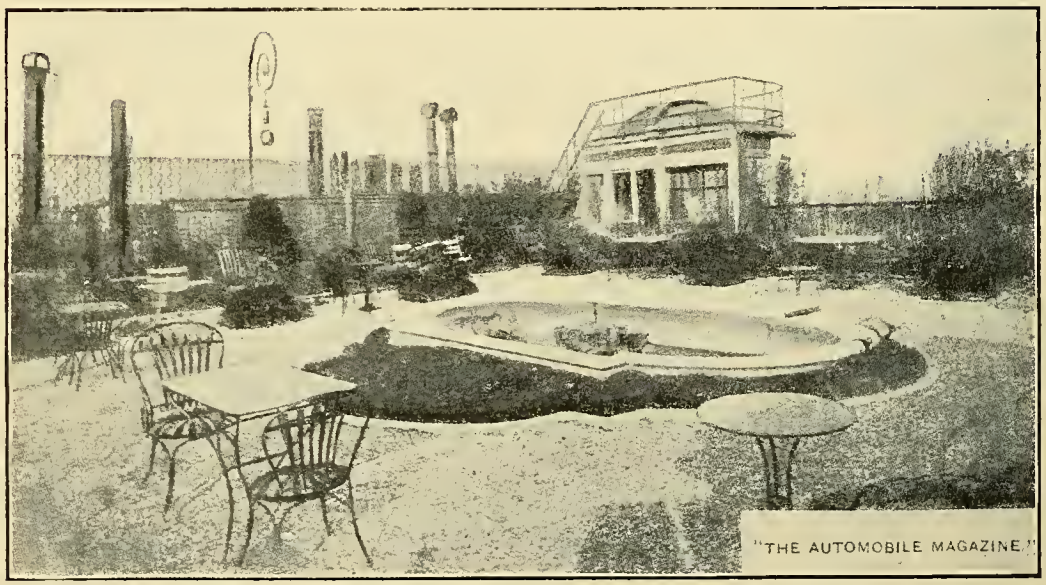
railway section, the most important one of the Vincennes annex. This section occupies the vast quadrilateral comprised between the fortifications, Avenue de Graville, the circular road, and Charenton. A branch starting from the Vincennes line, between the Bel-Air and Saint-Mandé stations, enters it at the Reuilly gate. Here stands the semaphore, a switching post from which are controlled the twenty-two tracks that give access to the immense halls in which are exhibited the rolling stock of France and of foreign powers.

These halls, which are constructed of iron, have trusses of 46 feet span, spaced 32.8 feet apart. They are five in number



Billiard Room, Automobile Club of France

and have the successive lengths of 656, 623, 590.4, 557.5 and 524.8 feet. Their height is 49.25 feet. They are covered with glass and are consequently perfectly lighted. They are to be occupied in the same order by the following powers: France,



The Roof Garden, Automobile Club of France

Russia, America, England, Belgium, Austria-Hungary, Germany and Italy, each of which will have four tracks at its disposal.

There are other halls set apart for the sections of aerostation, cycling and automobilism; but there is nothing material to be seen, and very little animation seems to prevail.

Optimists calculate that it will require six weeks longer to get things ready, and it is thought that it will be possible for the official inauguration to take place on the 24th of May—Ascension Day. For that day a fête at the park of Aerostation would suggest itself!

The work of arranging things at the Champ-de-Mars, although not so far behindhand as that at Vincennes, will require a few weeks more before it is entirely finished.

Class 30 will certainly not have its full complement of exhibits before June 10. Those whom this part of the Exposition particularly interests, that is to say, all our readers, will do well, if they wish to derive a general and complete idea from their visit, to postpone their trip, in case they have purposed making one previous to that date.

The Military Automobile at the Exposition of 1900

THE Committee of Class 116, armament and artillery material, of Group XVIII. of the Armies of the Land and Sea, decided upon the plan (now realized) of selecting from among the vehicles necessary for the requirements of the army various types that seemed as if they ought to lend themselves more particularly to automobile applications, and of entrusting the construction of such models to a certain number of manufacturers.

The collective exhibit, thus constituted, will comprise 12 vehicles, 2 of which are driven by steam, 1 by heavy petroleum and 9 by gasoline, viz.: a traction engine for the service of the artillery, engineer corps, commissariat, etc.; a truck designed for the same purpose; a paymaster's wagon; a medical carriage with surgical apparatus, medicines, etc., and a dismountable tent for visits and operations; a traveling telegraph office provided with Morse apparatus; a telegraphic van; a carriage for army postal service; an omnibus for the carriage of personnel; a carriage for the Commander in Chief of the Army, or the Commander of an army corps; a high-speed automobile for the service of the staff-

office of the army; a voiturette for the service of staff officers, and a moto-cycle for the transmission of orders.

These apparatus were distributed among the following manufacturers: Société Scotte, De Dion-Bouton & Co., Société Morse, De Dietrich & Co., Société Koch, Sauter, Harté & Co., Société Georges Richard, Société Panhard & Levassor, Société Peugeot, Société Decauville, Kellner & Fils, and Rheims, Aucher & Co.

The majority of these automobiles will be of the uniform slate-gray color adopted for the rolling stock of the army. All will carry inscriptions or devices indicating the purpose for which they are designed.

The space reserved for them is located in the Palace of the Armies of the Land and Sea skirting the Quai d'Orsay, and on the upper ground floor, that is to say, on a level with the roadway of the quai.

It comprises two stands (No. 48) placed near the central vestibule of the palace, opposite the new foot-bridge, one extremity of which rests upon Quai Debilly.

This exhibit constitutes a great advance to the front for the automobile cause, and such dedication of the new mode of locomotion does the greatest honor to the Committee of Class 16, from which the manufacturers have received nothing but aid and encouragement, and also to the organizers of and participants in the exhibition of military automobiles.

The exhibit under consideration will certainly be one of those most visited by specialists, who will find here, not a number of vehicles more or less adapted, in haste, to a special use, but rather a number of models that have been elaborated with very particular care.

Automobile Conveyance in the Interior of the Exposition

IN order to go quickly and without fatigue from the galleries of the Champ de Mars to the palaces of the Quai d'Orsay or the installations of the Esplanade des Invalides, a person has the choice of two methods of conveyance—the rolling platform and the electric railway. Both follow the same route, and each forms a long endless belt that circumscribes the space comprised between Avenue de Labourdonnais, the Quai d'Orsay, the Esplanade and Avenue de la Motte-Piquet, for a total length of about 11,150 feet, say a little over two miles.

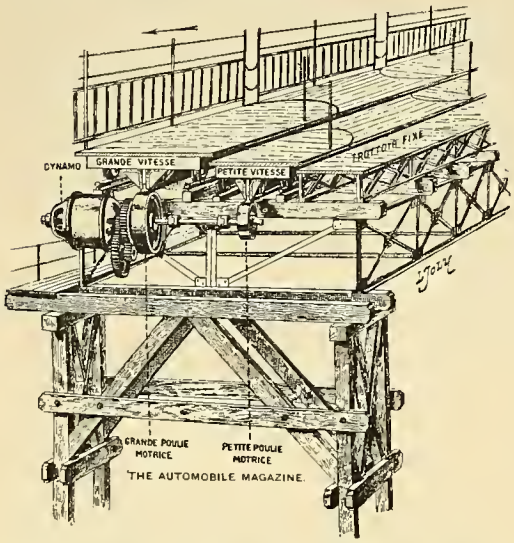
In passing over this perimeter, the electric trains always run in a direction from right to left, so that in taking a train, say at Porte Rapp, the passenger reaches the Quai d'Orsay and then the Invalides and returns via the Military School to the starting point. The platform, on the contrary, rolls in the opposite direction; and, moreover, is established for its entire length at the level of the first story of the exhibition galleries of the Champ de Mars and of the Esplanade, with the floor of which it directly communicates, while the electric railway, which sometimes runs close to the ground, rises or descends, according to circumstances, after the manner of a gravity railway, in order to cross, by viaduct or tunnel, the public roads that it meets.

Automobile Sidewalk

The rolling platform, which was devised by MM. Blot, Guyenet and de Mocomble, consists essentially of three footways, one of which is stationary, while the two others roll continuously, one at a speed of 2.63 miles an hour and the other at that of 5.27 miles. The passengers ascend to the platform on the side at which the stationary footway is situated and pass with the greatest ease from the latter to the low-speed footway, and thence to the high-speed one, where they are free to stand or to further increase their speed by walking thereon in the same direction in which it is moving.

In order to leave the platform, the same operations are performed in a contrary direction. The object of the intermediate footway is, in both cases, merely to assure the passengers' equi-

librium, which would be endangered by too abrupt a passage from a state of rest to a high speed, or inversely. Posts placed at regular intervals further facilitate the passage from one footway to the other.



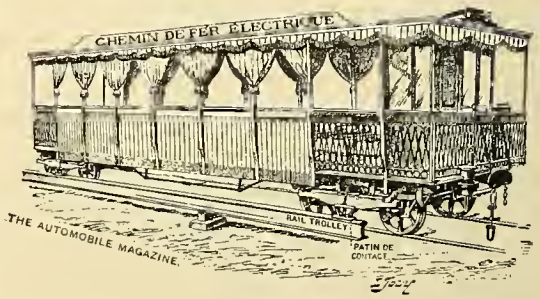
Mechanism of the Rolling Platform

The high-speed footway is 6½ feet in width, the low-speed one, on which the passengers do not tarry, is 3 feet, and the stationary part of the platform is 3½.

The movable footways consist of a succession of four-wheeled trucks connected with each other by trucks without wheels. The first run upon lateral rails, while the others serve to assure the continuity of the system. The extremities of two successive trucks are rounded in a contrary direction so as to fit into each other and follow the curves of the track.

Motion is communicated to the footpaths in the following manner: Under each truck is fixed a sort of rail or "axial beam," which is jointed at each extremity to those of the adjacent trucks. These beams slide over driving pulleys, placed here and there, which transmit the motion that they receive from the dynamo-electric machines with which they are connected. The variation in speed between the two movable footways is obtained very simply by the difference in diameter of their driving pulleys, which, as may be seen in one of our figures, are mounted upon the same axle. This diameter varies from simple to double, and the velocities vary in the same way.

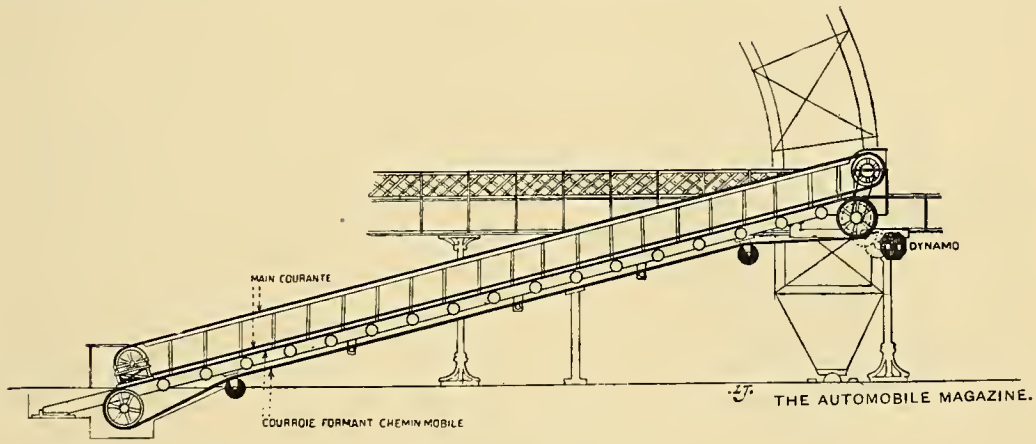
Some very ingenious arrangements for the regulation of the suspension springs of the wheels, for their easy inspection, and even for the changing of them while the apparatus is in operation, have been elaborated by M. de Mocomble. The entire system is elevated upon a metallic viaduct supported by wooden trestles in order to diminish noise and deaden vibrations.



Automobile Car of the Electric Railway

The electric energy necessary for the running of the platform, as well as that of the railway, is to be furnished by the works that the Compagnie de l'Ouest has established at Moulineaux for the service of the line between the Invalides and Versailles. The current is received in a special electric station erected on the Champ de Mars, not far from the Quai d'Orsay, where it is transformed and raised to the required voltage, in order to be afterwards distributed, through conducting cables, to the dynamos of the platform and the "trolley rail" of the railway.

The platform is reached through stairways and, at certain places, through movable ramps, while direct communication with the first story of the palaces is obtained by means of footbridges and passageways. These approaches are established at points that are called "stations," and perhaps improperly so, since, as



A Movable Ramp

the movable pathways have a continuous motion imparted to them, they do not admit of stoppages; and, moreover, passengers can get on or off the platform at any point whatever of the route. These "stations," which are formed through a simple widening of the stationary pathway and are covered with a glass roof, are eleven in number, namely: Rue Saint-Dominique, Rue de l'Université, Pont des Invalides, Palais de la Perse, Puissances Etrangères, Palais de l'Hygiène, Pont de l'Alma, Palais des Armées de Terre et de Mar, Tour Eiffel, Porte Rapp and Palais de l'Agriculture.

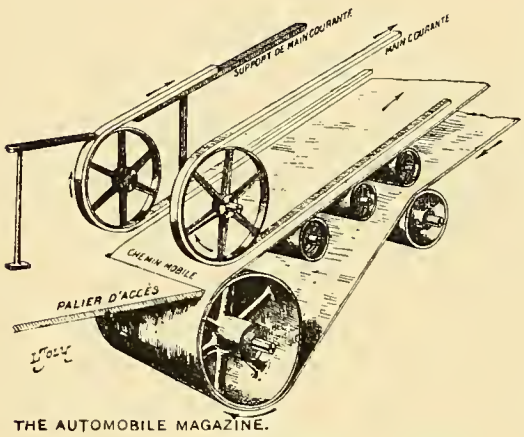
The fare will be half a franc (10 cents) for any distance less than that embraced in the round trip, which will consume twenty minutes. There is no doubt that this new method of conveyance will be widely patronized by the visitors to the Exposition.

The feature of originality of the electric railway is the application of a system of transmission of electric energy by means

of an insulated third rail placed externally to the two rails that constitute the track. This is, in a manner, a "trolley rail," which transmits the current to the cars through the intermedium of pivoted contact—slides, as shown in one of our figures. The service is effected by trains composed of three cars capable of carrying about two hundred persons, and succeeding each other at intervals of two minutes.

The first car of each train is automobile, and is provided with four 35 horse-power motors that permit it to make a round trip in twelve minutes, inclusive of stoppages.

The cars are of the open type, like those used in certain cities in summer; but the precaution has been taken to close them tightly on the side on which the conducting rail is situated, so as to prevent any accident due to the imprudence of the passengers, who are therefore obliged to get in and out on the opposite side. The railway is provided with five stations, namely: Palais de l'Electricité, Tour Eiffel, Guerre et Marine, Puissances Etrangères and Invalides. The fare is a quarter of a franc (5 cents) for anything less than a round trip.



THE AUTOMOBILE MAGAZINE.
Entrance of the Movable Ramp

In order to complete what concerns the methods of conveyance in the interior of the Exposition, we must have a few words to say about the movable ramps—devices already used in several large stores in Paris, and that will permit the visitors to avoid the fatigue of climbing stairs in order to reach the various stories of the palaces.

These ramps are of various models. The one that we represent herewith is of the Piat system. There are ten of this type at the Champ de Mars and seven at the Invalides. They present a great analogy with those employed in the Magasins du Louvre.

What further renders such arrangements very interesting in places where there is a large crowd is the fact that their capacity is much greater than that of elevators or even of ordinary stairways. With a ramp of this type, the ascensional speed is from 20 to 22 inches per second. In other words, it takes from 30 to 35 seconds to ascend to a height of about twenty feet. As the ramp is capable of accommodating from 30 to 35 persons at once, its total carrying capacity is from 3,000 to 4,000 passengers.

an hour. An elevator of ordinary dimensions is capable of carrying but from 300 to 400 persons in the same space of time.

As for mechanism, the movable ramp consists simply of a very thick and strong endless leather belt, tightly stretched, and supported by a large number of rollers in the part designed for the passage of the public. Two other endless belts form side-guards, which likewise are movable. In other systems the leather belt is replaced by a movable platform of jointed flat rods, recalling the method of closing photographic frames.

Parisian Fashions for the Automobile

DAME FASHION, ever watchful for the interests of her votaries, has decided what is the correct toilette for the *chauffeuse*. What Parisian *modistes* offer their patronesses is shown in the accompanying illustrations.

One of our engravings represents an automobile costume made of soft, black leather, the dull sheen of which is exceedingly effective. The coat, lined throughout with silk, harmonizes excellently with the loose paletot ornamented only with a narrow border of trimming. The high, turned-down collar is covered with velvet. Although waists of any desired character can be worn with this suit, a *crême* flannel waist seems most appropriate. The cap (casquette), in its overhanging portion, is made of woven horse-hair and is finished with a narrow strip of velvet around the edge. The peak is made of patent leather. Glasses can be used to protect the sensitive eyes of the automobiliste from the dust of the road and from the biting air.

The second toilette which we illustrate consists of a rather long, smooth coat made of dark-brown material, a silk waist of like color, and a *redingote* of leather, lined with silk, the borders being fastened by large buttons to a *paletot* provided with two capes and *revers*. Feathers and a few rosettes are used to trim the hat.

There are many members of the Automobile Club of America now in Paris, and others constantly arriving, and the reception accorded those who have registered at the Automobile Club of France has been of a most cordial character. The list of the visiting American automobilists includes Mr. John H. Flagler, Mr. Jefferson Seligman, Mr. C. J. Dinsmore, Mr. Louis Stern, Mr. Alexander Winton, Mr. Roland R. Conklin, Mr. Charles S. Weston, Mr. D. E. Stone, Mr. C. J. Field and Mr. Albert C. Bost-

wick. It is to one of these gentlemen that we are indebted for the various photographs of the home of the Automobile Club of France, together with some excellent suggestions relative to the prospective establishment of a club-house for the Automobile Club of America.

Society Women as Motorists

By William Earle Baldwin

AUTOMOBILISM in society is not confined altogether to the men. A dozen or more women well known in the most exclusive circles of New York society have fallen victims to the fascinating art of driving an automobile, and before the summer is over as many more will join the ranks of motorists. All of these women do not operate their motor carriages in town, but several of them have become so skillful that they do not hesitate to go out on Fifth avenue or any other crowded thoroughfare, and take their chances with the best of them. Most of the women motorists, however, have confined their adventures to the country, and have had all sorts of interesting experiences, particularly at Newport, where the automobile parade, and its subsequent incidents, was the hit of the season.

The automobile has also been taken up seriously by society for more formal use, and the old-fashioned victoria or brougham drawn by its high-stepping horses is being put aside, to some extent, for the automobile brougham and the handsome type of carriage known as the victoria daumont which have made their appearance on Fifth avenue of late very frequently. Indeed, one prominent family in New York has given up its private stable altogether, and, instead, has installed a complete automobile outfit, including carriages for every conceivable occasion. The result has been very satisfactory, and by next winter many others will follow the example of these pioneers in Twentieth Century development in transportation.

There is no smarter appearing horseless vehicle than this victoria, and with the two men at the rear in immaculate livery, the effect of exclusive privacy is given to great advantage. Several society women in New York use these handsome vehicles for the purpose of paying afternoon calls and attending teas and receptions, and it is needless to say that they are envied by their less fortunate friends who have to be contented to go about in the old-fashioned carriages, drawn by horses.

One of these victorias is owned by Mrs. Henry B. Hollins, who is seen out every pleasant afternoon on Fifth avenue. She appears to enjoy her trips about town very much, and the men at the rear who guide the machine are dressed in the livery of

the servants of the Hollins family. Another of these victorias is owned by Mr. Jefferson Seligman, and members of his family use it constantly. Mr. E. B. Pennington is another gentleman who has recently added a vehicle of this description to his equipment of automobiles. These victorias are finished much like an ordinary carriage of this description, and combine lightness with speed, as well as smartness and style. They are making a great hit, and before very long society people will travel about town to fulfill the various engagements incident to the society season in them, or vehicles of similar design.

One of the first young women to operate an automobile about the city streets was Miss Florence E. Woods, the daughter of Mr. Clinton E. Woods. She showed such skill in the art of using a horseless carriage, that she was granted a permit to take her machine into Central Park, and is to be seen there nearly every pleasant day. It is said that Miss Woods always had a tendency towards mechanics and similar matters, and she learned to operate an automobile in fifteen minutes. If this is so, Miss Woods certainly breaks records, as some of the men automobilists have not proven themselves so clever. Indeed, cases have been known where men have practiced day after day, and have ended by running down fences, innocent dogs in the highways, or colliding with trees, to the great disadvantage of the tree, not to mention the automobile.

It is interesting to note, in relation to Miss Woods, that she has always been afraid of horses, and has never driven one in her life; but she took to automobilism as a duck does to water. She is an attractive girl of medium height, with gray eyes and brown hair. She has operated all kinds of automobiles, from a heavy Stanhope phaeton to the lightest sort of a runabout, and can do all sorts of fancy tricks in turning, stopping, starting and all the many different things which an expert motorist should know.

A society woman of much prominence in New York, who has lately taken up automobilism, is Mrs. Rhoades, who has a magnificent house at the corner of Fifth avenue and Seventy-second street. As far as is known, Mrs. Rhoades is the first woman to undertake the management and operation of a gasoline carriage. Not long ago she became much interested in automobilism, and in spite of the many different things one has to know to properly operate a carriage of this description, she had no hesitation in securing one, and recently she has had it out on the street, and so far has not had a single accident. Mrs. Rhoades has a decided taste for mechanics, and before she secured her carriage she investigated the interior arrangements of the

vehicles, so now she can do all the little things required, such as filling up the gasoline tanks, whirling the heavy crank to start the thing going, and then taking care of the machine after it gets well under way. Mrs. Rhoades recently did a little riding around Atlantic City in her automobile, and simply astonished the dwellers in that usually quiet resort by the handy way in which she managed her automobile when out for a little spin.

Mrs. Hermann Oelrichs has taken up the victoria of a small pattern for driving about town, and also has a runabout which she occasionally operates. Since the automobile parade at Newport last summer, Mrs. Oelrichs has been taking lessons in automobilism, and will astonish some of her society friends when the right time comes.

Mrs. A. L. Riker, wife of the winner of the recent fifty-mile road-race on Long Island, is becoming an expert automobilist, and frequently is out in a pretty runabout.

Mrs. John Jacob Astor, one of the most beautiful women in society, became much interested in automobilism last summer, and Mr. Astor provided a special carriage for her own use while at Newport. She became so interested in the sport that she intended to use one in town during the past winter, but finally gave up the idea. Mrs. Astor's favorite carriage is a Stanhope phaeton.

The first woman automobilist in the society set was Miss Daisy Post, a niece of Mrs. Frederick Vanderbilt. She took up automobilism some two years ago, and her first carriage was a big Stanhope, which she learned to guide with great skill. She has done little work of this sort in town, but for the past two seasons at Newport, she was a prominent figure, and all of the visitors there soon become accustomed to seeing her driving her auto about the city at what appeared to them to be a most reckless speed. She never had any serious accidents, however, and was so much admired by the men for her dashing courage, that many other women of the Newport set found that in order to be thought sporty they must follow her example.

Then Mrs. William K. Vanderbilt, Jr., took to automobilism, and she had better success than did her liege lord, who owned an acrobatic auto, which turned handsprings while going down hill. Mrs. Hermann Oelrichs and Mrs. Charles Oelrichs at once sent for automobiles, and soon the entire Newport colony was automobile crazy.

Mrs. Stuyvesant Fish, who now is looked upon as the leader of the most exclusive set in society, barring Mrs. William Astor, is an expert automobilist. To see Mrs. Fish sitting back in her

victoria, being whirled down the avenue, after two horses the equal of any of the finest horses in town, one would not think that she cared anything for automobiles. She does not even turn her head to glance languidly at the various public autocarriages, even if the drivers nearly collide with her handsome trap. But as soon as she gets to the country all of this is changed, and the first thing she orders after breakfast on the first day of her visit is her automobile. Mrs. Fish learned to drive an automobile last summer at Newport, to the great detriment of the lawns about her fine place there. She didn't mind stone walls, big trees and shrubbery, and finally ran the machine up the wide stone steps of her villa. This experience did not curb her desire to drive an auto, and now there are none more expert than she. At Newport this summer, where Mrs. Fish will entertain largely, she will have a supply of automobiles on hand for the use of her guests, among whom, by the way, are to be Mr. and Mrs. George J. Gould. Another visitor at the Fishes will be Miss Greta Pomeroy, a mighty huntress, who has shot bears and buffalo, and who is now mastering the difficulties of running an automobile. She witnessed Mrs. Fish's trying experience, and not warned by the awful example, resolutely set to work to become an automobilist herself. It is understood that one of the features of the Newport season will be automobile races between these two fashionable women.

Mrs. Harry Payne Whitney, formerly Miss Gertrude Vanderbilt, is another young woman who is enthusiastic about automobilism, and as a motorist she hopes to make an excellent record during the coming summer. She rode about Newport a great deal last season in the comfortable victoria which was so popular there, and seemed quite contented; but now so many women are taking up automobilism, she has determined to get in the swim. While at her husband's place on Long Island recently, Mrs. Whitney did some practicing, and she will enter the ranks of the women motorists well equipped with the necessary experience to show them a thing or two. Mrs. John R. Drexel is another society woman who is fond of the electric victoria, and she has decided to stick to it, and not try to operate a machine herself.

Mrs. Oliver H. P. Belmont was one of the leaders in automobile matters last season at Newport, and took a prominent part in the parade, having one of the most strikingly decorated vehicles in the line. Her plans for the coming summer indicate that she will be out more than ever, and if there is an obstacle race she will stand an excellent chance for the first prize, as she

is getting to be something of an expert. Mrs. Belmont is one of the handsomest women in the Newport set, and has lost none of the beauty which made her prominent for many years in New York society.

Mrs. Adolf Ladenburg, whose tastes have usually run to horseback riding, and following the hounds at the meets of the Meadow Brook Club, has fallen a victim to the fascinations of automobilism abroad, and her friends here expect that when she returns she will bring two or three horseless carriages with her. It is only recently that she has taken up automobilism, and if she goes in for the sport as thoroughly as she has for horseback riding, it will take a very clever person to beat her in an obstacle race or anything else.

In addition to the fact that automobilism is good sport, the society women appear to like it, as it permits them to wear very novel and handsome gowns, most of which they secure in Paris. There are styles in automobile costumes just as there are in everything else, and if a woman can add another style of gown to her wardrobe that is different from everything else she is perfectly happy. One great feature of the automobile parade last season was the handsome gowns worn by the women. Those who drove their own machines were attired in the conventional automobile dresses, while others who went as guests of the various society men who took part wore pretty gowns such as might be seen on the occasion of the New York Coaching Parade.

Newport will be the great headquarters of the women motorists this season, and the arrangements for the parade will soon be made. It promises to be the great out-of-door event of the summer, and there will be a big array of the vehicles in line. None of the Lenox set have taken up automobilism to any great extent, with the exception of several men, but if Mrs. Harry Payne Whitney visits the Berkshires this summer, it is her intention to try the hilly roads in that section, in company with her husband. Up the Hudson a number of women will be out, including Mrs. Rhoades, who has a fine country place in the vicinity of Tarrytown.

The tendency of the present age is to allow women much more latitude in the selection of their recreations and amusements than formerly. They have come to the front in out-of-door sports very rapidly during the past few years. In golf, some of them have had great success. In automobilism it is predicted that their keen eyes, quick and ready hands, and steady nerves will all contribute to making them successful as motorists.

Doings of the Automobile Club of America

THE active season of the Automobile Club of America has just set in, and though many of its most energetic members have departed for Europe in anticipation of the automobile races in Paris, the summer season will be replete with attractive incident.

M. Léonce Blanchet, of the Automobile Club of France

Among the most important of these undoubtedly will be the run to Philadelphia, June 2, for which the members of the Com-

mittee on Runs and Tours are making great preparation. This will be the first long-distance run held by the Club, its purpose being to test the endurance of the machines participating rather than an exhibition of speed.

Another notable event of the coming season will be the forthcoming series of automobile trials and tests which are to take place this month. Following is a letter, addressed to the Club's members, embodying the purpose of the idea:

Acting under the direction of the Board of Governors, the Technical Committee is preparing the details for a series of trials and competitive tests, which are intended to develop the strong features in turning, stopping, avoidance of obstacles, hill climbing, and other various maneuvres, which will develop the strong points of each one of the different types of automobiles, and also comparative ones in competition with horse-drawn vehicles, the idea being to make this an interesting and instructive series of tests for the benefit of the club members and the public at large, and also to develop the question of safe speeds for the different types of automobiles.

The Chairman of the Technical Committee asks as a special favor that all the members of the club give their thought to this matter, and any ideas which they have on the matter to kindly forward to him about the middle of June.

This is about the time Mr. Field will return from his trip abroad, and the committee proposes to take the matter up at that time to formulate rules and regulations in the matter, and issue them for the information of the club members during the month of July.

It is proposed to hold these tests at some place in New York City during the early fall.

Your hearty co-operation in the matter in making suggestions and also arranging to take part in them will materially aid in making these trials what we believe they should be, one of the most successful and important features of our work this year.

Respectfully yours,

C. J. Field,

Chairman, Technical Committee.

For the month of May, the Committee on Runs and Tours announced three events. The first, a run to Babylon, L. I., and return, which was to have taken place May 5, was postponed.

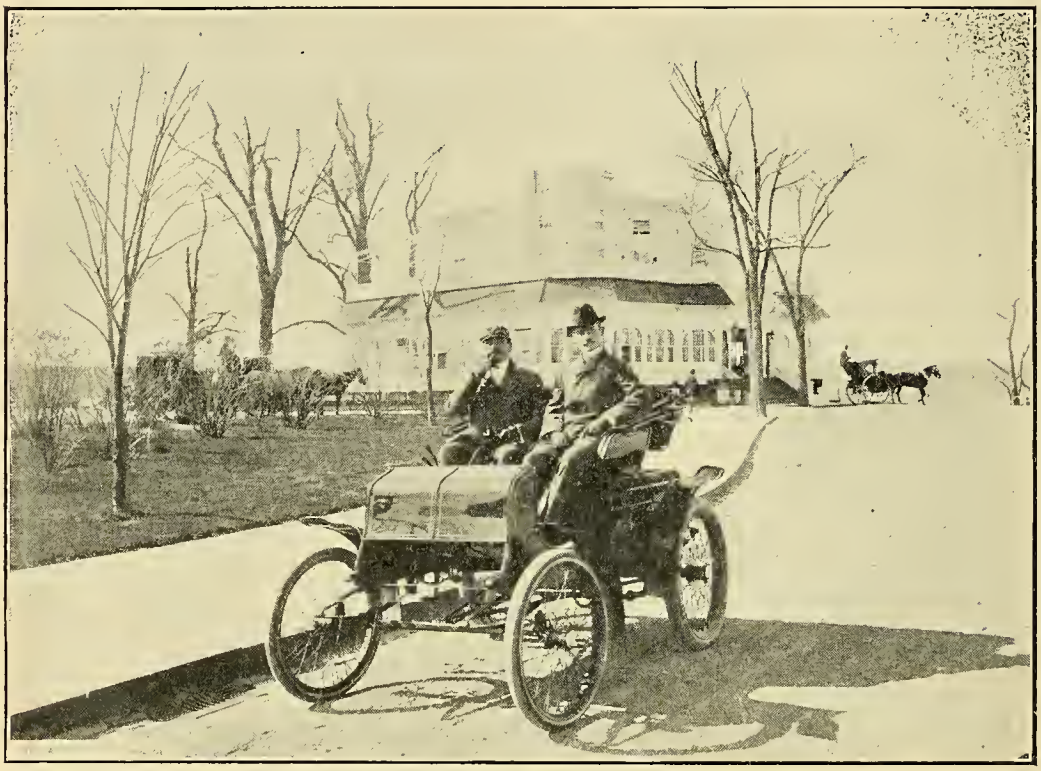
The second was a run to Morris Park on May 12.

The third, a run to Nyack and return, May 19.

It was at first decided to make West Point the destination of the run of May 19, but after consideration the Committee on

Runs and Tours decided the run would be too long and changed the destination to Nyack.

Due to the courtesy of Mr. D. H. Morris, the Automobile Club of America received an invitation from the Turf and Field Club to attend the races at Morris Park, May 12. The invitation was accepted and the start was made about noon from the Waldorf-Astoria. The run was under the conduct of Mr. Whitney Lyon. At the head of the line was Mr. D. H. Morris. Electric brakes, electric and steam runabouts, gasoline victorias, electric and gasoline phaetons, hunting traps and steam carriages were



J. Dunbar Wright in his Gasoline Carriage

the vehicles seen in the line. Captain Homer W. Hedge made the run in Mr. S. T. Davis's steam carriage, which machine, it will be remembered, finished second in the recent automobile race between Springfield and Babylon. None of the members of the club who took part in the run tried to see how quickly he could cover the distance from the Waldorf-Astoria to the track. All were purely on pleasure bent, and they made the journey to and from the course at moderate speed. They reached the track in about an hour, and the run homeward was made in the same time. While at the track the members of the club enjoyed the privileges of the club-house and had luncheon there.

Among the members who made the run were Mr. George F. Chamberlin, Vice-President of the organization, and at present Acting-President; Mr. George Ackerman, Mr. Whitney Lyon, Mr. Winslow E. Busby, Mr. Gibbs, Mr. J. C. McCoy, Mr. Bronson, Dr. E. C. Chamberlin, Mr. George H. Macy, Mr. E. E. Schwarzkopf, General George Moore Smith, Mr. F. A. La Roche, Mr. J. H. Wells, Mr. C. E. Corrigan, Mr. C. Hall, Mr. W. H. Hall, Mr. James J. Mandery and Captain Homer W. Hedge, Miss A. R. Shattuck was the only woman who took part in the run.

All the automobiles had power enough to make the journey homeward. Mr. W. H. Johnson, a member of the organization, was unable to start on the trip to the track at the time scheduled. He, with several guests, rode to the course later in the afternoon in an electric carriage. They made the run from the course to the Waldorf-Astoria with the other members.

The distance from the Waldorf-Astoria to Morris Park is about twelve miles. The route of the run from the hotel was as follows: Up Fifth avenue to One Hundred and Eleventh street, along Seventh avenue to Macomb's Dam Bridge, to Jerome avenue, thence to the course.

The cordiality shown in the tendering and acceptance of this invitation will assist materially in making clear the mistaken impression obtaining in some quarters as to the attitude assumed by automobilists toward horsemen.

In the absence of Mr. A. C. Bostwick, Mr. George Isham Scott was elected Chairman *pro tem.* for the Committee on Runs and Tours, on account of the recent bereavement to Mr. David Wolfe Bishop in the loss of his father.

In addition to the trial and test event the programme of the Committee on Runs and Tours includes a run, on June 16, to Bernardsville, and another, on June 30, to Asbury Park. This Committee has under its consideration at the present time a set of racing rules drafted by Mr. D. Wolfe Bishop.

Prior to his departure for Paris an informal planked shad luncheon was given by the club to M. Léonce Blanchet, at the Claremont, Riverside Drive, April 25. The club made this the occasion for the presentation to M. Blanchet of a handsome loving cup. M. Blanchet, it will be remembered, is the donor of the cup won by Mr. A. L. Riker in the recent 50 mile race on Long Island. The cup presented to M. Blanchet bears the inscription: "Presented by the Automobile Club of America to Mr. Léonce Blanchet in recognition of his interest in the sport in America."

Before the club, in the evening of April 28, Prof. R. H.

Planked shad luncheon at Claremont, given to M. Léonce Blanchet by the Automobile Club of America.

Thurston, Director of the Sibley College, Cornell University, delivered a lecture on "The Trend of Progress in Automobile Construction." In his lecture Prof. Thurston presented the conditions that impede and those which favor the permanent and successful establishment of the automobile in the commercial field. The first installment of Prof. Thurston's lecture will be found elsewhere in this issue.

Following is the list of gentlemen elected to membership during the month of May:

Active Members—Frank C. Armstrong, H. M. Atkinson, E. T. Birdsall, G. B. Berckmans, George W. Bacon, Hon. Stewart M. Brice, Fred. B. Cochran, Malcolm W. Ford, Josiah M. Fiske, Charles J. Glidden, William H. Hall, Walther Luttgen, Erwin Lavens, Hiram Percy Maxim, Charles A. Metz, E. L. Powers, Edward E. Pettee, Isaac L. Rice, Isaac Robinson, T. H. Russell, W. K. Ryan, Kenneth A. Skinner, W. E. Scarritt, R. A. C. Smith, Thos. B. Stearns, O. F. Thomas, Arthur Turnbull, Herbert A. Wagner.

Associate Members—William D. Gash, Demming Jarvis, Ernest J. Knabe, Ubert K. Pettingill, F. E. Stanley, F. O. Stanley.

The club is ever growing, and at the present writing there are 232 members, 140 of which own automobiles.

At one of the recent meetings of the Board of Governors it was decided to make the presidents or acting chairmen of the automobile clubs of Great Britain, France, Belgium, Germany, Austria and Italy honorary members of the club.

A club book is now in preparation and will soon be in the hands of members.

Mr. Whitney Lyon will follow the other members of the club now in Paris early in June. A report comes from that city of the purchase by Mr. A. C. Bostwick of M. René de Knyff's famous Panhard which established the world's record at Pau and won the recent Nice-Marseilles race. The sum paid for the machine is said to be $12,000.

THE FORTHCOMING AUTOMOBILE EXPOSITION

An automobile exposition will be held under the auspices of the Automobile Club of America at Madison Square Garden from November 3 to November 10, 1900. The committee appointed by Acting-President Chamberlin of the Automobile Club of America is as follows: A. R. Shattuck, Chairman, General George Moore Smith and E. E. Schwarzkopf. All inquiries relative to the exposition should be addressed to Frank W. Sanger, Manager, Madison Square Garden Co., New York City.

New York to Washington and Back in an Automobile

By George Isham Scott

IN a few years a "horseless" trip from New York City to Washington, D. C., will doubtless be looked upon by the average automobilist as a very short jaunt, but to-day, when auto-touring is still in its infancy, and the long wished-for system of road-building is still unborn, the two hundred and fifteen odd miles separating the cities demand the services of an exceptionally good machine, were the tourist to make the journey with any degree of comfort.

To the recollection of the writer the trip between these points in self-propelled vehicles on the highways has been accomplished only twice; once in the summer of 1899, when a motor-cyclist rode and pushed his machine from Boston to Washington, and in April of this year, when a locomobile went through from New York, carrying the writer.

With two riders the little steam carriage started from New York in the A. M. of April 4. With goggles fixed, caps drawn over eyes and water-proof ulsters up over ears, the street urchins led us a merry dance to the Twenty-third Street Ferry. While crossing the river a crowd of curious passengers gathered about the machine, some offering information concerning its "make-up," mechanism and construction, others giving it their silent inspection—all interested.

Leaving the ferry-boat we rolled through the streets of Jersey City, holding our first consultation with L. A. W. directions. A turn to the left on a long line of asphalt led us to the Boulevard and to the Plank Road, on which we rode to Newark. Leaving Newark behind we went over a fine stretch of macadam to Elizabeth and to Rahway. From there, passing through Metuchen, New Brunswick was reached, where an L. A. W. road-house offered hospitality. At this point of the journey the road changes for the worse, and for 14 miles ugly ruts and "Thank-you-marms" are the attractions, as well as an occasional irate farmer.

At Princeton the tanks were refilled and the 10 miles to Trenton were swallowed in 25 minutes. Then began a series of troubles; roads deep in sand, toll-gates and horses, whose owners

cannot be persuaded that the road to Philadelphia is not a more pleasant one than that to Trenton. An amiable livery man was finally found in Philadelphia, when that city was reached, and our "steamer" went to bed for the night.

Shouldering our baggage we made a combined assault on a hotel dining-room. After two days in Philadelphia a single *chauffeur* sallied forth on the Lancaster Pike. Twenty miles of this "going" was bliss; trains were left, and slow toll-gate keepers were admonished to hasten, but after that, although the toll-gates continued to appear, the road became worse and worse

and worse, and when the Pike was left behind the real experience of rough riding began.

Notwithstanding the ruts and hills encountered in this span of the journey, the ride lacked not of pleasing features. Arriving at the Susquehanna the information was vouchsafed that as the ferry-boat had met with disaster it were necessary to have recourse to the train at Perryville. After a run of 5 miles along the bank of the river up and over a multitude of machine-testing hills, a flat-car brought the second day's journey to an end in Havre de Grace. After a good night's rest and a merry send-off in the morning, with a citizen for companion, the last day of the

run south begun. As the carriage ran along, black legs scampered through farm-house doors and black heads appeared at windows, with voices raised in the never-failing exclamation, "Look at the carriage without a horse!" One objection made by a young woman of color was this, "Oh, go way, 'f I had one o' dem things I couldn't do no work; I'd jus' be flyin roun all atime." Then at any stop for oil or water, the regular series of remarks and questions, "How much is it worth; how fast can it go; look out, it's going to blow up; you don't need no horse for that thing," etc.

Two days in Washington, and under the escort of a small squad the start was made for New York. At Baltimore a combination of wet car tracks, gutter and carelessness were responsible for the loss of eight spokes. They were quickly replaced, however, and after two days' experience with mud, which frequently came up to the hub, Philadelphia was reached, via Wilmington. Leaving Philadelphia in the morning of April 14, and after both "steamer" and operator had become equally and unutterably lost in a cemetery, the old road was regained, and finally the ferry at Perth Amboy. From Tottenville the Staten Island Rapid Transit Railroad train was left one minute and a quarter in the rear over a distance of 12 miles, not a discreditable performance for a carriage having traveled over 600 miles on unspeakable roads. The 18 miles of road from Tottenville to St. George is the finest about New York, and resultant therefrom the ferry-boat made possible an arrival in New York in season for dinner.

AUTOMOBILES ON THE TOW-PATH

A new automobile, which is to displace mules as motive power on the tow paths, was tested recently on the banks of the Delaware and Raritan Canal, in the presence of several officials of the canal company. The automobile towed a hundred-ton boat at a rate of three miles an hour for a stretch of several miles.

Although the automobile weighed several tons, it towed the one hundred tons with ease. When it came to a standstill the strain behind gave it a pull backward in some way, and before the motorman could stop it it had backed down several feet in the water.

The officers of the canal company are satisfied with the test, and will place one of the automobiles at work at once. It is believed that they are each competent to haul six boats, at the rate of five miles an hour.

Trend of Progress of the Automobile

By R. H. Thurston

First Paper

THE automobile should be a self-moving carriage which, to be safe, reliable, comfortable, well-adapted to the special purpose proposed in its use, handy, as speedy as may be found desirable, light in proportion to power, compact, simple, elegant, manageable and inexpensive, both in first cost and in operation.

The problem of the designing engineer in this case is that of producing a design and plan which, when executed by the builder, shall fully meet the requirements of the proposing purchaser. He must ascertain what are the best materials for the several parts of the structure, must combine them in a carriage graceful, light, strong and comfortable, in machinery of maximum power with minimum weight and volume, combine carriage, machinery and running gear in such manner as to insure ample factors of safety in every part, while keeping down costs to those at which the market will take the automobile with a rapid and constant expansion of demand. The duty of the builder is to select the best material, standardize the dimensions and proportions of the several elements of the automobile, put together the carriage, the machinery and the running gear and erect the whole construction in a permanent and durable form and to make his manufacture so systematic and scientific that, making a standard automobile in sufficiently large lots, he can put it on the market at a reasonable price with a reasonable margin of profit to all interested—including the buyer.

The problem in design is much the same as that faced by the naval constructor and naval engineer when called upon to build an ironclad, or, perhaps, more accurately, a torpedo-boat, and that of the aëronaut, who, more than the engineer in any other branch of mechanical construction, is compelled to seek combined lightness and power as far as science and art combined can co-operate in solution of this most attractive and important of problems in engineering.

The carriage may be made of any form that may be found

desirable and satisfying to the aesthetic instincts of the user. The removal of the animal from before it leaves the designer comparatively free to express his most artistic and most utilitarian ideas and to combine these often opposing demands in whatever manner his genius and inventive power may devise as the best combination or the best compromise possible. Great changes in form and decoration of the carriage will doubtless be found among the other modifications which will come of this entire freedom in design and construction of the carriage as a structure which can now be fitted to meet the requirements of the user as to comfort and elegance without being in any way hampered by compulsory adaptation to the peculiarities of the animal organization and temperament.

The running gear must be light, strong and capable of transmission of the impelling force; but otherwise of such design and proportions as shall best suit the user and subserve his primary purpose.

The motor must be just as light as is possible within the limits of entire safety. As the motor is a part of the non-paying load, as viewed from the economist's standpoint, its weight, however small, is a tax upon the automobilist, and the space occupied, however small and out of the way, is a waste also, either as loss of availability for stowage purposes or as detracting from the elegance of the automobile.

The selection of the type of motor for the purpose held in view by the designer is his first task, and experience has already shown that at least three motors are more or less adaptable to this work—steam, already used for a hundred years more or less successfully, the internal-combustion or gas-engine, also proposed for the purpose in the early part of the nineteenth century and lately employed quite extensively, and the electric current supplied by a "storage battery" or "accumulator" carried by the vehicle. The first is the oldest and best known, both as to its availability and its economies; the second has rivalled and in some directions outfooted steam in these later years; the third is used very extensively and is the ideal motor in its operation, but far from ideal in its endurance and its cost. Steam is troublesome and involves some risks, and is costly to maintain; the gasoline-engine and its relatives are subject to some objections in manipulation and in the character of the motor-fluid; electricity brings with it what at present are insuperable objections for general work and especially for long route operation, in its weight, bulk and great cost and limited quantity of energy-storage.

"The Trend of Progress" at present with this new apparatus

of transportation thus seems to be along a bifurcated, in fact a trifurcated, path. It is at the moment apparently true that no less than three distinct types of motor and as many types of automobile are finding use, and in considerable numbers, each in its own peculiar and specially suitable line of development: the steam-carriage, the electric vehicle and the internal combustion engine with its appropriate running parts. Whether these several lines of progress shall hereafter fall into one can perhaps be better guessed after some of the facts of the case are developed before the reader; but just now one can only guess the future. There is no definite knowledge to be obtained permitting a positive assertion. The probabilities may, perhaps, however, be stated after making a review of the practice of the day in its essential elements as bearing upon this question.

In reviewing the history of the possibly available motors for the automobile, one is struck by the curious fact that the most recent and the very lightest of all the existing types of modern heat-motors, employing steam as the working fluid, the steam-turbine, was actually known by the old Greeks and was described by Hero, two thousand years ago or more, and was even, possibly, old when Archimedes was seeking a lever-fulcrum from which to move the world. After all these centuries, the steam-engine has indeed caused the world to move and has given it an impetus in the single century just closing greater than had been acquired in the intervening centuries since Archimedes and Hero and their fellows of the Alexandrian era. How unfortunate that the old philosopher and engineer could not have found his fulcrum then and started this movement two milleniums earlier! It was not until 1680 that Sir Isaac Newton, proposing the construction of an automobile to be moved by steam, suggested the utilization of a form of aeolipile involving Hero's principle, that of reaction, as utilized in the Greek rotary steam-engine.*

Sir Isaac Newton was probably the first automobilist inventor, but, like many later inventors, unfortunately, he did not succeed with his scheme. The Cugnot carriage, of 1770, however, was a real and a working machine, and the artiquarian engineer or automobilist who chooses to study its construction at the *Conservatoire des Arts et Métiers*, in Paris, where it is still preserved in good order, will admit that, for its time, it was a remarkable bit of engineering.

One of the first inventors of the gas-engine, Brown, in 1827, proposed its use for steam-carriages, and the steam-carriage itself was the precursor of the railway. Watt's steam-engine of 1784,

* Manual of the Steam Engine, New York, J. Wiley & Sons; History of the Growth of the Steam-engine, New York, London, Paris and Leipzig.—R. H. T

his superintendent and manager, Murdoch's, model locomotive and automobile, and the full-sized and really successful steam-automobile constructions of Trevithick, at the commencement of the nineteenth century, were steps toward the modern automobile of no small importance and practicable automobiles thus antedated the railway.

The history of the automobile has illustrated well the tendency of the uninformed and the prejudiced populace to obstruct every economic movement essential to the most direct and effective social progress and to their own most rapid advancement. It was no sooner made a success by the inventors, mechanics and engineers of the early half of the nineteenth century than direct physical opposition and the restraints of legislation, urged in the interests of rival and less satisfactory methods of locomotion, brought the movement to a full stop, precisely as the same spirit had, in earlier days, destroyed Papin's steamboat and the "newly-invented" looms and the spinning frames of ruder times. It is only now that we find the legal pronouncement, through a New York court, that the ancient and inefficient must yield to the modern and efficient methods and mechanisms. Says this modern Solomon, recognizing the spirit of the age, "If one should find it desirable to go back to primitive methods and trek along a city street with a four-ox team and a wagon of the 'schooner' variety, it would possibly cause some uneasiness among the horses unused to such sights. Yet it could not be actionable, in my opinion, if a runaway should result, provided due care were shown not unnecessarily to interfere with the use of the highway. Horses may take fright at conveyances that have become obsolete as well as those which are novel; but this is one of the dangers incidental to the driving of horses and the fact cannot be interposed as a barrier to retrogression or progression in the method of locomotion. Bicycles used to frighten horses, but no right of action accrued. * * * The temporary inconveniences and dangers incident to the introduction of these modern and practical modes of travel upon the highway must be subordinate to the larger and permanent benefits to the public resulting from the adoption of the improvements which science and inventive skill have perfected."

(*Second paper in next issue.*)

An Automobile Trip in Algeria

By Ernest Archdeacon

M. Ernest Archdeacon, the well-known Parisian *Chauffeur*, who recently spent several months in Algeria, has sent us a very interesting account of his trip in an automobile to the country of the cactus. We publish it in part, as we are convinced that it will interest all our readers.—*La Vie Au Grand Air.*

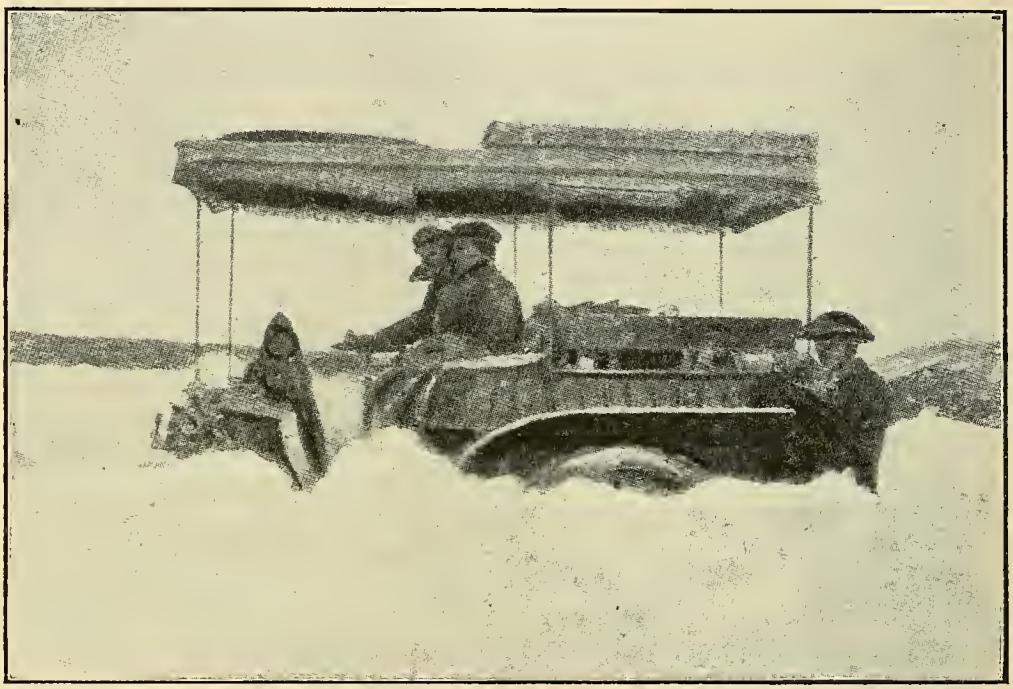
SCARCELY was I installed at Biskra than I could do no otherwise than send post-haste for my inseparable, beloved and faithful companion—my automobile. There was a special reason, too, that prompted me to this decision, and that was that I had learned at Biskra that no automobile had as yet

Mr. Archdeacon Initiating the Notabilities of Biskra in Automobilism

dared to brave the horrible roads of this region, nor had pressed the sand of the queen of the oasis beneath its wheels. To crown all, I had learned that M. de Talleyrand Perigord himself, one of the kings of the automobile, had not dared to brave them, and had come to Biskra a few days previously in a mail-coach drawn

by eight Algerian mules. I immediately resolved to demonstrate by myself that, with boldness and a good carriage, it was materially possible to do what my eminent colleague had not done, and I wished to offer myself the innocent satisfaction of being the first to impress the soil of Biskra, which, up to then, had known the wheel of no automobile. No sooner said than done. I telegraphed to have the forwarding attended to, and a few days afterward my carriage was in the oasis.

In the vicinity of Biskra itself, I made but very few excursions, since the wretched state of the roads, or rather the absolute absence of roads, rendered the thing impossible. So I remained



Stalled in the Snow

there but a short time, and decided to go to Algiers by road. Nevertheless, I hesitated about leaving Biskra, since I knew full well that I should almost immediately meet with snow upon the high plains.

I speedily sent my carriage to Constantine by train, and left this city for Setif on January 24, first reaching Saint Amand at a distance of 15 miles therefrom. Starting from this place the snow reached a depth of over three feet in the cuttings. These last 15 miles were made of many hills, and it took us three hours to mount them. I remained ten times absolutely stalled in the snow, convinced every time that this stoppage would be the last and that it would be necessary to leave the carriage there.

Nevertheless, thanks to the combined energy of my road companion and engineer, the latter of whom dug passages in the snow with my carriage tools, I arrived at Setif at half-past five in the afternoon, without any other notable mishap than the breakage of the dash-board.

On the next day (January 25), we went to reconnoitre the road, and immediately found that it was radically impossible, almost at the very start from Setif, to avoid running against walls of frozen snow that reached a height of six feet in the cuttings. I never saw anything like it in my life, in France.

Numerous gangs of laborers were distributed along the road in order to clear the way, and according to the state of the work

Work of Clearing Away the Snow

it seemed certain that there was enough of it yet to be done to last for twenty-four hours. In fact, on the next day, we started at ten o'clock in the morning, but at 8¼ miles from Setif found ourselves again stalled before the eternal wall of snow. Finally, at noon, the cutting was sufficiently open, and we were the first to pass through it.

My engine, although very powerful, quite often operated without being of any aid to me, since, owing to the hardened snow that accumulated under the wheels, the motor caused the latter to revolve with great velocity upon the ice without compelling the carriage to move forward an inch. This fact prevented my companions from attempting to push against the wheels for fear of having their hands cut.

A Difficult Passage Through Six Feet of Snow in Open Algeria

Finally, after accidents without number, such as the cutting of electric wires and the breakage of accumulators by the fearful shocks produced by the ruts in the roadway, we arrived all the same at Mansourah (72 miles from Setif) at half-past seven in the evening, by means of a road very ordinary in appearance, but astonishing in reality, seeing the incredible difficulties that had been encountered and the damages that were the consequence of them.

After repairing the damages of the preceding day, we left Mansourah at nine o'clock in the morning. After starting from this place, the snow disappeared completely, and the roads became repassable. In ordinary times, they must even be excellent.

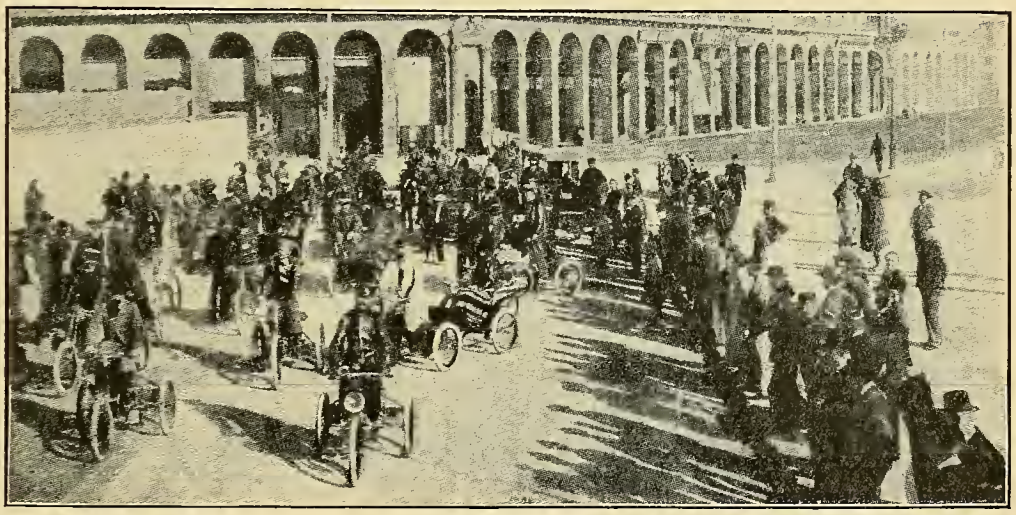
We traversed the superb gorges of Palestro and reached the environs of Minerville, where we found the highway cut up. My resolution was soon formed, and I called for the assistance of fifteen men (with the promise of a *pour boire*), who were working upon the road. I got them to collect a very large number of flat and wide stones, and, by means of these, made them form two tracks just as far apart as the space between the wheels of my carriage, and just wide enough to support my large pneumatic tires, provided the steering was done in a straight direction.

Upon reaching Algiers, I immediately met with a society of winter visitors, officers and colonists, who were all very much

interested in the automobile movement. Several, even, were owners of automobile vehicles.

I had not been in Algiers eight days before I knew everybody. People literally fought to see who should get me. Perhaps my carriage had a little to do with this general sympathy; but whatever the motive was, it afforded me pleasure all the same.

I collected the addresses of all the *chauffeurs* of Algiers and sent each of them an invitation to take part in a caravan excursion to Blidah. This was the first tentative of the kind that had ever been made in Algeria. I hoped to bring together fifteen *chauffeurs* at the most; but the result was thirty vehicles of all kinds and fifty-six *chauffeurs* and *chauffeuses,* who, having started from Algiers at 10 o'clock, were at noon seated at the



Rendezvous of the Chauffeurs, Boulevard Carnot, at Algiers, Before the Start of the Caravan for Blidah

Hôtel d'Orient around a huge table that had been prepared for them.

This was a triumphal success that astonished my Algerian colleagues themselves. Since they had never conceived the idea of assembling, they did not know their own strength or number.

Paris was certainly far from surmising the great development taken by the automobile in Algeria. Everything, in fact, in my opinion, should contribute towards such collossal and rapid development. The exceptional clemency of the climate, the beauty of the country, and, finally, the cheapness of living ought to have the effect of attracting thither all winter tourists who are lovers of the beauties of nature.

From a utilitarian point of view the development of the automobile in this country ought to be greater still. In fact, in addi-

tion to the relative rarity of railways here, the transportation charges in Algeria are absolutely prohibitive; and so much so that the principal tradesmen of Algiers apprized me of the extraordinary fact that they effected a saving of 50 per cent. over railway charges in having their merchandise carried by camels!

The mail-coach tariff on the Algerian railways is double that of the railways of France. Fine country! Intelligent rulers!

In order to finish this note in a cheerful tone, I am going to tell, in a few words, how my carriage served for the exhibition of some female masqueraders. The following is the story: A merry band of eighteen charming Algerian girls had decided to celebrate Mardi-gras in an original manner. I may perhaps be indiscreet in saying that I really believe that some of them were star danseuses or chanteuses of the Theatre of Algiers.

The entire eighteen of them had dressed themselves in the same manner, and to this effect had adopted a superb yellow and green gown with a handsome cat of black velvet in the centre. After which, thus costumed and closely masked, it occurred to them to stroll through the city in a band and everywhere perplex the Algerian notables by calling them by name, whether they knew them but slightly or intimately.

After this they conceived a second brilliant idea, and that was to send a charming "delegation" to me in order to unfold a project and to suggest to me that, as a vehicle, my automobile would answer the purpose admirably. They offered me, in addition, a costume like their own, in order that I might be in uniform and not mar the effect of the *tout ensemble!*

No sooner proposed than accepted, with the reservation that the springs of my carriage might perhaps not be strong enough to support eighteen persons. I managed, however, to take as many as nine of them and divided the remainder among the automobiles of my friends. We defiled thus through the heart of the city for two hours, to the astonishment of everybody.

But the triumphant idea of the end was to go to finish the day at the races, for which all of the ladies had tickets.

Here my eighteen impetuous damsels intruded upon the operation of weighing, and tapped the abdomen of the most dignified officials, whom they addressed by their familiar name. After this the entire band departed in a body, and like a gust of wind, just as it had come.

It will be seen that Algeria is not only a fine and *fin-de-siecle* country, but also that people there do not allow themselves to worry.

The Automobile as a Civilizer

WHEN M. Léonce Blanchet, of the Automobile Club of France, offered a cup to be raced for by members of the Automobile Club of America, his sole object undoubtedly was to stimulate the exciting sport which has reached astounding proportions in France. The keen spirit of a true sportsman and a natural desire to witness a test of American mechanically propelled vehicles alone were the actuating motives. M. Blanchet must have been pleased indeed at the interest manifested by men in every walk of life, the goodly turnout of automobiles and the many lessons learned in the first true race ever held in the United States.

The famous Merrick road has been a great battle-ground for sports; speed and endurance tests of every description have been held on its firm level surface; horses of magnificent pedigree and world-wide record have sped neck and neck for supremacy. Cyclists have pedalled for fame or fortune in races of one to one thousand miles, and now the noted Long Island highway has added to its unsurpassed list the first great automobile race.

What did the run from Springfield to Babylon and return show the enthusiastic *chauffeur*, the interested but undecided future automobilist, the "general public," or the lover of sport? Certainly not which method of propulsion is the best for all-round use; still unsettled is the burning question of electricity, gas, steam. So it must remain; for many points are to be considered—cost per mile, ease of securing motive-power requisites, simplicity of working parts, etc., etc.

As yet the best strain of blood in horseflesh is unsettled; speed, endurance, size, weight and docility are seldom rightly combined in any animal.

To-day, as twenty years ago, cyclists are wide apart on wheel-base, length of crank and "gear."

Every factor possible of enumeration is of trifling importance compared with the one grand item—the entrance of the automobilists of the United States into the work for American civilization.

Good roads are a necessity and but one remove from the prime necessity of every civilized nation; first comes the school-house, then the road. No other country on the globe can compare with the United States in educational facilities open to all classes, all kinds of purses; to statistics proving this we "point with pride";

further, no other civilized country has so many miserable roads; to statistics on this subject we do not point at all. In fact, few Americans do anything about the greatest of economic problems, beyond a passing malediction, a spasmodic annual remonstrance at Highway Commissioner or Road Master. Except in a few States no attempt is made to secure improved roads.

Ignorance, rather than indifference, causes the startling apathy on this subject among the voters of this great country. The politician is largely responsible; in his frantic efforts for re-election he strives to keep the tax-rate down and draws frightful pictures of ruinous cost, etc., etc. In reality, the cost of good roads would be but a small per cent. of the annual waste of material, labor and money in the annual farce played in almost every section of the United States called road-making.

The agriculturist for years fought road-improvement laws, the horse-owners were in opposition; but the cyclist coming in personal contact with poor roads, moaned and then studied the matter; the League of American Wheelmen was formed, and by statistics, by State-aid laws and by agitation gained supporters. Agricultural societies, village improvement societies and all thoughtful well-wishers of their country lent a hand. The gospel spread, at first slowly, and now a new and very powerful force, the automobilists, have appeared, not as reinforcements, but as a new army, working shoulder to shoulder with other enthusiasts in the good cause. Already their powerful aid has been shown, especially in New York State, and the fifty-mile race on the Merrick road means the start of a new crusade which perforce must carry all before it and give universally to the United States the one thing needed to place this country at the top in all branches of civilization: good roads.

Buena Fé.

A Clever Chauffeuse

THE wonderful achievements in all walks of life of the woman of to-day, has come almost to assume the proportions of the commonplace, so familiar have we become to the view of the various fields of her endeavor, and it

(Copyrighted, 1900, by T. K. Hastings.)

Miss Eva Mudge in her Locomobile

is only where versatility is added to her accomplishments that a new and startled interest is excited.

Among the many New York women whose possession of that quality has brought them into public view, few can be noted whose years can be numbered in the first score.

Miss Eva Mudge, the clever daughter of Mr. R. C. Mudge, prominent in the Locomobile Company of America, is one. Miss Mudge is only eighteen years of age, and her versatility embraces the skill of the *chauffeuse* and the art of raising $10,000 for charity. She has for some years past been engaged in entertaining select circles with song and impersonation. At six years of age she attracted public attention by her remarkable musical gifts, being engaged at that time to sing at a reception at the White House, Washington, D. C., by President and Mrs. Cleveland. Twice since that time she has appeared in entertainments at the White House, and has been constantly engaged in giving songs and recitals during the twelve years past. Miss Mudge has been specially noted for her warm interest in charity work, and two beautiful gold medals have been given her in commemoration of her services in this direction, one by her society and professional friends, and the other, set with diamonds, by the New York press. She enjoys the enviable distinction of having given more to the poor than any other girl of her age in the country. Her latest achievement is the rendition, in a Stonewall Jackson suit and hat, of the famous poem, "Barbara Frietchie," which aptly displays her accomplishments. The musical setting enables her the free use of a rich contralto voice. Miss Mudge is a lineal descendant of Zachariah Mudge, Prebendary of Exeter and Vicar of Plymouth, born 1680; and of Admiral Zachariah Mudge, of the English navy.

ELECTRIC CHARGING STATIONS ON THE ATLANTIC COAST

The New Jersey Electric Vehicle Transportation Company has arranged to install automobile stations during the summer season at the following points on the New Jersey coast: Seabright, West End (Long Branch), Allenhurst, Spring Lake and Atlantic City. At each of these stations Columbia vehicles, both electric and gasoline, of various designs will be for sale, and a specialty will be made of charging and caring for Columbia automobiles owned by private parties. The location of the various stations insures proper accommodations for vehicles and offers a large field for driving. Park wagonettes and omnibuses will be available for special service and for parties wishing to make trips through the surrounding country.

The New York Electric Vehicle Transportation Company has opened a salesroom at No. 541 Fifth avenue, New York City, where all types of Columbia automobiles are exhibited and where information regarding prices, etc., can be obtained.

A Challenge

New York, May 12, 1900.

Automobile Magazine,
No. 21 State Street, New York:

Gentlemen—The present war machines built by the Anglo-American Rapid Vehicle Company, under Mr. E. J. Pennington's patents, and known as the Pennington War Torpedo, which patents have been taken out in every country in the world where patents can be obtained, are without a doubt the fastest, lightest and strongest machines ever constructed, and to prove this statement I wish to make the following proposition to any and all comers who may wish to enter into competition against Mr. Pennington's machines, either in America, England, France, Germany, or any other country. Such test to take place in either one of the first four mentioned countries.

For oil driven or gasoline automobiles I will, at distances from 100 to 1,000 miles, give all such automobiles an allowance of 15 miles in every 100. In other words, while they do 85 miles our machines must do 100. For vehicles driven by steam, electricity, compressed air or any other power, we will give an allowance of 30 miles in every 100.

If the roads are extra heavy with sand or mud, and have extra hilly and rough surfaces, we will give an additional allowance of 5 to 10 miles in every 100, according to the condition of the roads.

This offer will hold good for acceptance for sixty days from this date. While these machines have not been built for racing purposes, but for war purposes, this matter of speed will show the ability of our vehicles for running over rough ground. I have myself ridden over plowed fields at 30 miles an hour, and have been a passenger of one among six on one of these machines when 64 miles an hour was easily obtained on a slight up grade.

All correspondence to be addressed to me at No. 20 Broad Street, New York.

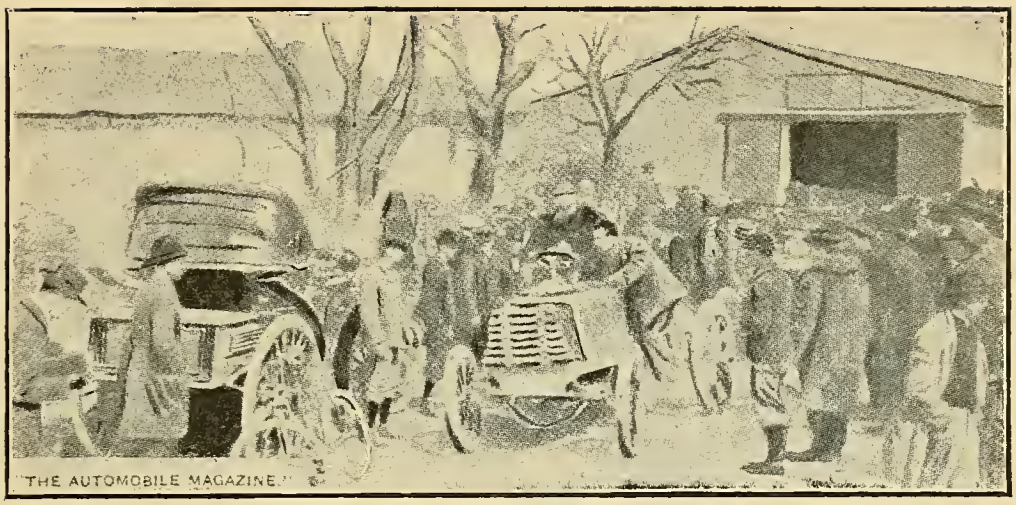
Very truly yours,

H. B. Twyford,
Manager War Machine Department,
Anglo-American Rapid Vehicle Company (Inc.).

The Automobile Abroad

(By Our Own Correspondent)

THE many always have to suffer for the misdeeds of the few. The reckless conduct of a comparatively small number of automobilists in dashing over the highways without regard to safety of life and limb, either for themselves or others, has stirred up public opinion against these abuses to so great an extent that the government has felt itself obliged to prohibit not only all such speeding on the roads, but even all road-racing, which has taken place under special permit. But the recent flagrant disregard of explicit regulations laid down in behalf of the safety of the public on such occasions that characterized certain of the participants in a recent road-race, led the authorities to take summary action. This action prohibits absolutely the various great races that had been planned as special attractions this season in honor of the Exposition. Enormous pressure will be brought to bear to secure a modification of the decree in favor of these events. Whether it will be successful remains to be seen. This was to be the first year of the great international contest for the James Gordon Bennett Cup, and the annual Paris-Bordeaux race has come to be, as M. Serpollet says, the Derby of the automobile for France. There is a belief that the feeling will soon blow over, and that the great races will be permitted, after all. But there is no telling what the outcome will be. Many of the leaders in the industry, as well as sport, stand aghast and take a gloomy view of the future, unless the decree is modified. M. Charron, for instance, says that the commercial results of the interdict will be disastrous, meaning an arrest of development for the whole industry. He says that without the incentive given by racing the great improvements made in the automobile would never have been seen. There are others, however, who think that this view of the matter is too serious. The automobile has progressed so far as to be beyond danger of harm from such a decree. On the contrary, they say, while the interest aroused by racing has led to certain improvements, the great advance has been not in the achievement of qualities of speed, but in those matters that make the automobile an all-round practical vehicle. The future of the automobile lies with its popularity with the great public, and for this end it must be a vehicle of common utility, safe and convenient, and adapt-



Finish of René de Knyff at Marseilles

120 miles in 3h 25m 30s

able to all the manifold uses for which the horse is now employed. It must be something more than a new toy, a racing-machine, which will be cast aside in fashionable regard with the arrival of some new fad. Therefore there are even those who maintain that the true interests of the automobile will benefit by the interdiction of its use in a manner that makes it a danger to all users of the public highways.

It is estimated that in June of this year there will be at least 12,000 automobile vehicles of various descriptions in use in France, against 5,000 a year ago. This prodigious increase has called the attention of the government to the importance of further regulation of the new form of locomotion. The Minister of Public Works has therefore constituted a commission to study the subject with special reference to the imposition of new restrictions as to sound-signals, police measures relative to traversing collections of people on the road, and distinctive marks on vehicles. The commission is composed of eleven members. MM. Jozon, Councillor of State, Director of Routes, Navigation and Mines, as President; Forestier, Inspector General of Bridges and Highways; Mourier, Master of Requetes in the Council of State; Michel Levy, Chief-Engineer of Mines; Collomp, Chief of the Bureau of Urban, Neighborhood and Rural Transit; de Zuylen, President of the Automobile Club of France; Ballif, President of the Touring Club; Commandant Krebs, Constructor; Pierre Giffard, Publicist; Rudolphe Darzens, Publicist; and Walckenaer, Chief Engineer of Mines, Secretary. Eight of the commissioners are practical *chauffeurs* and members of the Automobile Club. Pierre Giffard, one of the members, is editor of *Le Velo,*

and in an article in that paper he advocates doing away with sound-signals entirely. He says that the noise of the motor is sufficient. As to distinctive marks, he favors a special name upon every vehicle beside the number of the same.

Here in France the automobile industry now gives employment to no less than 180,000 persons.

An automobile club has been organized in Avignon with Joseph Pernod as President.

During the Exposition the Berlin Gesellschaft für Verkehrsunternehmen (Company for Traffic Enterprise) is running here in Paris 12 electric vehicles with 12 seats each especially to take German tourists to and from places of interest in and around Paris.

The first automobile recently arrived at Biskra, greatly to the astonishment of the Arabs of the desert. The honor of this achievement belongs to M. Ernest Archdeacon, who left Batna at eleven o'clock in the forenoon in a heavy snowstorm with over a foot of snow on the ground, reached El-Kantara at one o'clock and left at two o'clock, arriving at Biskra at 4.30 o'clock, the total distance being 121 kilometres. The party entered the oasis with its date-palms under a beautiful warm sun. The automobile was a magnificent eight-seated vehicle.

The statistics for horse-runaway accidents for France show that in the second half of the year 1899 there were 3,278 persons injured from this cause, and 314 killed. In December alone there were 656 persons injured and 52 killed. In the same six months there were 164 persons injured by automobile accidents and 91 killed. Probably the most of the automobile accidents were occasioned by high speeding and reckless driving, which are altogether too common in France.

The record for the month of February gives the number of accidents due to frightened horses as 757, resulting in 57 deaths and 700 injuries. In the same month there were 25 automobile accidents, none of which were fatal. There were also 43 bicycle accidents, 4 of which resulted in death.

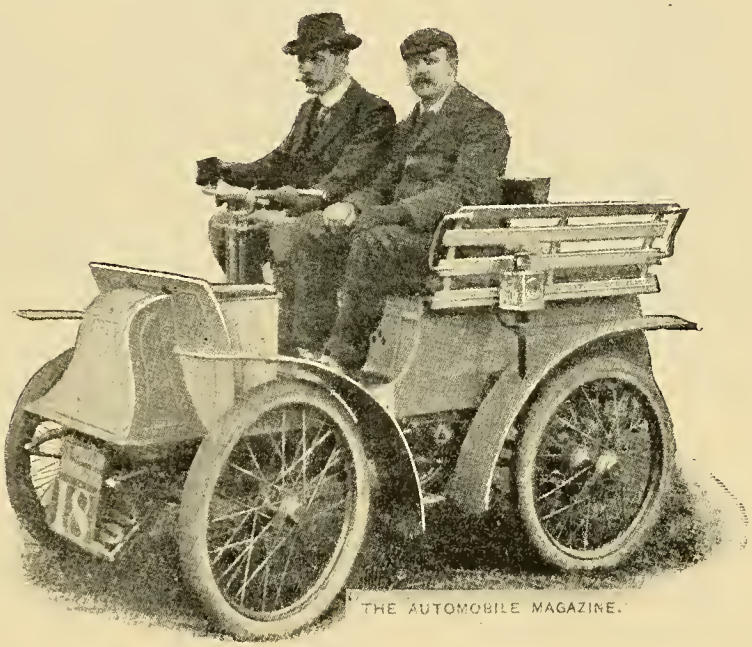
The Societé libre d'emulation du commerce et de l'industrie de la Seine inférieure has offered a prize of 1,000 francs and a diploma for the greatest progress in automobilism as applied to small urban traffic, represented by vehicles of the four-wheeled voiture class, called "voitures de place." The prize is to be given either in cash or in a medal of gold inscribed with the winner's name and the remainder in cash, as may be preferred.

The Automobile Club of France has now a membership of 2,301. Among the recently elected members are Frederick

Brackett, General Secretary of the United States Commission at the Paris Exposition, and H. Hulbert, Director of Groups for the United States Commission.

M. Felix Dubois, the explorer, has returned from a sojourn in the Soudan, whither he went to establish an automobile service between the Senegal and the Niger. The installation has been very successful, the vehicles working admirably, in spite of the bad condition of a part of the route.

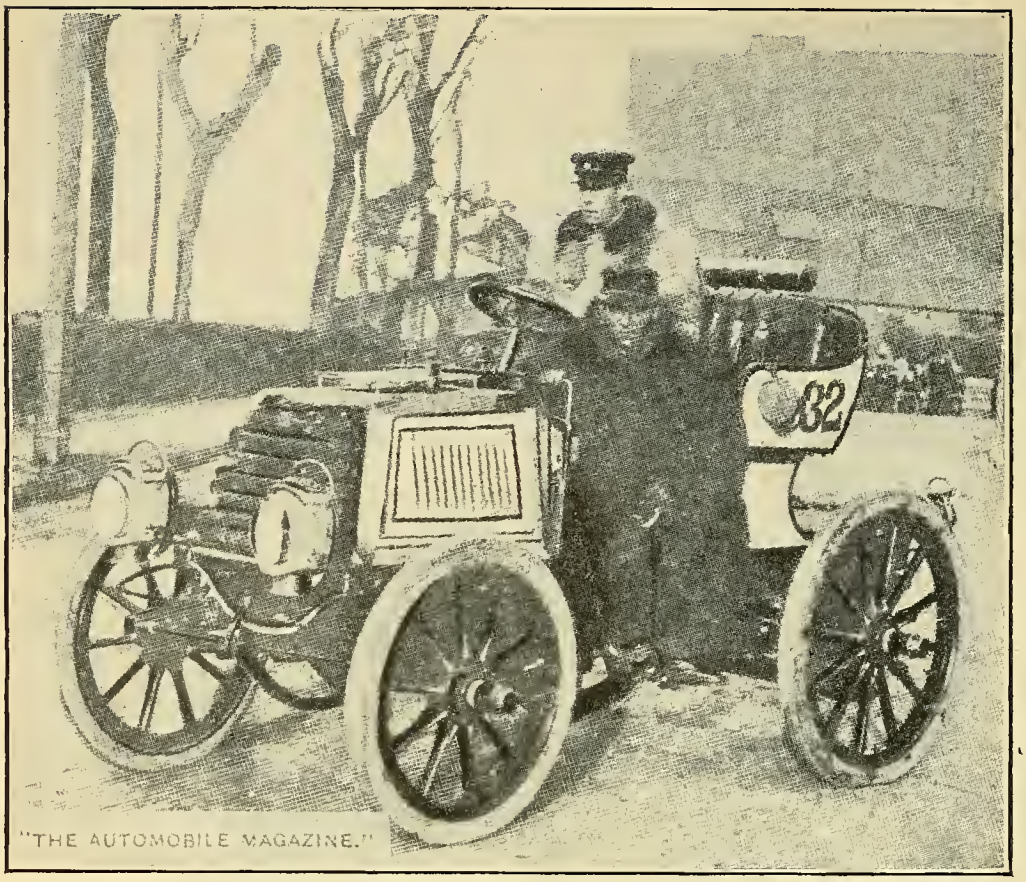
A distance of nearly a hundred miles without recharging is the remarkable record of an electromobile recently driven by M. Louis Krieger. The journey was from Paris to Dijon, a distance of 152 kilometres.



The Endurance Car

The Endurance Motor Company

The Automobile Club of Great Britain has arranged with the festival committee of Dieppe for an international automobile festival to take place in northern France on June 17, 18 and 19. At the head of the festival will be the Mayor of Dieppe and the British Vice-Consul in that city. The event of the first day will be an international course over a route yet to be selected. The second day there will be a grand festival of flowers, together with short distance courses. The third day will be devoted to a handicap course from Dieppe to Rouen and Beauvais, returning to Rouen. Participation in this course will be limited to British automobilists and members of the Automobile Club of Great Britain. The rules followed will be those of the Automobile



M. Lorraine Barrow in His 12 H. P. Daimler

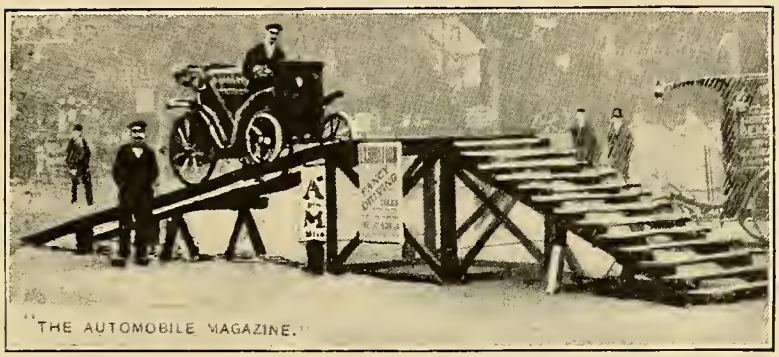
Club of France and the committee will be appointed by the British club.

Two British automobilists, Messrs. Cambell Muir and Worsley, recently made the journey from Stuttgart to Havre. They made the 170 kilometres from Stuttgart to Strassburg in seven hours; from Strassburg to Nancy, 155 kilometres, in a snow-storm, in five hours; Nancy to La Fére—Champenoise, 220 kilometres, in six hours; Le Fére—Champenoise to Paris, 132 kilometres, in five hours; Paris to Rouen, 136 kilometres, in four hours, and Rouen to Havre, 92 kilometres, in three hours—a total of thirty hours on the road.

The Princess of Wales has recently ordered a four-seated automobile of a Coventry manufacturer.

The British Ministry of War has advertised for bids for furnishing five motor-wagons with a carrying capacity of two tons each and a speed of five miles an hour.

M. Crouan's first motor car is now completed; it contains many features of novelty. The motor is said to have four horizontal balanced cylinders, developing 20 H. P. Compressed air,

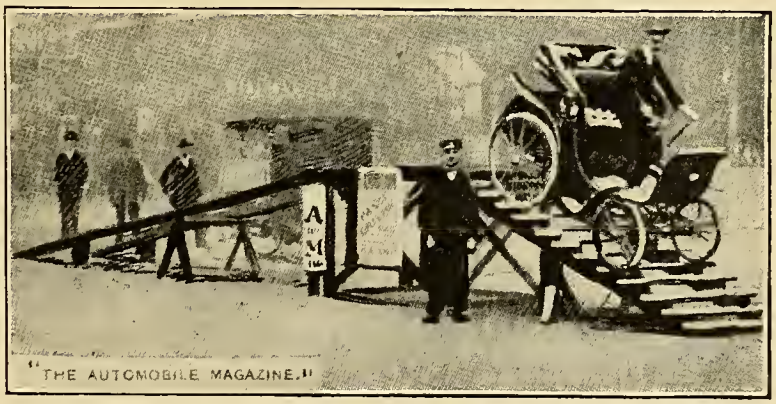


Coles Driving Hewetson's Benz Car up an Incline of 1 in 4

obtained by utilizing the pressure of the exhaust gases, is employed for actuating the change-speed gearing. Considerable interest is centred upon this new vehicle, as M. Crouan's previous experimental cars have shown great promise.

A novel idea, which should appeal to the managers of your continuous-performance theatres, is that of automobile trick-riding on the stage. A most interesting demonstration has recently been a feature at the Alhambra in London, where E. J. Coles, an expert driver, gave an exhibition of fancy driving. One feat was the driving of an ordinary Benz carriage with a hood, weighing 850 pounds, up a slope 18 feet long with a 25 per cent. gradient to a platform 6 feet by 5, and thence down a flight of 17 steps with 10-inch treads and 4-inch risers, on a slope of one in three. Another feature was fancy driving in graceful curves and twists in and out among flags and blocks.

The automobile section of the Glasgow International Exhibition of next year promises to be a particularly attractive and important feature. The special cement track will offer good opportunities for speeding and racing. The exhibits of the



Coles Driving the Benz Car Down a Flight of Steps

motor-vehicle class will be located in the Locomotion and Transport Section.

The second annual exhibition of the Automobile Club of Great Britain was held at Agricultural Hall. It showed rapid progress on the part of the industry in Great Britain. The gasoline type was particularly in evidence.

An Automobile Exhibition Company has been organized in Berlin for the purpose of establishing a permanent show of automobiles in the German capital, with the idea of bringing seller and purchaser into closer relations. A most favorable location, close to the Friedrichstrasse railway station, and conveniently reached from all parts of the city, has been obtained, with a floor space of about 1,200 square metres, beside a considerable extent of additional room available, part enclosed and part open towards the street. Place will be given to everything of interest relating to the automobile. It is intended to make it a permanent international automobile exhibition. Numerous applications for space have been received. Chief Engineer Freund, who was a technical member of the direction of the International Motor-Vehicle Exhibition at Berlin last year, has been engaged to direct the undertaking. The address of the management is Dorotheenstrasse 6, Berlin, N. W.

In the course of the Nuremberg automobile exhibition there will be several runs from that city. In the latter part of June there will be a long-distance run to Bamberg, Schweinfurth, Würzburg, Ochsenfurth, Uffenheim, and Ausbach, and thence back to Nuremberg. Among several shorter runs arranged for will be one to Erlangen, Heroldsberg, Neumarkt and Schwabach.

A novelty at a swell ball in Berlin this season was the entrance of a four-seated automobile under the guidance of Herr Siegfried Blum. It was handled with such dexterity as to make its way with great rapidity about the hall, threading its way in and out among the crowded company.

The Sultan of Turkey has decorated Herr E. Kühlstein, of the Kühlstein Automobile Works of Charlottenburg, near Berlin, with the Medjidie order.

The Central European Motor-Vehicle Society (Mitteleuropäischer Motorwagen Verein) of Germany had 563 members at the beginning of the year. Of these 192 belong in Berlin, and the cities of Cologne, Suttgart, Dresden, Munich, Dusseldorf, Hamburg, Frankfort on the Main, Hanover, Leipzig, Mannheim, Nuremberg, Breslau and Augsburg are well represented. There are 34 members in Austria-Hungary, and other countries represented are Switzerland, Sweden, England, Holland, France, Bel-

gium, Russia, Italy and America. Two-thirds of the members are manufacturers or their representatives, and technical men connected with the industry.

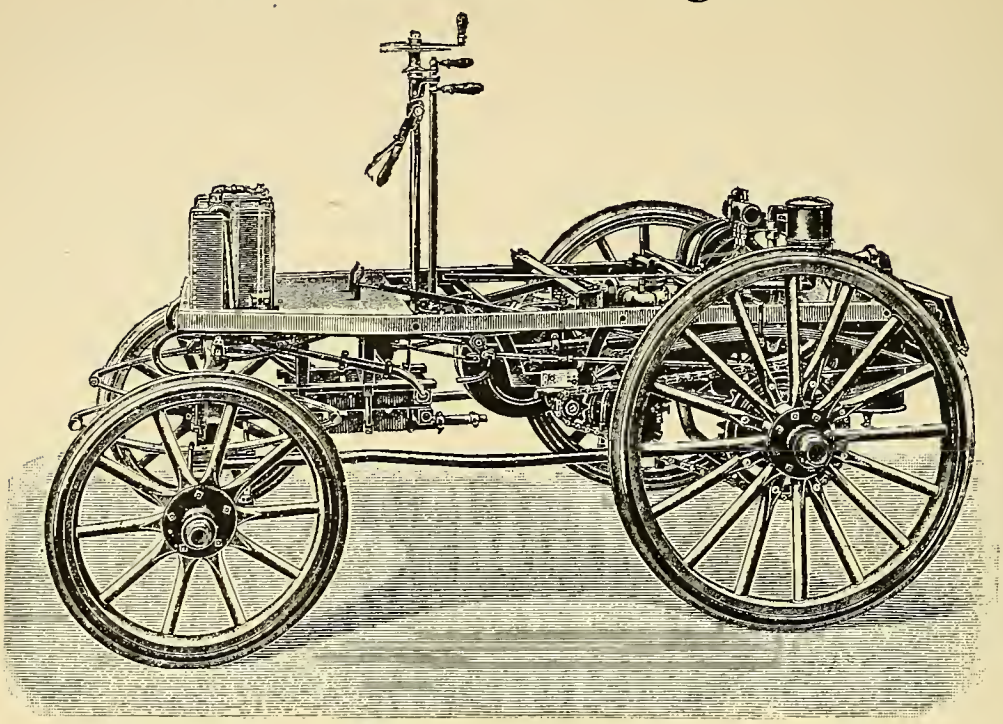
The Thuringian Forest in Germany, with its enchanting mountain scenery and perfect park-like roads, has become a favorite resort for automobile excursions. The Mitteldeutsche (Central German) Automobile Club of Eisenach has performed an excellent service by establishing automobile repair and benzine-supply stations at all principal points throughout Thuringia, designating them by conspicuous signs.

The German military budget for this year contains an item of 175,000 marks for continuing the experiments with the automobile for ambulance and ammunition purposes. The Minister of War, von Gossler, said that the automobile had shown itself greatly superior to animal traction for such purposes, but further experiments were desirable.

A great manufacturing consolidation has lately taken place in Berlin. The Motorfahrzeug-und Motoren Fabrik Berlin, Actiengesellschaft Marienfelde (Berlin Motor-Vehicle and Motor Factory, Marienfelde Stock Company) has increased its capital by 5,000,000 marks and formed a consolidation with the Gesellschaft für Verkehrsunternehmungen Berlin (Berlin Company for Traffic Undertakings). The consolidated companies have a magnificent exhibit at the Paris Exposition, including numerous electric vehicles and a wholly new type of automobile with benzine motor.

The Trades Union Association of Wurtemberg have made the experiment of founding a motor company for purchasing and renting small motors to artisans and petty manufacturers. The rent for such motors is to be paid monthly and goes on interest on the capital invested. The motor can, at any time, be exchanged for one of larger dimensions. The company are also enabled to sell motors outright at a much lower rate than they can be bought by such manufacturers direct. The result of this experiment may be awaited with a good deal of interest, and, if favorable, will doubtless find imitators.

The Railway Brigade are at present making trial trips with a six-seated automobile on the Tempelhofer Feld, Berlin. The vehicle is manned by an officer and five sappers, and has hitherto given perfect satisfaction. The steam generator is in the front of the vehicle. This is only one of many trials lately made in army circles with horseless vehicles, which it is proposed to introduce for supplying the advanced firing line with ammunition and for transporting the wounded.



Benz & Co. Auto-frame

Benz & Co., of Manheim, Germany, deliver now to carriage and wagon builders automobile frames with all machinery attached, a specimen of which is illustrated herewith. This enables carriage builders to supply any body desired.

The Vienna automobile exhibition opens towards the end of May. It will be located in the sixth section of the Royal-Imperial Agricultural Society's building, adjoining the rotunda. There will be a great automobile corso, with a track 500 metres long. A special attraction will be an automobile omnibus service between the centre of the city and the Praterstern, with low fares for visitors to the exhibition.

Vienna Automobile Exposition and Racing Track

The Automobile Abroad

Consul General Alexander Singer recently made the trip from Vienna to Nice with a six horse-power Bollée vehicle.

The Austrian Society of Automobilführer (automobile drivers) has regular courses of instruction given in 15 lessons of two hours each, twice a week from 7 to 9 o'clock in the evening. Membership in the Society is required in order to take the course. Members of the working classes pay the entrance fee and so much a week; those who are not workingmen pay for the lessons in advance at double rates. There is a theoretical course and a practical course. There is also a special course for the coachmen of Vienna.

The Bavarian and the Austrian Automobile Clubs are to join in a race from Munich to Vienna early in June, under the new rules of the Austrian Club. There will be exhibitions in Munich, Salzburg and Vienna.

Prince Alfred Wrede, of Vienna, has asked for a concession for a motor-omnibus line between Graz and Eggenberg.

In the Tyrol they appear to be alive to the advantages of the automobile. In Bozen, Bruneck and Ampezzo the authorities have been considering no less than twelve distinct propositions for motor-omnibus lines between different localities. One of the new lines is that between Toblach and Cortina. Experimental trips on this line have given most satisfactory results. Railway connection is made in Toblach.

Brussels is to have a public automobile service with six-seated wagonettes. The tariff will be five francs an hour for two persons and an addition of one franc for each additional person. For six persons the charge will be 11 francs, and for each additional hour 10 francs.

Attention is called to Java as an excellent country for the automobile. The sultry climate is disastrous for horses, and the entire island is threaded by perfect roads which, with the delightful tropical scenery, make automobile touring a constant delight. The bicycle is greatly in vogue there and the automobile is undoubtedly destined to like popularity. At last accounts, however, there were only two in use on the island.

Slipping, Creeping and Sliding

WHEN a railway-train rounds a curve, its speed is limited to a degree dependent upon the radius of the arc as well as its inclination from the road. In order to counteract the effect of centrifugal force, the inner rail is slightly raised so as to incline the cars within the curve. The car-wheels are held and guided on the tracks by their flanges.

But an automobile, in rounding a curve, is unprovided with any means for counteracting the effect of centrifugal force. The road must be taken as it is. For this reason the speed must be reduced and the greatest care taken in passing around corners.

Centrifugal force tends constantly to throw the carriage within the curve, and, when there are no inclines—which is the general rule—is counteracted only by friction between the tires and the ground. When the road is slippery and the centrifugal force, owing to the speed, rather great, equilibrium is destroyed, and "slipping" takes place; that is, the carriage, in gliding on its wheels, is thrown without the curve. Slipping is always dangerous, because it cannot be checked.

There is another phenomenon observed in automobiles, which is easily confused with slipping, because its effect is almost the same. It must, however, be distinguished from slipping because its origin is different. The phenomenon I speak of is that of "creeping."

No road is perfectly horizontal. Its section is a curve, the summit or highest point of which is in alinement with the axis of the road. Only when the vehicle is in the middle of the road, are two wheels of the same axle on a level. Under these conditions, the wheels are horizontal; and the highest point of the road is located between them, slightly above their treads.

The road usually pursued is inclined, from which it follows that the weight of the vehicle, which always acts vertically downward, is not normal to the road. This weight is a force which can be resolved into two component forces, one acting perpendicularly to the road and causing the adherence of the wheels, and the other acting parallel to the axle and tending to produce creeping. The first force is usually the more powerful; but its superiority is overcome by the second when the ground is slippery and the inclination considerable.

Creeping increases with the weight; for the adherence does not become greater as the weight augments. But the force

acting parallel to the axle is dependent upon the weight and its effect is therefore all the more dangerous. On an arched road the side within the curve should always be selected.

"In running a carriage on the highways," writes George Moreau, in his work on Explosion Engines, "a highly trained hand and an exceedingly good judgment are required, when the speed is at all great. When an obstacle is to be avoided or a carriage to be passed the longest possible curve should be described in order to avoid the slipping which results from the action of the centrifugal force invariably produced when the carriage deviates from its rectilinear path. Moreover, the necessity of leaving the centre of the road causes the carriage to run at an incline, if the road be dome-shaped in cross-section. This inclination, coupled with the centrifugal force, may cause serious danger, if an unforeseen obstacle be encountered. No set rules can be given in this matter. The driver must know his carriage, *must feel with it.* With a vehicle whose every member he knows thoroughly, a good automobilist can perform feats in perfect safety, which the most elementary considerations of prudence would forbid.

Sometimes it happens that when the carriage is running along at an incline, the steering-gear refuses to work, with the result that there is a slipping of the steering-truck. When the carriage is running in a straight line, the propelling forces can be resolved into four parallel forces acting in the planes of the wheels. But when the inclination of the front wheels is changed, the forces acting on these wheels can be resolved into two forces, one acting in the plane of the wheel, the other parallel to the axle. The second may be greater than the first, and hence produce a slipping which will vary with the rapidity with which the *chauffeur* desires to operate the steering-gear and with the adhesion of the tires to the ground. The two forces combine to give rise to a movement oblique to the plane of the wheel.

Slipping may also be caused by the ill-timed action of the differential. In all carriages, the differential has a certain influence on the steering-gear. When the brakes are applied and the wheels are running on ground in which the coefficient of adhesion is variable, one of the wheels will stop before the other, and the carriage will therefore pivot about the wheel which should have been the first to stop, *i. e.*, about the wheel on that portion of the ground having the least adhesion. The wheels carry the vehicle along by friction on the ground—a friction which constitutes what is termed the adherence. On the other hand the ground forces the wheels to rotate in spite of the brakes, when the

adherence is considerable. If, at the time, the front wheels are not on ground to which they can adhere, or if the driver does not energetically operate the steering mechanism, the carriage will slip to such a degree that it may be completely turned about. A similar result is produced if instead of braking the differential, the brakes be applied on the rear wheels.

SLIDING

A wheel slides or "skates," as it is sometimes called, when it rotates without changing its position relatively to the ground, or when its speed at the rim is greater than its speed of translation. The phenomenon is caused by the expenditure of more power than is necessary to overcome the resistance.

Although sliding should be prevented as much as possible, it cannot be entirely obviated even in the best conducted carriage. Jolts cannot be altogether avoided; and the moment the driving-wheels leave the road, though it be but for a fraction of a second, the motive force, no longer being counterbalanced by the resistance at the rim, causes an acceleration in the operative mechanism; and the wheels, when they come into contact with the ground, have acquired a peripheral speed greater than that with which they were rotating before they left the road, or, in other words, greater than the speed of translation. Hence the wheel slides. Since the motive force is always less than the adherence, sliding soon ceases, and the wheel rolls along as it should.

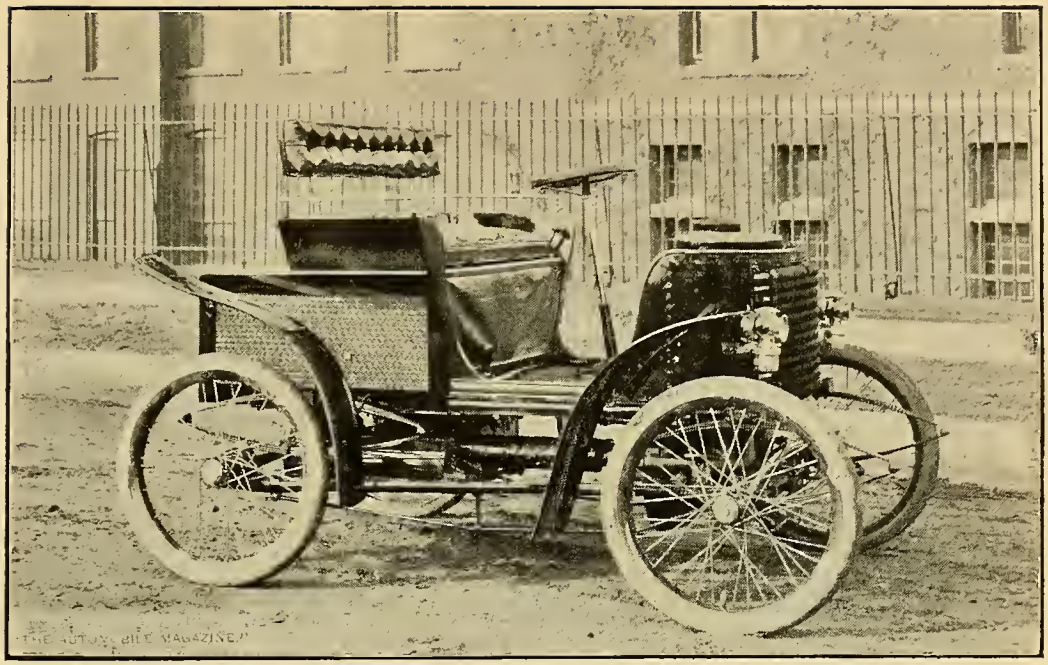
In a suspended carriage, the springs have a certain effect on the sliding of the wheels. The various movements of the carriage-body sometimes have the effect of reducing the load of the motor. It may happen that by reason of a particularly sharp movement, the load, for the moment, may be so far reduced that the adherence falls below the motive force, with the result that the wheels slip.

Finally, inequalities in the road have something to do with the slipping of the wheels. When a wheel meets with a short declivity or a rut, the resistance at the rim may be reduced; and if this reduction be sufficient, slipping may ensue.

This tendency to slipping possessed by all carriages in common, should not give rise to anxiety. Reasonable care should be taken to prevent continued slipping; for the tires may otherwise be subjected to undue wear and the driving-mechanism damaged.

The remedy for the evil is clearly to reduce the motive power, and if necessary to stop the motor.

H. Vernier.



Mr. H. P. Whitney's Columbia Gasoline Voiturette

MR. HARRY PAYNE WHITNEY has come into possession of what is decidedly the best gasoline voiturette of American manufacture.

Mr. Whitney operates this machine daily between his country seat in Old Westbury, L. I., and New York City, a distance of 30 miles, which he covers in less than two hours.

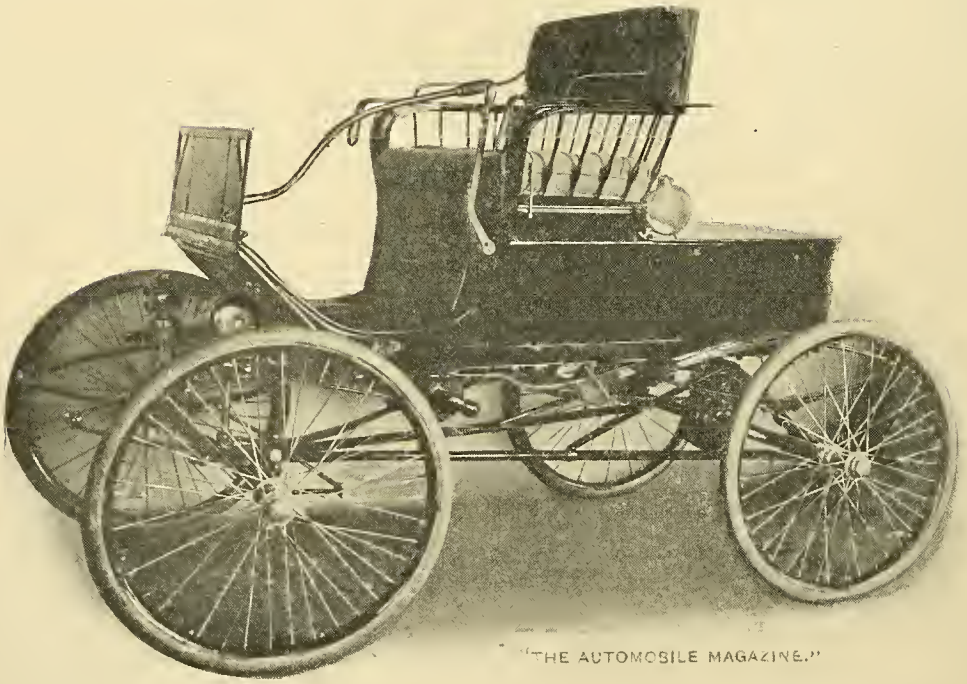
The voiturette illustrated above is the machine in question. It is the latest creation of the Electric Vehicle Co. of New York, and was built at their factories in Hartford.

The vehicle carries a single cylinder motor of 4 horse-power cooled by water and having three speeds, the maximum of which is 20 miles per hour. The speed-changing gears are housed in a cartere running in oil.

The water tank, which is situated in the front of the vehicle with the lubricating reservoir, holds 4 gallons and is equipped with cooling radiators. The gasoline tank, which has a capacity of 5 gallons, is situated with the carbureter and accumulator for ignition, under the seat. Rear of the seat there is a spacious compartment for the storage of extra gasoline, tools, baggage, etc. The machine, which is shaft-driven, is equipped also with a backing device and is steered by a wheel. The carriage seats two people and weighs 1,400 pounds.

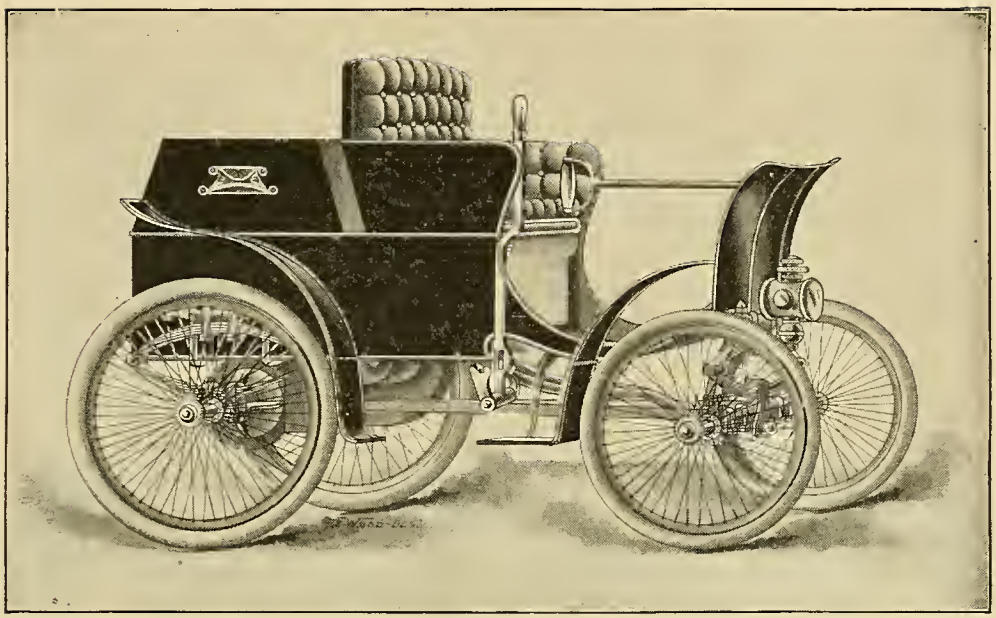
Gallery of American Automobiles

Columbia Gasolene Delivery Tricycle

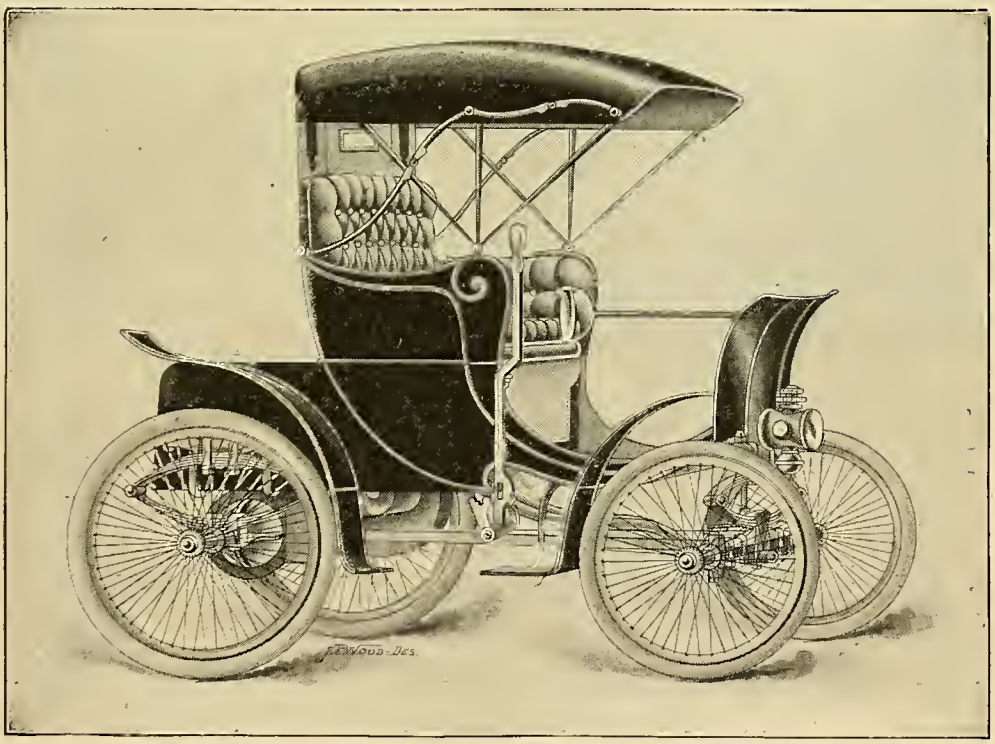


Gasolene Runabout of the Autocar Company, Ardmore, Pa.

Gallery of American Automobiles



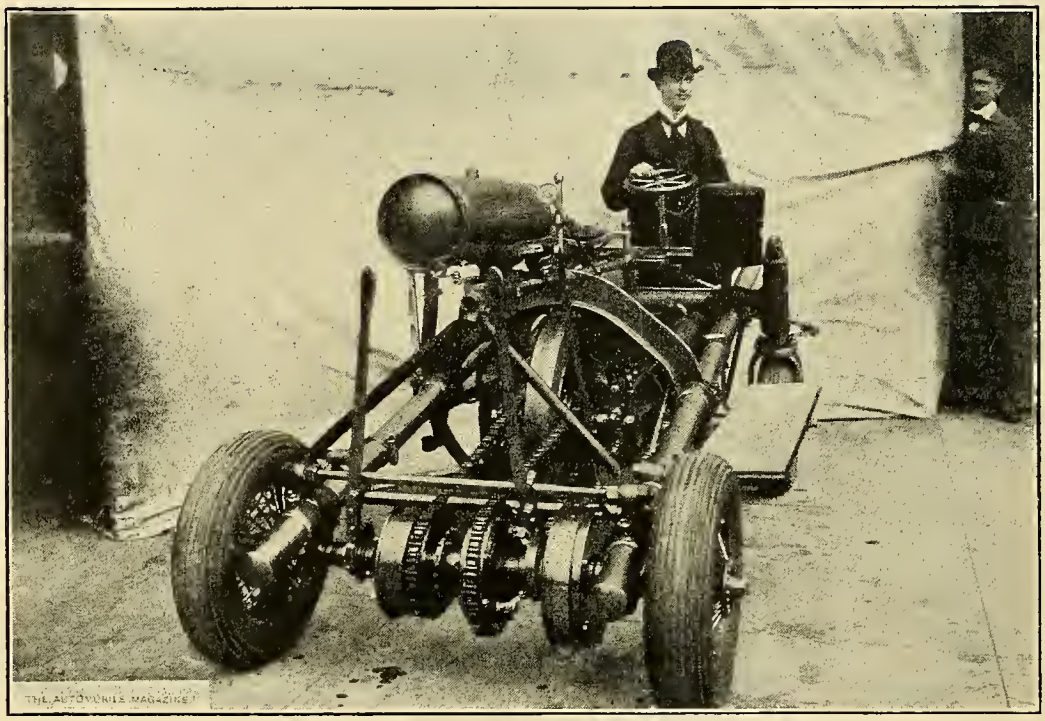
Touring Cart of the Detroit Automobile Company



Phaeton of the Detroit Automobile Company

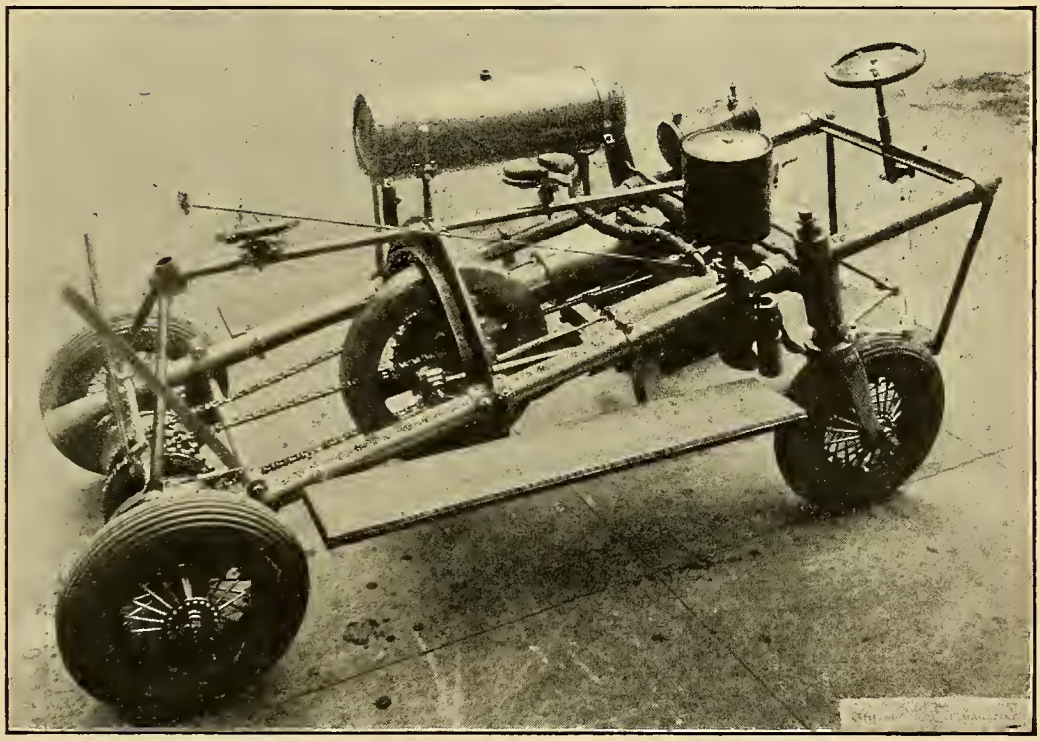
Pennington's War Automobile

THE Garvin Machine Company when they first received the order to build the Pennington Automobile War Machines for the Anglo-American Rapid Vehicle Company, were very skeptical as to the results which would be attained, and in view of the very unsatisfactory experiences which they have previously had in building automobiles, they were very reluctant to undertake the order. The contracts which they have executed in the past have always proven unsatisfactory for the reason that the vehicles, when completed, never came up to expectations.



The construction of the machines and all details are covered by Mr. Pennington's patents, and after they had gone carefully through his drawings they found that he had, by the practical details, set forth all the necessary requirements for the automobile. In eight weeks from the time the drawings came into the works Mr. Pennington took the first war machine out on the road. This rapid construction is due to the personal supervision which he gave to them and their efficient workmanship. Such a powerful and speedy machine of this character has never previously been constructed for use on public highways and general country work. There are two cylinders each 6¼ inches by 12

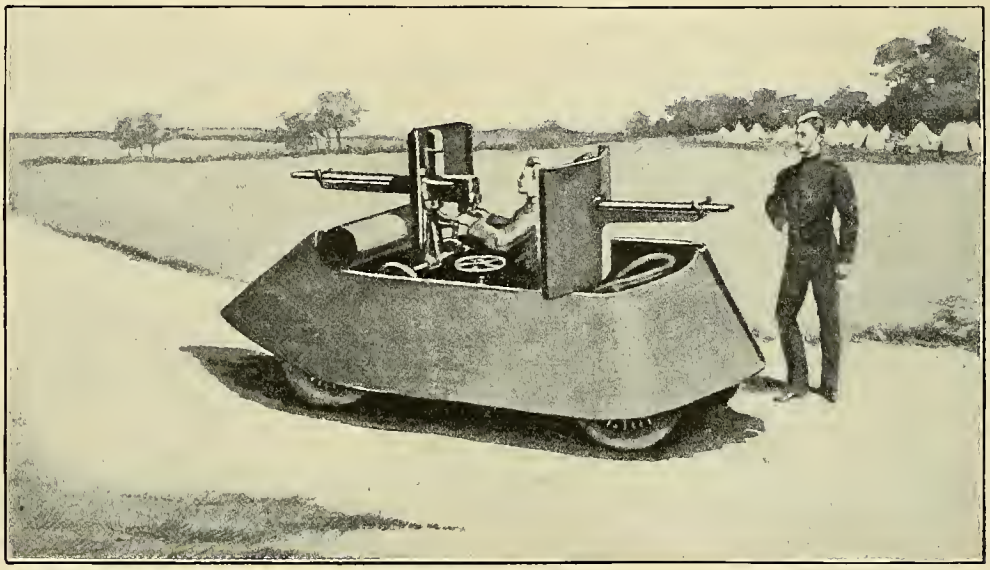
inches, mounted in a frame of steel tubing and manganese bronze. By some very clever patents Mr. Pennington is enabled to dispense with a carbureter and feeding his oil into the combustion chamber by a very simple process. The machines are fitted with both electric and hot tube ignition. There are two speed gears running from the crank shaft on either side of the fly-wheel to the driving shaft, the transmission being by chains. When the motor is running at its normal speed the machine will travel at the rate of 25 to 30 miles an hour on the lower gear, and 60 to 75 miles an hour on the higher gear, according to the condition of the road.



Although a great deal of skepticism was evident as to the machine fulfilling the prognostications of Mr. Pennington, we subsequently found that the trial fully came up and even surpassed the assertion that he had made as to its capabilities. This was in a great measure due to the very careful working out of the details in the drawings which he furnished. This enabled the workmen to put the machine together without any hitch whatever, and was also the means of its proving such an entire success on its initial trip.

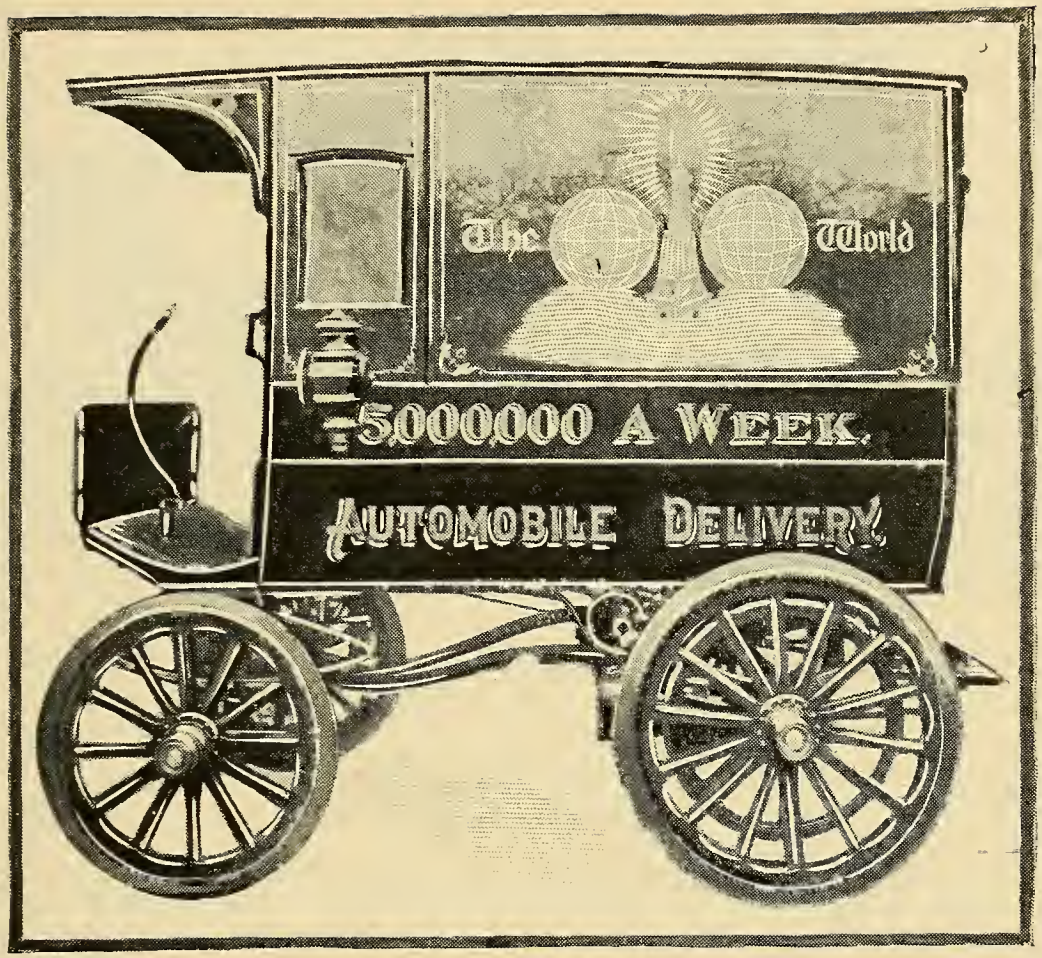
The various tests which have been made in the past two weeks have brought out very prominently the merits of the machine. It has been timed for several half miles, making them easily in 27

seconds, and miles in 53 to 55 seconds. The machine being built expressly for war purposes, it was essential that it should be adapted for very rough work; several tests were therefore given it on very rough country roads and across ploughed fields, where it maintained a speed of 20 to 30 miles per hour. One cause for the favorable results obtained from this very rough country work is that the wheels are only 22 inches in diameter, which absolutely prevents the machine from being upset. The tires also add greatly to the value of the vehicle for this class of work, as they are specially built from Mr. Pennington's designs, being 5 inches in diameter and bolted to the rim with 20 lugs. The amount of oil and water which is carried enables the machine to be run at



any of the speeds mentioned above for 500 miles without stopping.

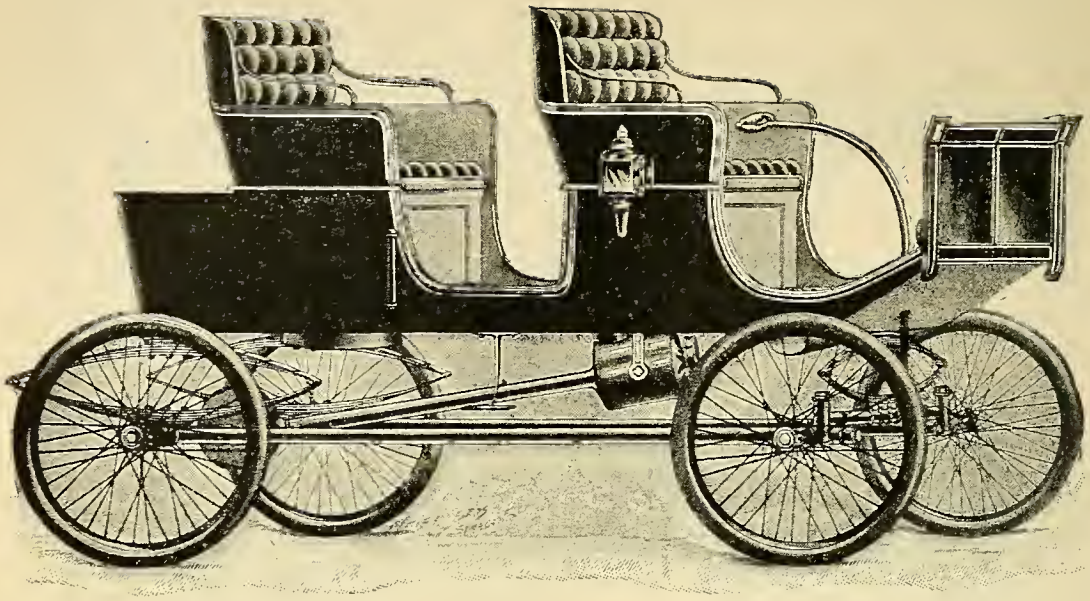
It is the intention to have these Torpedo War Machines mounted with rapid firing guns and protected by armor plating. These will be of much greater service in war times than the armor trains which have been in use in South Africa, as they are strictly confined to the railway tracks, and are only of use when they have a locomotive attached. There are many other purposes for which the Automobile War Machines will be utilized, such as pulling ammunition wagons, provision and forage wagons. There are five more of these machines almost completed, and those which are intended for racing will be fitted with wind shields, while those which are to be utilized for war purposes will be fitted with the armor plating when they arrive in England.



Newspaper Delivery Automobiles

THE New York *World,* with its usual brilliant efforts to keep pace with the advanced age, has recently introduced the automobile into its circulation service for carrying and delivering newspapers in New York City and vicinity. One of the first of a large number ordered from the Woods Motor Vehicle Co. is now being used for the purpose, having been tested under various conditions, with most satisfactory results. The machine has answered all the requirements imposed by weight carrying, grade climbing and speed, and will obviate the thousand and one difficulties incident to the employment of horses in this capacity.

Heretofore the safe and speedy delivery of daily newspapers has been a problem with which circulation managers have long struggled, and the *World's* adoption of the new form of locomotion undoubtedly will bring with it the solution.



"Century" Steam Carriage

THE above illustration shows a two-seat steam carriage built by the Century Motor Vehicle Company, of Syracuse, N. Y.

The driving mechanism of this carriage is the same as that used in all vehicles manufactured by this company. The engine is directly connected to the gear shaft at the forward end and the set of bevel gears, connecting the rear end of the gear shaft to the rear axle. The rear axle of all their vehicles is so constructed that the driving power is applied to the centre of the axle, the compensating gears being also located at that point and at the same time having a solid rear axle that is not cut in two at the centre. This is claimed as being one of their special features and calculated to make a very rigid axle without adding to the weight or complication of the construction.

This vehicle is controlled by means of a steering lever which also controls the speed of the engine; the driver sitting on the left side of the vehicle as in all of their other styles, using his right hand to steer, stop and start.

The weight is about 1,150 pounds, complete, without top. Strength is not sacrificed in vehicles of this kind in order to make an abnormally light machine; also the machines are not geared so high to obtain a high speed that they will not easily draw themselves out of mud, and sand holes, or run up steep hills without overtaxing the engine and boiler.

The engine is pivotally connected to the sills of the body under the front seat in such a manner that it allows of all movement of the body caused by variable weight of the load in the same, and it allows of other movements caused by uneven road, etc.

This company make their own wheels, gears or frames, bodies, engines, boilers, and, in fact, nearly all principal parts, as they have found it extremely difficult to obtain properly proportioned equipments suitable for their vehicles.

They use in their wheels laminated wood rims of a heavy section, made according to their own specifications, and the tire lugs are spaced in such a manner that the rim is not weakened on account of one or more of the lugs coming close to the spoke hole. The spokes are of the very best possible quality, swaged pattern with the reduced centre. The nipples are of hard brass and of liberal proportions. The hubs and bearings being of their own construction and designed for the use intended.

Parts are made to templets and gauges, interchangeable ball bearings are used throughout, and the ball bearing cones and ball races are made from tool steel and tempered.

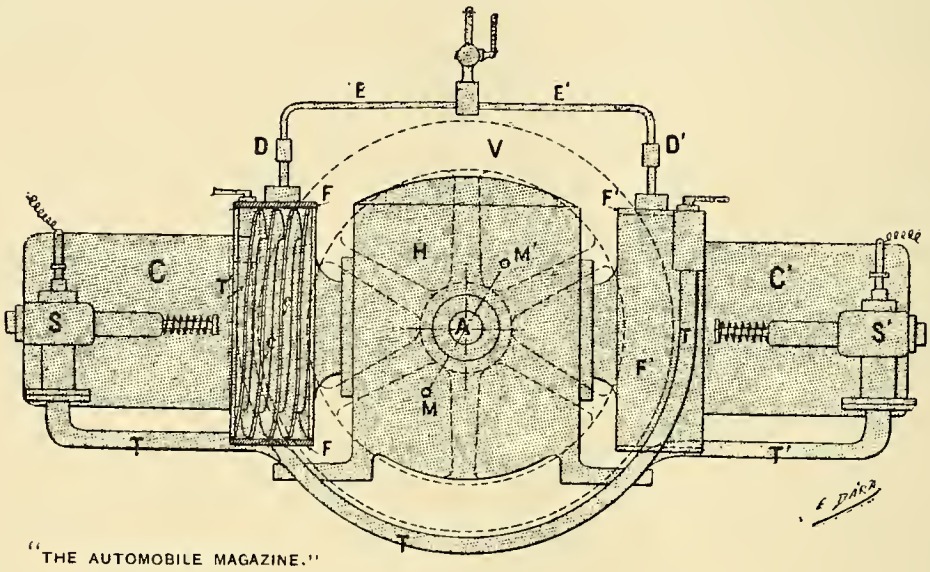
The bodies in these vehicles are made with heavy substantial sills, are framed heavily and are fitted with ½-inch panels. All parts of the body are blind screwed and glued.

AUTOMOBILE OMNIBUSES FOR THE PUBLIC

The important privileges secured by the Fifth Avenue Coach Company under recent legislation should make that company an important factor in the transit problems of New York. Beside the regular license charged by the City for stage-coaches and omnibuses the company is obliged to pay to the City five per cent. of its gross receipts. The company has the right to charge ten cents for a continuous trip. Since it is subsidiary to the New York Electric Vehicle and Transportation Company, controlled by Mr. William C. Whitney and his associates, who also control all the surface-transit lines of Manhattan, the Fifth Avenue Company will naturally be operated in harmony with those interests. The company not only has the franchise for Fifth avenue, but, with the approval of the Railroad Commissioners, it can extend its lines through any other streets of the city. It is intended to have the Fifth avenue service complete by a year hence. The regular vehicles will be large double-deck affairs, with seats for 28 passengers. Several of these will soon be in operation.

The Martha Alcohol Motor

ALTHOUGH there is nothing particularly remarkable about the Martha alcohol motor, in so far as its cylinder, piston, connecting rod, etc., are concerned, it nevertheless possesses one peculiar feature worthy of note, and that is that it operates apparently without a carbureter, properly so called. More accurately speaking, the system of carburation is so new that any one would hesitate to apply to the combination of parts that concur therein the name of carbureter adopted by our present terminology. Nevertheless, for want of another

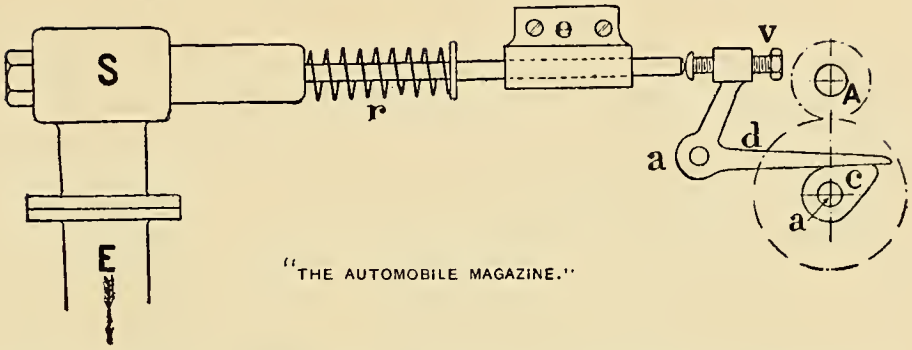


term, we shall have to describe the apparatus under the name of the " Martha Carbureter."

An inspection of Fig. 1 will show that M. Martha has arranged at the head of each of the cylinders of his motor a worm formed of three spirals enclosed in a casing, *F*. At the entrance of this helicoidal conduit is situated the principal air inlet, which is provided with a valve, *D*, of which the upper stem, pointed at the extremity, prevents the entrance of the alcohol. At the top of the last spiral there is a second regulatable air inlet.

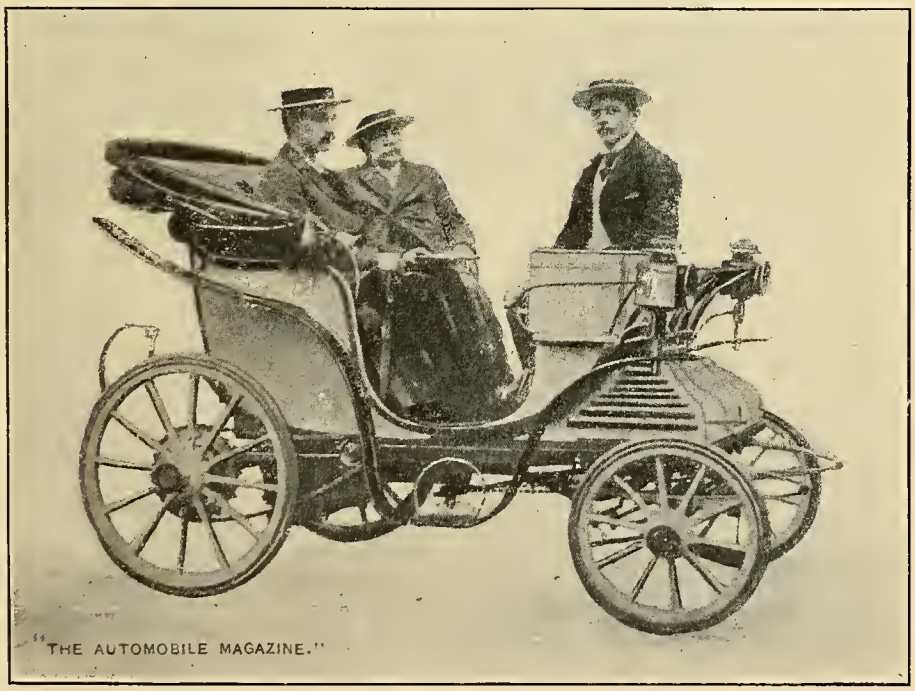
At the time of the suction—at the moment at which the valve allows the air to enter, the passage of the alcohol occurs. At the same time, the latter becomes heated in contact with the cylinder and keeps on flowing, while the suction of air continues through the aperture in the last spiral.

The Martha Alcohol Motor



The alcohol, volatilized during this passage between two strata of air, becomes intimately blended therewith. The detonating mixture thus obtained is absolutely homogeneous and reaches the cylinder ready to be compressed and ignited. It is to be remarked that since this mixture has been formed in the helicoidal conduit, the temperature of which is quite high, it has undergone expansion. It follows that, if it were admitted into the explosion chamber in this state, the entire power of the motor would not be utilized. This is why the inventor makes it pass beforehand through the radiating tubes, $T\ T^1$, that surround the fly-wheel. This latter, through the displacement of the air that it occasions, cools the tubes and reduces the mixture to a normal volume.

For this principle of utilizing the waste heat of the motor, which thereby becomes cooled, and which favors the intimacy



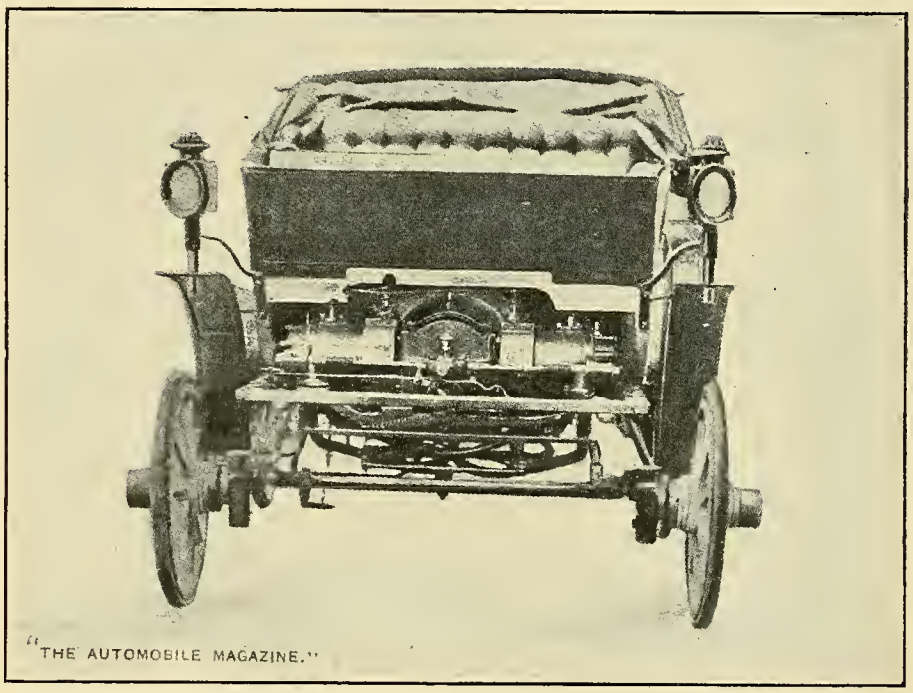
Side View of the Martha Alcohol Carriage

of the mixture that is subsequently reduced to a smaller volume, the inventor has been granted a patent in Germany.

It is evident that this device may be greatly reduced in bulk and be placed upon the exhaust tube or the muffle, and thus become applicable to all existing motors.

With the Martha carbureter, whatever be its temperature, the motor always starts in a cold state, at the first stroke of the piston, and even with ordinary sophisticated alcohol.

The trifling vaporization of which we have spoken suffices to start the motor, and, after the first explosion has taken place, the heat of the cylinder or that of the exhaust will be sufficient to assure the normal velocity, which may be regulated in a few

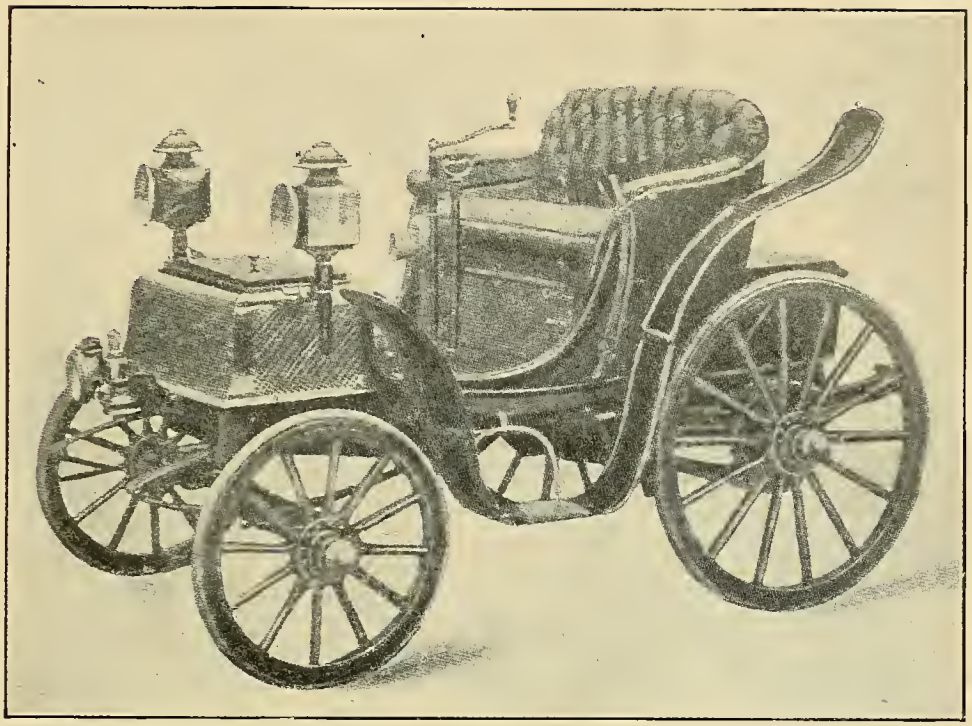


Front View of the Martha Alcohol Carriage

seconds through the air orifices. The entire loss of alcohol in starting is but from 3 to 4 cubic centimetres.

From what has been said, it will be seen that carburation with alcohol is as easy as it is with gasoline; and, what is an immense advantage is that, aside from the fact that the entire amount of the hydro-carbureted liquid is utilized, atmospheric influences—heat or cold, dryness or humidity, are not to be apprehended with this system. How many carbureters are there of which so much could be said?

In conclusion, it should be stated that the arrangement under consideration operates equally well with carbureted alcohol and gasoline.



A New German Motor-Carriage

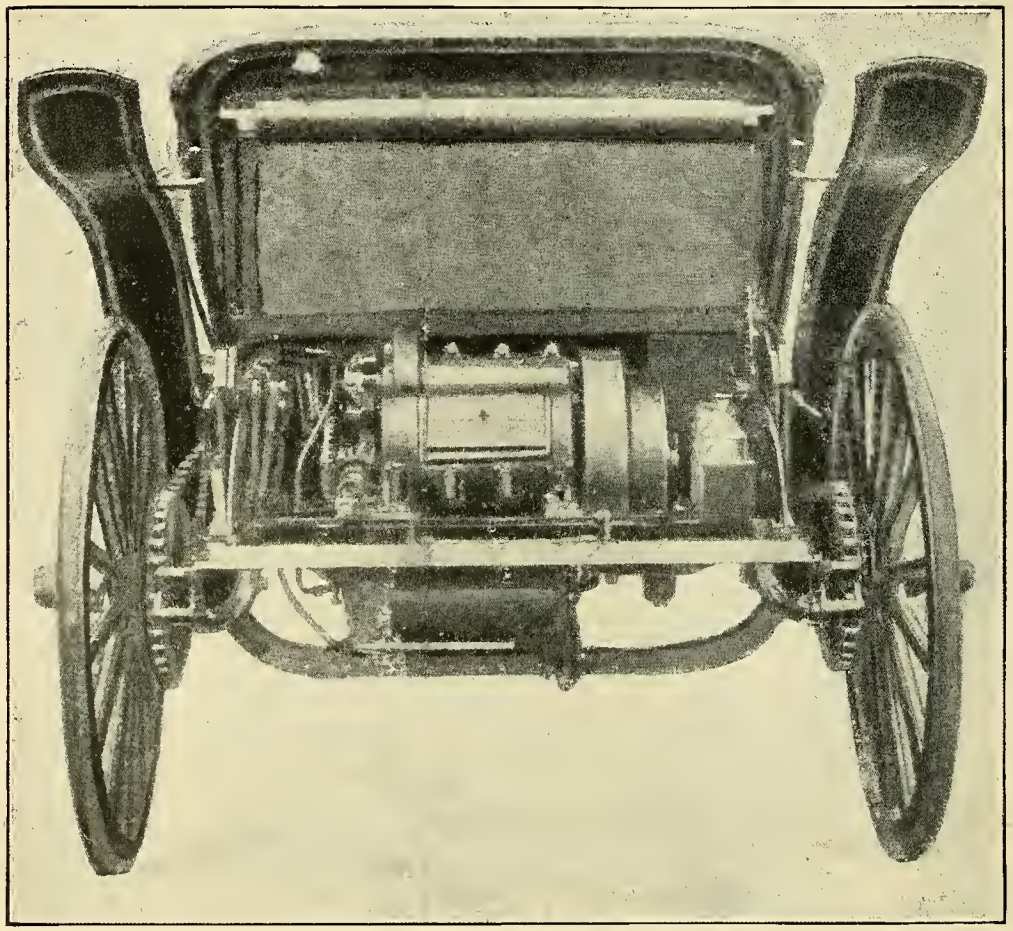
ALTHOUGH the tricycle and the voiturette are the types of motor-vehicles most commonly used in Europe, they do not fully meet the requirements of the buying public. Often they are built far too light; and their motive power is so small that they cannot be driven to the summit of every hill. The vibration is sometimes too perceptible; and the seat is not ample enough for the occupants.

The well-known German engineer, Vollmer, of Charlottenburg, Berlin, the inventor of the fore-carriage which has been successfully introduced in the United States by the Vollmer Fore-carriage Syndicate, has overcome these objections in a vehicle, the making of which has been undertaken by Kuehlstein. In designing his carriage Vollmer was chiefly concerned with the provision and disposition of his motive power so that he could ascend heavy grades regardless of the character of the road.

His motor and auxiliary driving mechanism are mounted upon a straight frame—an arrangement which enables him to employ a wagon-body of any form and readily to make any repairs in his motor. The wagon-body is firmly held upon the frame by 4-6 bolts, but can be removed in less than five minutes.

The frame is connected with the axles by elastic springs, so that the mechanism will not be jarred. The moving parts are all inclosed in dust-proof casings and run in oil.

The motor is of the two-cylinder type and is horizontally mounted beneath the carriage-seat. The fuel employed is benzin. The energy developed is 4½-5 horse power. The cylinders are cooled by a single water-jacket, the water being circulated by means of a pump driven by the motor. The cooling-water for the cylinders is contained in a reservoir carried in the front

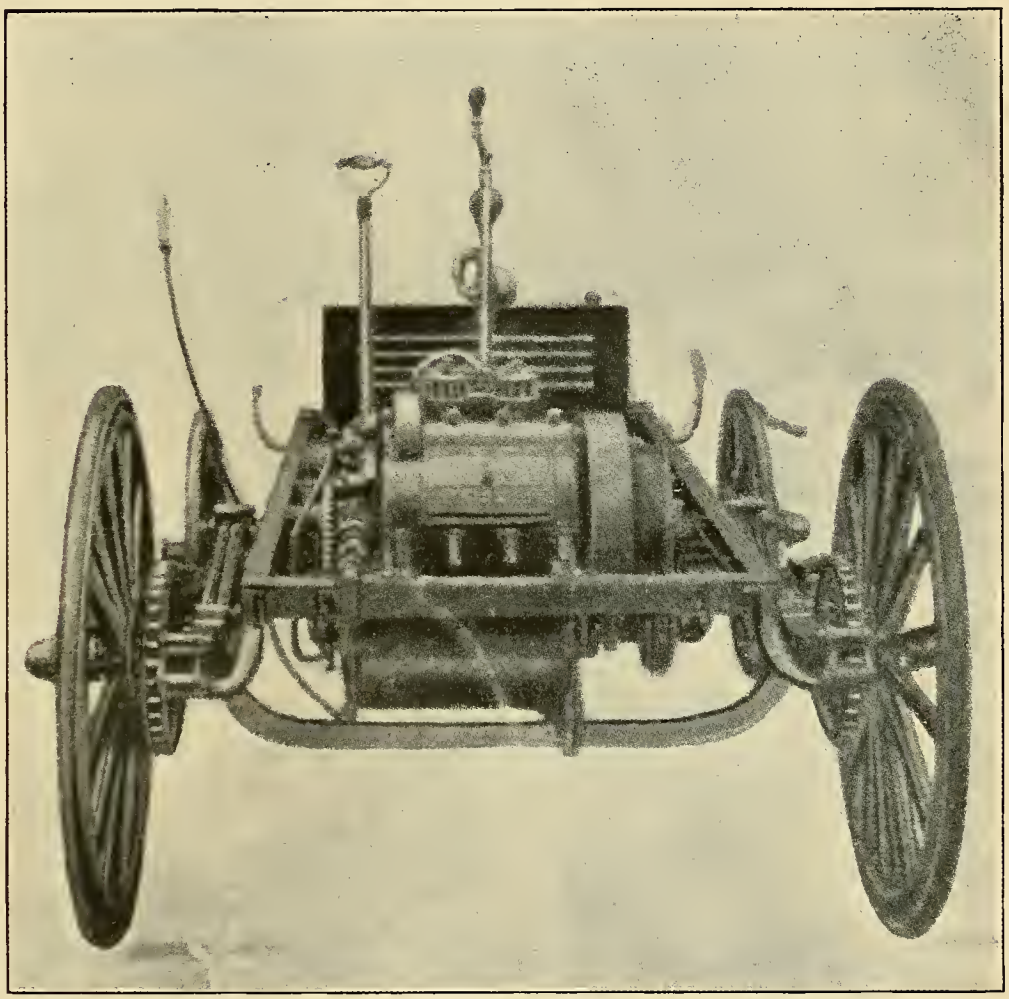


of the carriage and concealed by the front seat. The water is cooled by a system of coiled pipes in such a manner that the quantity contained within the reservoir will last for a run of 62 miles. The coiled pipes are located beneath the front of the carriage, so that as few obstructions as possible are offered to the air.

The benzin used as fuel is stored in a flat, metallic receptacle built in the rear wall of the carriage. The receptacle contains enough benzin to enable the carriage to cover a distance of 62 to

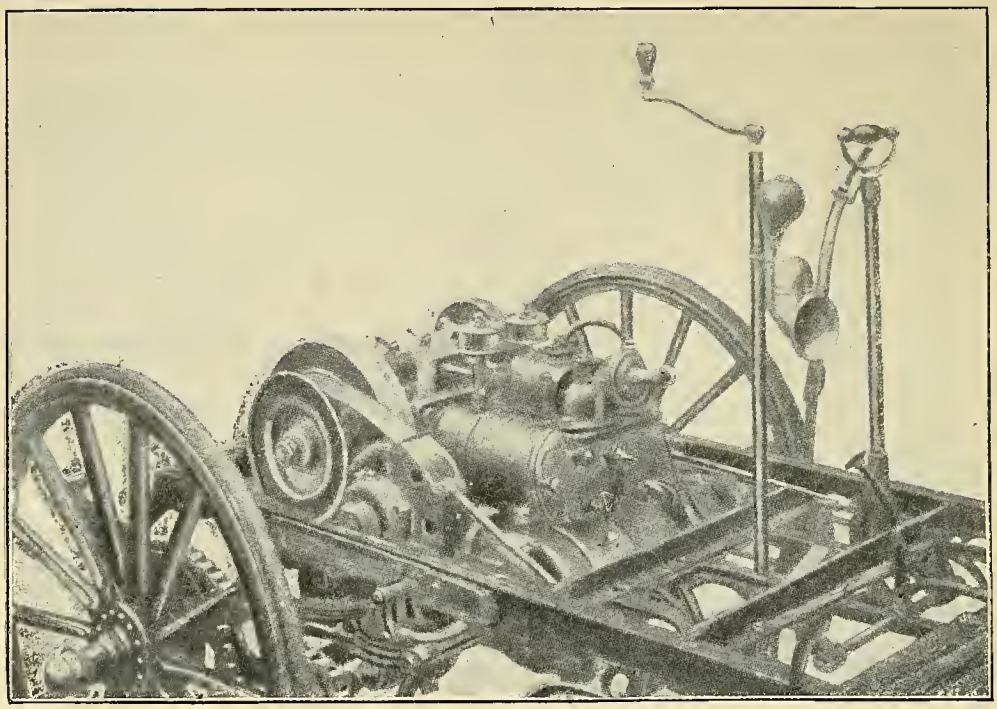
75 miles. From the storage receptacle the benzin is automatically fed to the carbureter in quantities exactly sufficient for the requirements of the motor at a given moment.

The carbureter is of an entirely new construction. Besides its small size, it has the merit of producing a constantly homogeneous mixture of vapor and air. Clogging of the inlets and overflowing of the carbureter are impossible. By means of a



gauge secured to the carbureter, the *chauffeur* can determine at what level the benzin should be, in order most efficiently to control the carburation. The proportions of the constituents of the explosive mixture can be regulated by a small handle at one side of the driver's seat.

The gas is electrically discharged. The spark-coil used is connected with an accumulator. Two accumulators are provided, each capable of yielding current for about forty hours. When



one accumulator is exhausted, the other can be connected with the spark-coil. Both accumulators and the coil are inclosed in a small box beneath the driver's seat. In order to drive the carriage at different speeds, the ignition can be regulated. The *chauffeur* is therefore enabled to run his motor at a low speed when his carriage is stationary.

The vehicle can be driven at a speed of 8, 18, or 27-35 kilometres (5, 11, or 17-22 miles) per hour.

The energy of the motor is transmitted by a new form of clutch to an encased gearing connected by a chain with the rear or driving wheels of the carriage. The usual reversing-gear is dispensed with; for the friction-mechanism enables the vehicle to be driven backwards. This friction mechanism consists of a disk which can be moved into or out of engagement with a second disk on the fly-wheel of the motor, by means of a vertical lever within reach of the driver's hand. When the first-named disk is thrown into action, the carriage is driven backwards; when the disk is withdrawn from the fly-wheel, the carriage is driven forward by a pulley and a belt tightened up by the lever mechanism. The arrangement, it is claimed, possesses an advantage over gear-wheels, since there are no teeth to break off. It is likewise claimed that many of the difficulties attending the use of the belt have been overcome.

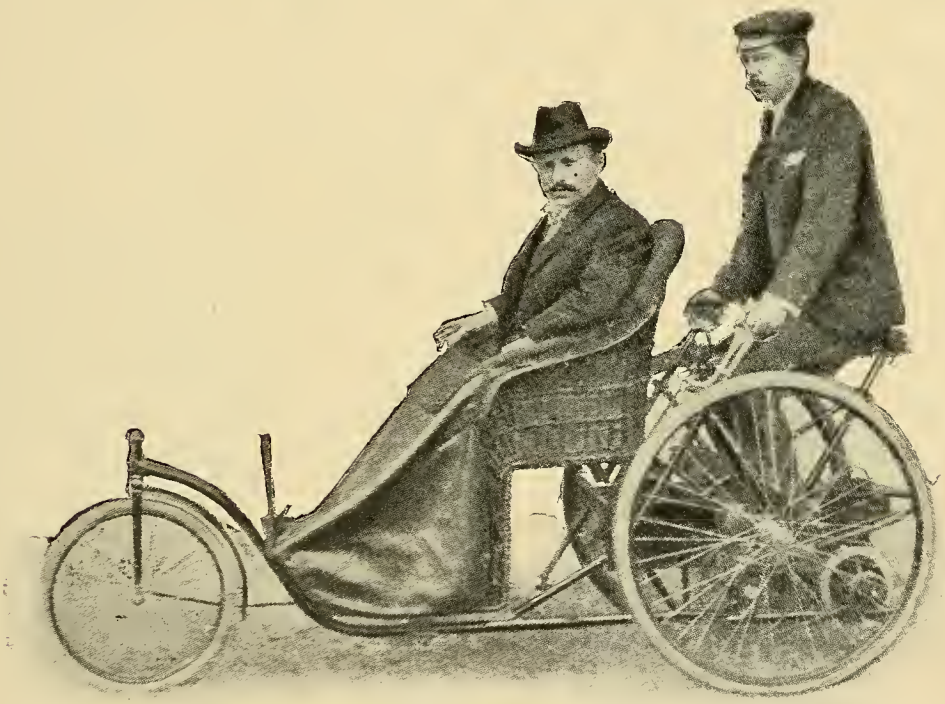
A New German Motor-Carriage

The different speeds are obtained by throwing into action the proper gear-wheels of a speed-changing gear inclosed in a water and dust proof casing. The particular gear-wheel corresponding with a certain speed can be thrown into action by operating a handle combined with the starting-lever.

The weight of the entire carriage is 1,550 pounds. The vehicle is made heavier than most automobiles of its size, because it has been found that the lighter German motor-cars are unable to travel for any great length of time over poor roads. The gain in durability more than compensates for the added weight.

Lubrication is confined to the filling of the connecting-rod cups and the cylinder-cups. All the other parts are automatically oiled.

A MOTOR BATH CHAIR



Mr. Worby W. Beaumont

One of the founder members of the Automobile Club of Great Britain.

This machine is an adaptation of the well-known "Coventry Chair," but the power or propulsion, instead of being supplied by the rear-rider, is generated by a De Dion Motor. The direction and control are entirely in the hands of the man at the back. The passenger in front is carried in a very comfortable and easily sprung wicker chair.

A New Starting Device for Motors

WE illustrate herewith the details of a ratchet-wheel arrangement for starting the motor of automobiles, recently patented by the De Dion-Bouton establishment. In Fig. 1 is shown a section through the axis of the mechanism, and in Fig. 2 a section on the line *A B* of Fig. 1.

In these figures, *a* is a shaft connected with the driving shaft through a gearing which is keyed at *b* and gives a proper ratio of speed; while *c* represents a portion of the carriage frame. Upon the shaft *a* freely revolves a chain sprocket, *d*, of which the hub is prolonged on one side and carries a ratchet-wheel, *f*.

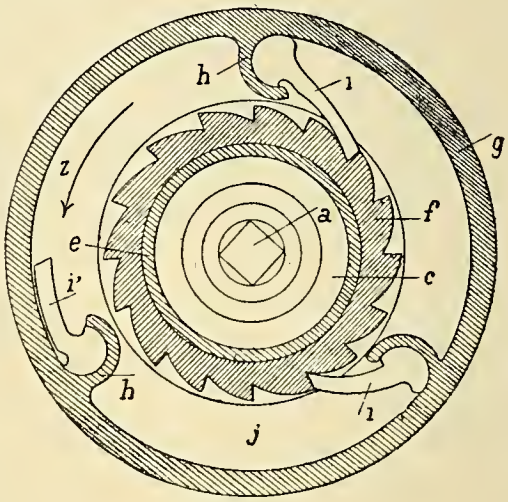


Fig. 1

To the extremity of this same shaft, there is keyed a circular box, *g*, which is cast in one piece with three curved members, *h*, in the concavity of which work the lower extremities of the clicks, *i*, that engage with the teeth of the ratchet-wheel. These clicks are capable of turning freely, and are held in place solely by the box *g* on one side, and by a properly adjusted cover, *j*, on the other.

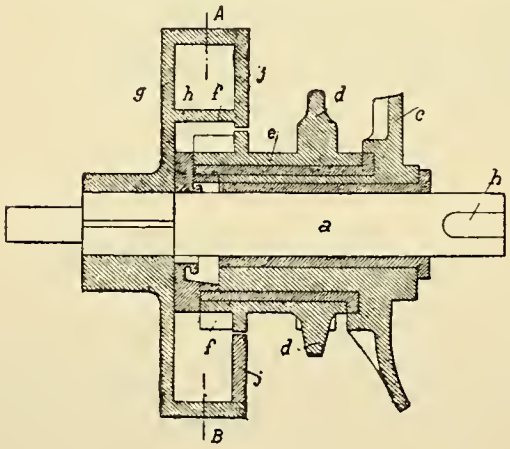


Fig. 2

To the chain sprocket, *d*, there may be imparted a continuous motion through an appropriate mechanism within the driver's reach.

The operation of the apparatus is as follows: In order to set the motor in operation, the driver, through the means at his disposal, revolves the sprocket *d* and the ratchet-wheel operatively connected therewith.

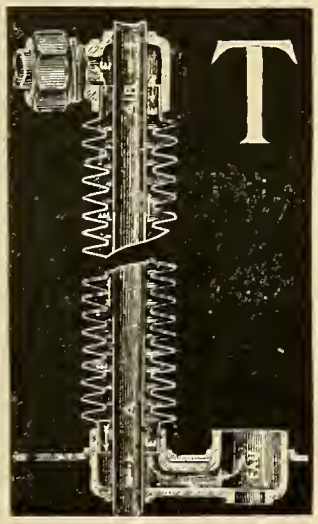
A New Starting Device for Motors

The ratchet-wheel, in acting upon the clicks adjusted in the box, causes the latter, as well as the shaft to which it is keyed, to revolve.

The motion of this shaft is transmitted, with a proper ratio of velocity, to the shaft of the motor, which, after a certain number of revolutions, will begin to run spontaneously. Starting from this moment, the shaft *a* and the box *g* will be revolved by the motor; and, since the rotary velocity is very great, the box will revolve faster than the ratchet-wheel. The clicks, *i*, through the effect of centrifugal force, will assume the position, *i''*, in which they will be completely disengaged from the teeth of the ratchet-wheel.

If, for any cause, the motor should happen to cease running, the clicks would again engage with the teeth of the ratchet-wheel. In order to effect a fresh start, it is only necessary to revolve the sprocket *d* in the direction shown by the arrow *z*. Then, after the motor has begun to operate, the carriage would be started by the usual methods.

The Apprin Radiator



THE Apprin radiator consists of a corrugated iron tube surrounding an ordinary tube with parallel walls. The water circulates in the space between the inner tube and its jacket, the corrugations of which are in contact with the air.

The result of such an arrangement is that a better rendering is obtained than with ordinary radiators, owing to the increase in conductivity and in the surface of contact with the air.

The construction and operation of this apparatus are so well exhibited in the accompanying figure as to need no extended description. It is only necessary to add this to what has been said: In order to facilitate the entrance and exit of the air when currents of the latter happen to be flowing in a direction parallel with the corrugations, the ends of the tubes must be bevelled in contrary directions.

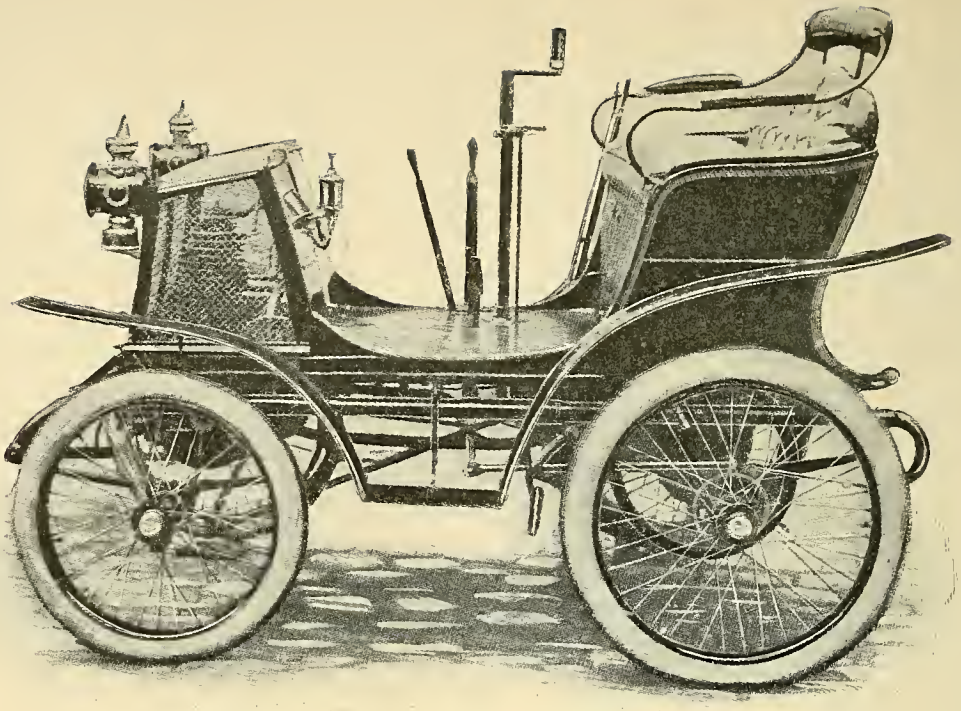


Fig. 1. The Underberg Voiturette

The Underberg Voiturette

THE voiturette represented in perspective, elevation and plan in the accompanying engravings, has been recently brought out by M. Underberg, a manufacturer at Nantes.

The motor, which is of the Gaillardet type, of 3¼ horse-power, and cooled by flanges instead of by a circulation of water, is placed in front, at *M* (Fig. 3). It actuates, through gearings, an intermediate shaft, *A*, upon which are mounted four toothed wheels that may be thrown into engagement with corresponding toothed wheels mounted upon the shaft *B*. This latter carries a pulley, *P*, which, through a belt, *E*, transmits its motion to a second pulley, *P'*, keyed upon the differential gear carried by the hind axle. A friction clutch placed upon the receiving gearing permits of effecting the changes of speed (four in number) without stopping the motor, since the clutch is operated by means of a pedal.

The motor is set in operation through a crank fixed in front of the carriage, and which is thrown out of gear automatically, as soon as the motor has started. Then the driver gets into the carriage, and, acting upon a lever, *L*, placed to his right, throws the mechanism into gear by slightly displacing the rear axle, which stretches the belt. The changes of speed are con-

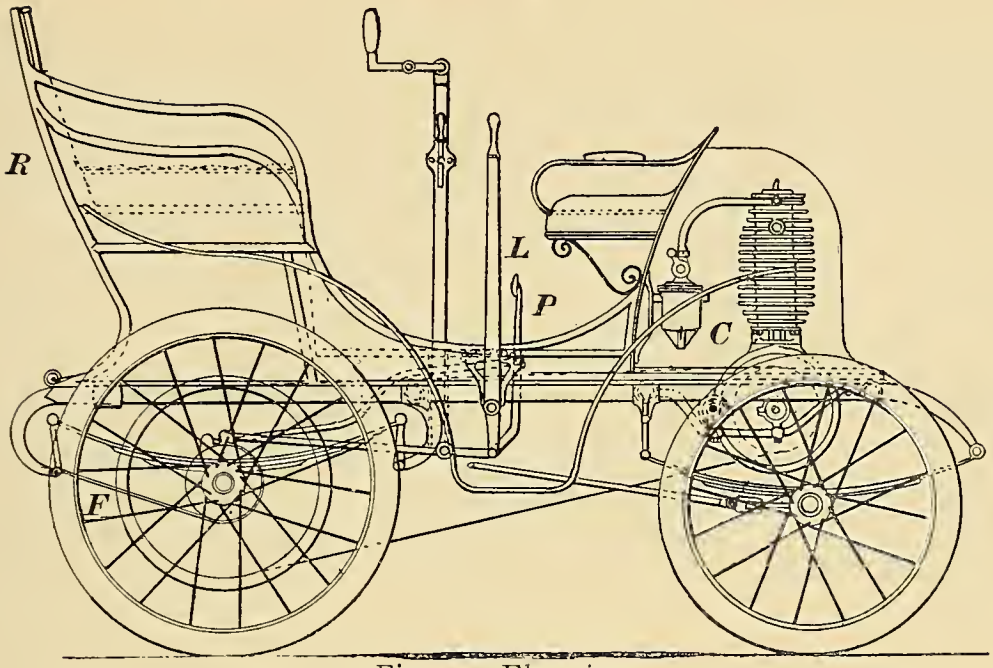


Fig. 2. Elevation

trolled by the lever *L*, which shifts upon the shaft *A* the sleeve that carries the gearings.

The carbureter, *C*, which is a constant-level and automatic one, is supplied by the reservoir, *R*, placed in the back part of the carriage. When it becomes necessary, it is heated through a pipe connected with the exhaust of the motor. A double cock controlled by levers placed upon the hollow steering bar, permits of proportioning the mixture of air and gasoline vapor to be introduced into the cylinder. The driver has at his disposal two

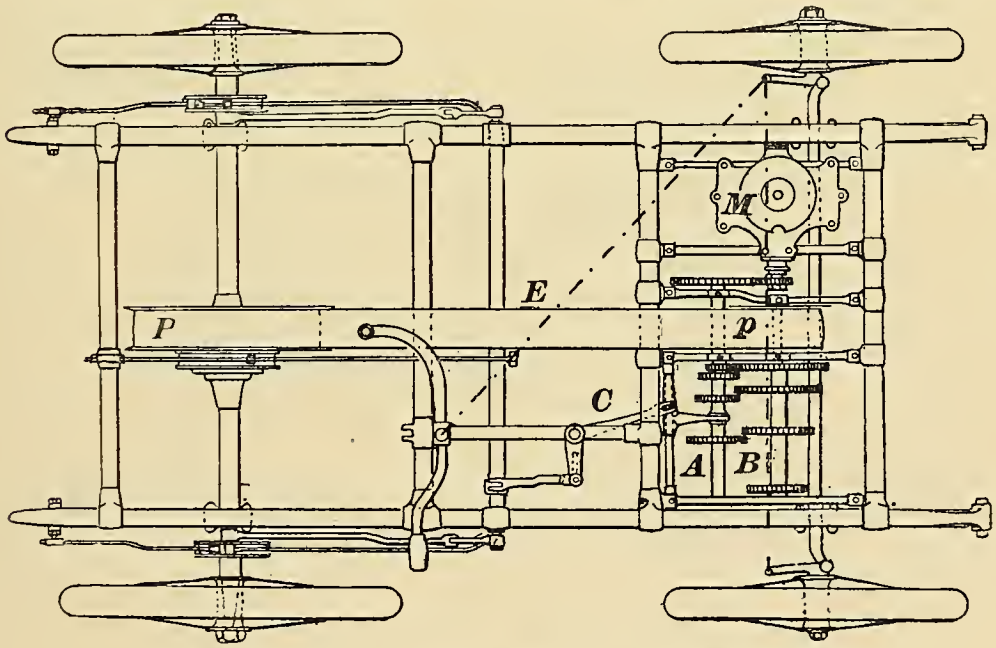


Fig. 3. Plan of Frame with Belt Transmission

brakes that are independent of one another, and one of which acts upon the differential gear, while the other acts upon the hubs of the wheels.

The ignition is produced by an induction spark; and a lever placed upon the steering bar permits of varying the point at which the discharging of the gaseous mixture takes place.

The carriage represented in Fig. 1 is designed for two passengers, but a bracket seat placed in front permits of carrying a third person or a piece of baggage.

Upon an experimental trial, this carriage has given a maximum speed of 21 miles an hour upon a level, and a mean speed of 15. It is capable of climbing an up-grade of 12 per cent.

The frame is constructed of seamless steel tubes, and is carried by four springs, while the body is carried by three. This method of two-fold spring support prevents all jarring and jolting.

In order to meet the requirements of those who do not wish a transmission by belts, M. Underberg is manufacturing a type in which the transmission is effected by gearings.

The plan of the frame of such a carriage may be seen in Fig. 4. At *M* is the motor, placed in front as in the carriage provided with a belt; *C* is the carbureter; *C F* is the friction clutch; *G* is the lubricator; *V* is the speed-changing lever; *P* is the bevel wheel that controls the toothed wheel placed upon the differential gear, *D;* and *F F'* are the brakes upon the hind wheels.

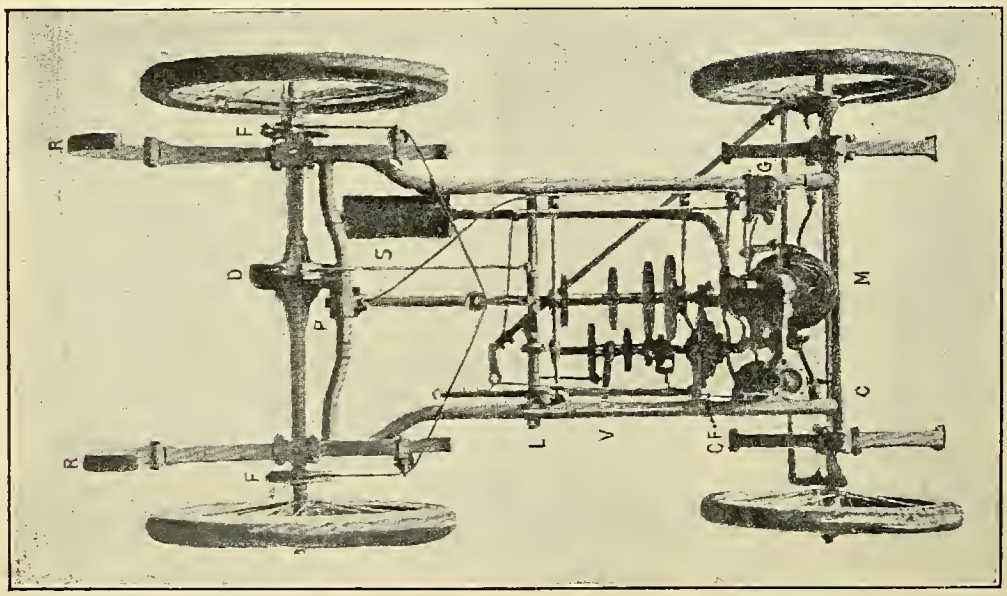


Fig. 4. Plan of Frame with Transmissions by Gearings

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Editorial Comment

A Ban upon Road-Racing

THE excessive prevalence of road-racing in France, which has been peculiarly the home of the sport, has had the inevitable result. With the multiplication of motor-vehicles in that country the habit of reckless driving, and the increasing frequency with which highways were converted from their legitimate uses for traffic into race-courses, has made travel more and more dangerous, has given rise to more and more accidents, and at last public sentiment has been so aroused as to call for severely repressive measures. It is high time the matter was taken in hand by the authorities, as it has been, with a view to efficient regulation of the whole subject. Else, even in spite of the enormous growth of automobile interests in that country, there would be the gravest danger of public opinion becoming so violently hostile as to retard the course of development very seriously.

The final strain upon the forbearance of the authorities was given by the accident caused by the carelessness of the participators in the recent Paris-Roubaix race, who recklessly disregarded the precautions that they were bound to observe. The Prefect of the Seine and Oise gave permission for the race only

on the express condition that whenever those taking part should approach any gathering of people, or any groups walking along the road, they should at once slacken speed to the pace of a walk. In consequence of the numerous accidents that have lately occurred the Prefect has absolutely forbidden all motorcycle races upon the highways in his department. Unless this order is modified it will make impossible the great races which were to be a remarkable feature of the present season, including that for the International Cup and that from Paris to Bordeaux, for both of which great preparations have been made and large expenditures incurred.

These developments have led the government to appoint a special commission to consider the subject of what regulations are necessary for the use of the automobile on the public highways, particularly in relation to signals by sound, police regulations for passing collections of people, and distinctive marks for vehicles.

While it would be a serious disappointment for many persons, and particularly to the intending participators who have gone to so much trouble and expense in their preparations, it would be a good thing both for automobile interests at large and for the public in general if road-racing should be absolutely prohibited from now on, with perhaps exceptions in favor of these two races for which such elaborate arrangements have been made. But after that France would do well to forbid road-racing for once and all, and other countries should adopt a like course.

There is little to be gained for automobile interests from such contests. The great thing desired is to introduce the automobile as extensively and as rapidly as possible. One great advantage of the new form of locomotion is its superiority to animal traction in the point of safety. But road-racing emphasizes the aspect of danger and inevitably tends to make that aspect prominent in the public eye, while making the highways more unsafe than ever. Extremely high speed is one of the least desirable things in automobile practice. It is compatible with neither safety nor comfort. For rapid transit the highways can never be expected to rival the railways, in spite of the phenomenal speed attained by the automobile in recent road trials. Road-racing with horses is prohibited nearly everywhere in this country, and there is no reason why exception should be made in favor of the automobile. Bicycle road-racing was recently in great vogue with us, just as automobile road-racing has been in France. In Massachusetts special permits were given for the purpose. But it became such a nuisance that it is now forbidden there and in various other parts of this country.

Editorial

For emergency use there is an advantage in high speed possibilities. On a good rural road, with a free course ahead, there is no harm in spurts of high speed when safeguarded by proper steering and checking appliances and the necessary skill in guidance. While the law limits speed on the highways to certain moderate rates, under such circumstances it is nowhere observed either with horses or bicycles, and it is not expected that it will be. Neither would automobilists be expected to regard it strictly. But it should be remembered that at the present stages of development the automobile is viewed with distrust, not to say hostility, by a large and influential portion of the community. It is necessary that the opposition from such sources should be disarmed by practical demonstration of the advantages of the new form of locomotion. But if road-racing and reckless speeding are to be indulged in, a strong public sentiment against the automobile will surely be stirred up. And one result will be likely to be the imposition of such restrictions upon construction that, through gearing or other devices, it would be impossible to exceed the legal maximum in speed. This would prevent a resort to high speed for emergency purposes or on occasions when no harm could result therefrom, all of which would be exceedingly unfortunate.

The sentiment of the Automobile Club of America is happily very strongly against road-racing. This should be a strong factor in discouraging the practice in this country. In Great Britain the development is very wholesome. The regulations against road-racing are stringent and are strictly enforced. The Automobile Club of Great Britain has just been enjoying a great thousand-mile tour of the country, in the entire course of which there was no racing. An occasion of that sort is of immense benefit in the promotion of public interest and the gaining of popular favor. It is in such directions, together with the achievement of universal good roads, that our energies should be bent in this country.

The automobile is a great time-saver. But practically this is not because of extremely high speed, but rather on account of moderate celerity, of promptness in starting and stopping, and steadfast maintenance of average speed in place of the dawdling movements of the horse whenever conditions of grade, etc., are in the least unfavorable.

There are, indeed, certain interesting and advantageous aspects of the automobile as a high-speed vehicle, and there is a great fascination in automobile racing. As in the case of the horse and the bicycle, however, automobile speed trials and contests should be confined exclusively to specially prepared and

enclosed courses, or to public speedways specially set apart for the purpose. Under such conditions the sport has a great future. As to road contests, they will be useful—as in the case of the great thousand-mile run in England—when restricted to other points than speed.

The Preservation of the Pedestrian's Right and Safety

There are, at present, in the City of New York about 1,000 automobiles and the prediction is justified that this figure shall be trebled before October and that May, 1901, will find about 10,000 of these new vehicles in operation in the streets of the metropolis.

The horse-car, the cable-car, the electric-car, the bicycle, all have gradually created new conditions. The automobile will do the same and the popular adjustment to the latest form of locomotion will be no less marked than that which developed in the successive introductions of improved traction.

In its introduction a much better speed-performance was expected from the electric-car than that given by its predecessors, the horse-car and cable-car, and it cannot be expected that the speed of the automobile will be as low as that of a hippomobile.

In order to determine what constitutes a reasonable speed to be allowed in the locomotion of automobiles two points have to be considered:

1st—At what shortest distance, traveling at a given speed, can an automobile be safely stopped?

2d—What curb can an automobile, traveling at a given speed, take with safety?

Comparative trials made with a horse and an automobile have answered the questions propounded above in the "stopping" and "curb" performances of an automobile running at the speed of 22 miles an hour as against those of a horse at the speed of 12 miles an hour.

All kinds of locomotion naturally dissembling each other have to be reconciled as to speed, and the time, therefore, has come when great cities like New York will have to make extensive provision for the future locomotion of the automobile.

The automobile, to-day in the minority, will be, in no distant day, in the majority, and the rapid approach of the time behooves a contemplation of the necessities resultant therefrom.

Editorial

The underground rapid transit system when completed will, of course, absorb a large part of New York's street traffic, but even with the realization of this gigantic innovation consideration must be given the pedestrian, lacking calculation for whom no plan of street transit is perfect. In line with this a preliminary suggestion is offered:

Why could there not be constructed on overcrowded crossings in Broadway, at intersections similar to those at Fourteenth, Twenty-third, Thirty-fourth and Forty-second streets, movable ramps similar to those now in operation at the Paris Exposition?

The adoption of such devices would certainly tend to eliminate the element of danger and greatly facilitate pedestrian transit at the congested points of the city. This manner of handling masses of people has proven entirely successful at the Exposition, previous to the opening of which this matter was indeed a problem, the solution of which was urgently sought.

The question of procuring power for these movable ramps has, also, been answered in Paris by the application of electricity which, contributing power to various things, including illumination, elevators, etc., also lends power to the ramps. After the substitution of electricity for cable in Broadway, why could not the fluid employed to run cars be harnessed to the various ramps?

In our opinion the sooner steps are taken toward such an arrangement the better it will be for all concerned.

A great imagination is not required to appreciate the good to be derived therefrom.

Respectfully submitted to and for the consideration of the Municipal Council of Greater New York.

Alcohol for Motive-Power

Much interest was aroused by the article on the use of alcohol for motive-power in our May number. The facts set forth were a revelation to the most of our readers. In was surprising to learn that alcohol had been used in automobile practice both in France and Germany, and that in the latter country it compared favorably with petroleum spirits in cheapness. The result in Germany is due to the fact that in that country alcohol used in the arts is exempt from taxation. This sagacious policy has been of inestimable benefit in the industrial development of Germany, and it would exert a corresponding benefit here, should our government have the wisdom to adopt a similarly enlightened policy. There is no particular difficulty in the way. All that is required is to "degrade" the spirits designed for such

use by the admixture of some simple and inexpensive substance that makes them unfit for drinking. It would then be impossible to devote such spirits to illegitimate uses.

The objections that are raised to the adoption of the policy by our government are based upon the trouble which it would occasion and the loss of revenue that would ensue. The trouble has been enormously magnified. There is no reason why the "degrading" process should not take place under the supervision of the national revenue authorities just as easily as it is done in Germany. As to the loss of revenue, in reality there would be practically nothing—the merest fraction of a trifle in comparison with the gain from the enormous industrial development that would follow. We are in the habit of calling ourselves a progressive nation and pointing to our common sense methods, while we laugh at the antiquated policies of governments like that of Spain, which places every possible obstacle in the way of trade and industry, hampering them by the most absurd restrictions that benefit nobody, and harm incalculably the interests of the public in countless directions. Yet here we adopt in this respect a policy which even Spain could not surpass in the way of fiscal folly. It makes impossible a whole line of most important industries which are now barred out as effectually as if they were specifically prohibited by law. We have adopted tariff measures especially for the building up of new industries. A few years ago there was absolutely no tin-plate manufactured in this country. Heavy moneyed interests declared their readiness to embark in the industry and establish extensive works provided a duty was imposed upon imported plate. This was done and a large share of the tin-plate industry was transferred to the United States.

Now, simply by removing the internal revenue tax from alcohol used in the arts, many industries of unspeakable value would at once spring up in this country, new industries would be created, and an enormous impetus would be given to automobile development. As it is, alcohol is now employed in the arts to so limited an extent in this country that there would be no appreciable loss of revenue from its exemption from taxation. But with such exemption the manufacture of alcohol for such purposes would enormously increase. Under improved processes alcohol can now be manufactured in this country at a cost, it is said, of from eight to ten cents a gallon. Without the tax it should therefore be sold at retail, at a good profit, for fifteen cents a gallon. And there is practically no limit to the possibilities of its production. It is chiefly made from grain with us, but in Germany it is extensively made from potatoes. It

can be produced from the fermentation of any vegetable substance containing saccharine material: pumpkins, watermelons, fruits of all kinds, roots, stalks and even leaves. Certain crops could easily be grown especially for the production of alcohol used in the arts, and a great benefit to agriculture would ensue. The present development of the use of alcohol in Germany for automobile purposes is directly encouraged by organizations devoted to the promotion of agricultural interests. It would certainly be immensely for the benefit of our own vast agricultural interests to have the use of alcohol so extended, as it thus would be, and American farmers should be alive to the importance of exerting their great power in behalf of the requisite legislation, which would open to them new markets at home. What are now useless fruit and vegetable products could then be profitably utilized for alcohol production.

If alcohol employed in the arts were thus made available a large proportion of automobilists would prefer to use it, even were it twice as expensive as gasoline or other forms of petroleum. Its freedom from unpleasant odor and its superiority in respect to cleanliness would compensate for higher cost. But in reality, were alcohol when so used exempt from taxation it would be fully as cheap as, if not cheaper, than gasoline now is.

In this connection it may be mentioned that increased interest in the use of alcohol in automobile practice is shown in France. Prince Pierre d'Arenberg has lately given the Automobile Club of France a thousand francs for conducting experiments with the use of alcohol, and the automobile daily, *Le Velo,* announces a second annual run for automobiles with alcohol motive-power over a course from Paris to Chantilly and return, to take place on October 11. The first run of the kind, under the auspices of that journal, took place last year over the same route, but owing to unfavorable weather only one vehicle made its appearance. The results, however, made an interesting contribution to the knowledge of the subject.

The Problem of Dust-Laying

The dust nuisance on steam railways has been so effectively abated by sprinkling the track with crude petroleum that the idea of employing the same means on the highways has naturally occurred. The Boston Park Commission tried an interesting experiment in this direction last season. A section of Jamaicaway, a division of the great Boston and Brookline Parkway, was sprinkled with the oil, about six gallons a linear foot being used.

The section treated was about 800 feet long. In his report on the experiment the Superintendent of Parks says:

"At the time of its application the roadway was hard, clean and smooth; the first effect seemed to be a slight disintegration of the surface, small pieces of macadam being loosened from their bond, which the wear of traffic crushed into powder; this became permeated with the oil, and formed a cushion on the surface of the road, very elastic and pleasant to drive upon. The treatment resulted in the abatement of dust for a period of two months on that part of the road subjected to it. At the rate paid for the oil the cost was two cents per linear foot, or $105.60 per mile of road forty feet wide, per barrel lots. It is possible the cost could be much reduced were purchases made by car-load lots. The cost of watering per mile for the same period would be about $200 per mile. This comparison, however, does not cover the ground, as under the oil treatment the dust was laid perfectly for a period of over two months, night and day, while under ordinary sprinkling with water, even under the most careful management, there are times when the dust cannot be controlled. One serious objection to the adoption of the oil treatment for laying dust on our parkways is the rank odor of the material; after the lapse of six or eight weeks it was still very offensive and the source of much complaint. Apart from that objection the experiment demonstrated the fact that dust can be more effectually laid by the oil treatment than by water sprinkling, and at less than half the cost. To prevent disintegration of the surface, on first application to a hard, clean road, it might be well to spread a cushion of slightly loamy sand as a matrix for the oil."

In spite of the enormous economy over ordinary sprinkling, it will be seen from the foregoing that the rank odor of the oil is something that will make its employment prohibitive. It would be bad enough on an ordinary highway, but on a park road, which is used purely for pleasure, all the pleasure derived from driving through attractive scenery in fresh air would be destroyed by the vile smell ever assailing the nostrils. There is another strong objection, not mentioned in the report, which would make its use impracticable on highways. That is, the destructive action of petroleum on rubber. Anything, of course, would be out of the question that would forbid the use of rubber tires. The railways have recognized this objection, and in sprinkling their roadbeds have refrained from oiling the highway crossings.

A saving of about 50 per cent. over the cost of sprinkling by water is something worth while striving for. And although these objections make the use of oil out of the question, experi-

ments should be conducted in other directions. Some hygroscopic chemical is said to have been successfully employed in California, where the roads become intolerably dusty in the long summer. Probably a strong brine would be one of the cheapest and most effective things for the purpose. Sea water has been used to advantage in Boston. One objection to its use has proceeded from the whitish deposit on the pavement from the evaporation of the salt water. On a macadamized surface, however, this would be hardly noticeable, and possibly some cheap coloring matter might be used to offset it in the case of stone pavements. In seaboard places where salt water is available the proportion of salt could be increased by the addition of a proportion of strong brine to each cart-load. The greater the proportion of salt in the water the better would be the result. The salt left by evaporation would absorb the moisture from the atmosphere, and so long as this was done, farther sprinkling would be unnecessary. Salt water is vastly cheaper than crude petroleum, and the stronger the solution the less frequently it would have to be employed. Possibly a few sprinklings in the course of a season would answer. This would greatly reduce the cost occasioned by the continual sprinkling necessary in the case of fresh water, which in the driest weather has to be done two or three times a day.

Our present methods of road-sprinkling are crude and unsatisfactory. The work is so unskillfully done as a rule that the surface is deluged with water and more injured than benefited by the process, while the ensuing mud is about as much of a nuisance as the dust would be. But with the hygroscopic action of an evaporated chemical, like salt, just enough atmospheric moisture would be attracted to keep the dust from blowing and maintain the surface in good repair.

Automobile Watering-Carts

We have previously spoken of some of the advantages that would come from the use of automobile watering-carts. The work would be much better and more quickly done, and there would be no horses to be kept idle in the stable, eating their heads off, at the times when sprinkling was not needed. A great economy would result. The present carts could very quickly be adapted to the new form of traction by using the " fore-carriage " for the purpose. These could be speedily constructed and supplied. There will be a great market for fore-carriages as soon as their construction is undertaken in this country.

Safety Steering

Automobilists in general will feel immensely greater security, and will take greater pleasure in their driving, when the use of some form of safety steering device becomes universal; something in the way of a lock-steering arrangement, keeping the direction given to the tiller firmly fixed until it is changed. The fatigue, the nervous strain, caused by the constant tension due to a firm grasp of the tiller, is something excessive. It is comparable to that occasioned by the tight hold that must be kept upon the reins in driving a spirited horse. Unless this grasp is maintained unremittingly there is great danger. The sudden striking of a loose stone in the road may throw the tiller out of the hand, with a quick slew and instant disaster as the result. Possibly there are several devices for lock-steering already invented. There is certainly one very effective one, at least, which has stood the test of several years in practical operation, and the writer has had the pleasure of witnessing its remarkable performance. No clutch, or even firm grasp, on the tiller is required—simply a gentle touch now and then; and no sort of jolt or shock, however sudden or violent, can change the direction of the wheels or the tiller until the impulse is given by the driver's volition. The consequence is a remarkable sense of security in operation. It should be worth the while of every automobile manufacturer to obtain the right to use a device of the kind.

Heavy Traffic Motor-Power

Recent experiments in France as to the form of motive-power best adapted to heavy traffic give the advantage very decidedly to steam, which proves to be the more flexible, adapting itself readily to changed conditions of load, and especially to roads with frequent and sudden differences in grade. On the other hand, the much lighter motors of the explosion type, as for gasoline, had an advantage on level roads. With heavy wagons the cost per ton-kilometre on ordinary roads with a steam motor was 0.373 francs, 0.2 francs, and 0.14 francs, according to whether the vehicle was one-third, two-thirds or completely loaded. With benzine motors the cost under similar circumstances was 0.673 francs, 0.369 francs, and 0.268 francs.

Book Notices

Garnier Frères have just published "*La France en Poche,*" by Le Lédier. The information given in the book is well classified. The unpaved and paved roads of each department of France are enumerated; and other useful facts regarding the nature of the country are given. The volume will probably meet with considerable favor with French touring *chauffeurs.*

The "*Almanach des Sports,*" edited by Maurice Leudet, is a magnificently illustrated and well compiled work. The best French authors in the field of sporting literature have contributed some very interesting and readable articles on the bicycle, automobilism, fencing, boxing, wrestling, shooting, football, running, etc.

Manuel théorique et pratique de l'Automobile sur route. Par Gérard Lavergne. Paris, 1900. Ch. Béranger. Octavo. Pp. 700. Illustrated with 329 engravings. Cloth, $4.00.

After a short history of automobilism and a brief review of the three principal motive agents (steam, petroleum, and electricity) used in most automobiles, M. Lavergne discusses the various elements which make up a motor-carriage—the motor (together with tables giving the power required to drive vehicles of given size and the means of measuring that power), transmission-gears, axles, wheels, tires, springs, frame, carriage-body, brakes, lubrication.

In the third part of the book the elements entering into the construction of a few well-known automobiles are described. Since it would be manifestly impossible to take up every motor-carriage made, the author has confined himself to a few well-recognized types.

The fourth and last part of the volume is devoted to an analysis of the results of the various races and contests which have been held in France. The discussion of these results will probably be of great interest to French manufacturers; for some very wholesome advice is given, to which the maker of automobiles may well devote his attention.

To the man who is about to begin the making of automobiles, this book will probably be of some service. The engineer will learn from it how to apply the mechanical principles, which form his stock in trade, to the automobile and how to solve the difficult technical problems which in the very nature of things he must encounter when he enters the field of automobilism. And lastly, the *chauffeur,* who knows little of machinery, will find in it a

means of acquiring the technical knowledge he should possess; for the author, in the opening chapters of his work, has so clearly defined and explained the various terms comprising the terminology of automobilism, that no difficulty should be met with in reading the more technical chapters.

As its title, *La Locomotion à travers les âges,* would indicate, Octave Uzanne's new book just issued by Ollendorf, is a historical review of all the means of locomotion employed by man, from prehistoric times to our own day. The text is very handsomely illustrated with engravings by Courboin, representing the vehicles used by the ancients. Several excellently colored plates picture the evolution of locomotion. As one might expect, the last part of the work is devoted to the automobile. The illustrations for this final portion represent most of the types of automobiles. Courboin's idea of a touring motor-carriage is worthy of mention.

"The Haulage of Goods on Common Roads," by H. Wilcke, is a small hand book written in a popular style. The author discusses the important question of road transport. He succeeds fairly well in stating the advantages of the automobile for country traffic. For dealing with large loads Mr. Wilcke propounds a scheme of his own which we notice he has patented. According to this scheme, the vehicles on which the goods are carried are made up into trains, or coupled together, say three or more, each vehicle is provided with a steam motor operating upon the road wheels in a convenient way; all the several motors are supplied with steam from a single boiler, in front of the train, and connected to it. This boiler is mounted on wheels and has its own engine, similar to a traction-engine; in fact it may be a traction-engine. But in this case, in addition to propelling itself, the boiler supplies steam to the engine of each car or vehicle, and also assists in hauling the vehicles.

A book which, although written in French, should prove of inestimable value to American automobilists and manufacturers is the *Annuaire Général de l'Automobile et des Industries qui s'y rattachent* (Annual of Automobilism and allied Industries), compiled by Messieurs Thévin and Houry.

The 1900 annual, which has just come to hand, is an octavo volume of 1,200 pages, which is sold for three dollars.

The book is divided into four divisions. In the first of these is to be found classified by countries (the United States being included) a list of automobile manufacturers, who are in turn classified by the type of vehicles which they make, and of the motors which they employ. The second division is composed of a list of manufacturers of automobile parts and accessories. The

third division contains a list (by towns) of manufacturers, repair-shops, experts, specialists, petroleum-supply stations, electric charging stations, etc. In the fourth division is a catalogue of automobile clubs, syndicates, and associations, with lists of their members. Transportation by automobiles is also discussed in the division, as well as the automobile tariffs of various countries. There is also a bibliography of automobile literature, patents, and the like. We are pleased to note that the advance made by American manufacturers in the new industry has been properly recognized. It is the intention of the publishers, we have been informed, to incorporate the addresses of all American manufacturers.

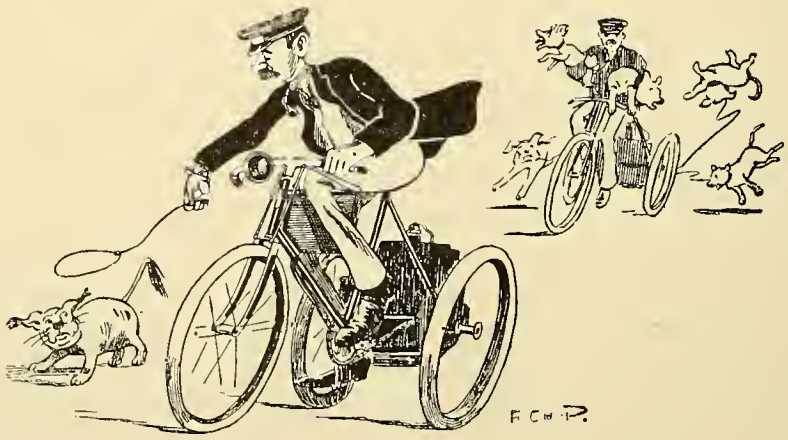
From D. Van Nostrand and Company, we have received a copy of "Petroleum Motor-Cars," by Louis Lockert. The book is a translation of the third part of Lockert's "Treatise on Automobiles on the Road," which we have reviewed in these columns. The "Treatise" was one of the first books on the automobile published in France; and none of its four interesting volumes was read with more avidity than that on petroleum automobiles. Since the publication of the work, so many improvements have been made in motor-carriage construction, that Lockert's book must necessarily give place to later discussions of the automobile. Although not fully up to date, "Petroleum Motor-Cars" will no doubt grace the shelves of many a *chauffeur*.

Baudry de Saunier, from whose pen articles have appeared in the AUTOMOBILE MAGAZINE, has just published the second volume of his "*L'Automobile théorique et pratique.*" In many respects the book is one of the most remarkable that has ever been written on motor-carriages—remarkable for the originality of the writer's style and for its thoroughly exhaustive discussion of the problems that confront the *chauffeur*. Bits of playful sarcasm alternate with recondite expositions of mechanical theories; amusing descriptions of the difficulties of automobilists give place to discussions of horse-powers and driving-gears. Taken as a whole, the book is one of the most interesting and at the same time one of the most instructive that has been added to the rapidly increasing bibliography of French automobile literature.

Georges Pierron has just completed his "Annuaire du Tourisme" for the Automobile Club de France. The book is a compact little volume, in which every French *commune* finds a place. The hotels are all mentioned, together with information regarding the hospitality accorded in each. The touring members of the Automobile Club de France should find Pierron's book of very considerable value.

The Automobile Magazine

Lee's American Automobile Annual for 1900 has just been issued from the press of Laird & Lee, of Chicago, and gives another proof of the up-to-date methods of this enterprising firm, since it is the very first original work of the kind published in this country on a subject that is attracting more and more attention the world over. The books on horseless vehicles issued on the other side of the ocean, although valuable in their way, do not really meet the wants of the American reader. The motors and vehicles constructed in the United States have to be built on principles that do not obtain, to an equal degree, in countries where the roads, climates, etc., are radically different. On that account, it is a positive treat to peruse a work written by Americans for Americans. It is clear, simple and complete, avoiding any excess of technicalities, and still describing with full accuracy the leading types of automobiles now on the market. The publishers have been very careful not to allow any particular firms of builders to be recommended at the expense of the others. Every system: gasoline, steam, electricity, is exhaustively discussed and illustrated, the author's opinion being given fearlessly as to the relative value of each. Over 100 cuts render the explanations easy to follow and understand. The rules and regulations adopted by leading cities in the country for the safe handling of automobiles on the public highways are given in full, together with monthly calendars, an automobile log-book, etc., etc. The size is handy for the pocket, and the work, as a whole, highly creditable and meritorious. [Flexible leather, $1.50.]



The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

A British Pioneer of the Automobile—
"The Autocar," Coventry, England, March 7, 1900.

A Carbonic Acid Automobile—
A technical article by G. Chauveau. With two illustrations. "The Automobile Magazine," May, 1900.

Accumulators—
Description of German Accumulators. "Automobile," Berlin, March 26, 1900.
Management of storage batteries, an article. "Motor-Car World," London, Eng., May, 1900.

Acetylene, Its Properties and Possibilities—
By Geo. W. Waltenbough. A technical article. "The Automobile Review," Chicago, Ill., 1900.

A Chainless Gasoline Truck—
A descriptive article. Illustrated. "The Automobile Magazine," May, 1900.

A Combined Automobile and Tramway Omnibus—
A description. With two illustrations. "The Scientific American," New York, April 21, 1900.

Alcohol Automobile—
Described and illustrated. "Le Chauffeur," Paris, April 11, 1900.

Alcohol in Automobile Practice—
A review of important facts in relation to alcohol as motive power for automobiles. "The Automobile Magazine," May 1, 1900.

Alcohol Motor—
Described and illustrated. "Le Chauffeur," Paris, April 11, 1900.

A Map of the Electric Stations of France—
A prospectus of a plan for the establishment of charging stations, prepared by the Touring Club of France. "The Automobile Magazine, May, 1900.

A New French Carriage—
A technical description of the Ramus voiturette. With two illustrations. "The Motor-Car Journal," London, Eng., March 30, 1900.

Automobile Exposition—
A review of the Berlin automobile exposition, 1899. "Der Motorwagen," Berlin, April 15, 1900.

Automobile Philosophy—
With two illustrations. By John Hope. "The Autocar," Coventry, Eng., April 7, 1900.

Automobiles in Australia—
Article. "Motor-Car Journal," London, Eng., April 13, 1900.

Carbureter—
The Longuemare Petroleum (heavy oil). Described and illustrated. "The Automotor Journal," London, Eng., March, 1900.

Carriage Builders and Automobiles—
By William Philipon. "The Motor-Car Journal," London, Eng., April 6, 1900.

Charging Apparatus for Accumulators—
A technical description. With illustrations. "The Automobile Magazine," May, 1900.

Coils—
Induction Coils, by H. E. Wimperis. An illustrated account of the construction and working. 1st paper. "The Automotor Journal," London, Eng., March, 1900.

The Automobile Magazine

Combination Carriage—

The Pieper Combination Carriage. Illustrated description of a vehicle fitted with both a gasoline motor and a storage battery electric motor. "Horseless Age," New York, March 7, 1900.

Compressed Air—

A Compressed Air Automobile (Une Automobile à Air Comprimé). By Daniel Bellet. A description of the Molas, Lamielle and Tessier vehicle, with details of the compressed air motor and differential gearing. "Revue Technique," Paris, France, February 10, 1900.

Diary of Forthcoming European Automobile Events—

Published for the benefit of American tourists. "The Automobile Magazine," May 1900.

Electric Attachment for Steam Automobiles—

A brief description. With two illustrations. "Electrical World and Engineer," New York, April 14, 1900.

Electric Cab—

Working Drawings of an Electric Cab. Illustrating the design of the side elevation and mechanical features. "Scientific American" Supplement, New York, March 10, 1900.

Electric Forecarriage—

System Heilmann described and illustrated. "Le Chauffeur," Paris, April 11, 1900.

Electric Vehicle Equipment—

By W. H. Chapman. An article with two illustrations. "The Automobile Review," Chicago, Ill., April, 1900.

Gallery of American Automobiles—

Illustrating four types of automobiles of American manufacture. "The Automobile Magazine," May, 1900.

Handling of Accumulators—

Advice as to the management of storage batteries. "Automobile," Berlin, March 10, 1900.

Heavy Traffic Automobiles—

Review of the heavy automobile competition at Versailles, 1898. "Der Motorwagen," Berlin, Germany, April 15, 1900.

Hydro-carbon Automobiles—

Description of George Richard's vehicle. Illustrated. "La France Automobile," Paris, France, April 1, 1900.

System de Bonstetten, described and illustrated. "Le Chauffeur," Paris, March 11, 1900.

Ducrosset's mountain automobile, Described and illustrated. "Le Chauffeur," Paris, March 11, 1900.

Hydro-carbon Motor—

The Aster motor described and illustrated. "Le Chauffeur," Paris, March 25, 1900.

Ignition—

A technical description of an electric gas engine igniter, new in design. With one illustration. "The Automobile Review," Chicago, Ill., April, 1900.

Description of a new ignition battery. With one illustration. The Automobile Review," Chicago, Ill., April, 1900.

Brief description of the Meyra dry battery. With one illustration. "The Motor-Car Journal, London, Eng., April 13, 1900.

Technical description of the Pullen reversible primary battery. With two illustrations. "The Motor Vehicle Review," Cleveland, O., May 1, 1900.

King's Automobile Hub—

A description of a new device. With five illustrations. "The Motor Age," Chicago, Ill., April 19, 1900.

Laterally Loaded Struts in Automobile Construction—

An article. "The Automotor Journal," London, Eng., April, 1900.

Lubricators for Automobiles—

Description of an oil-feeding device, made from aluminum. With three illustrations. "Motor-Car Journal," London, Eng., April 13, 1900.

Self-Moving Road Vehicles with Automobile Double Trolleys. E. Hospitalier, in "L'Industrie Electrique." Illustrated description of an automobile trolley, designed by M. Lombard Gerin. "Electrical Review," New York, March 7, 1900.

The Adams Motor—

A brief description. "Irish Motor News," Dublin, Ireland, April, 1900.

The Art of Managing a Motor—

Third paper. With three illustrations. "Irish Motor News," Dublin, Ireland, April, 1900.

The Astral Petroleum-Spirit Motor.

A brief description. With one illustration. "The Motor-Car Journal," London, Eng., April 6, 1900.

The Automobile Industry—

A brief review of the new industry. "The Age of Steel," St. Louis, Mo., April 7, 1900.

The Automobile of To-day in Europe and America—

A paper read before the Automobile Club of Great Britain. By Henry Sturmey. "The Automotor Journal," London, Eng., April, 1900.

The Automobile Outlook—

By C. S. Rolls. Interview. With two illustrations. "The Motor-Car Journal," London, Eng., April 13, 1900.

The Borow Electrical Generator—

A description. "The Motor-Car Journal," London, Eng., March 30, 1900.

The Corning International Automobile Congress—

The program and rules. "The Automobile Magazine," May, 1900.

"The Electric Automobile": Its Construction, Care and Operation.

By C. E. Woods. H. S. Stone & Co., publishers, Chicago, Ill.

The Gardner-Serpollet Carriage—

A descriptive article, with two illustrations. "The Automobile Magazine," May, 1900.

The History of the Automobile—

From its inception up to date, contained in vol. I. of "The Automobile Magazine," cloth and gilt, 625 pages.

The Kuhlstein-Vollmer Automobile—

A description, with two illustrations. "The Motor-Car Journal," London, Eng., April 6, 1900.

The Mercié Two-Speed Gear—

A description of a new device, with three illustrations. "The Motor-Car Journal," London, Eng., April 13, 1900.

The McInnerney Magneto-Electric Ignition Device—

Description, with one illustration. "The Motor-Car Journal," London, Eng., March 30, 1900.

The Pioneer of Automobilism—

A brief biography of Nicholas Joseph Cugnot. Also a short description of the first automobile. "The Motor-Car Journal," London, Eng., March 30, 1900.

The "Points" of an Automobile—

By R. W. Buttemer. "Irish Motor News," Dublin, Ireland, April, 1900.

The "Steate" Sparking Plug—

A description, with one illustration. "The Motor-Car Journal," London, Eng., March 30, 1900.

The Value of Increased Compression in Oil-Engines—

An article. "The Automotor Journal," London, Eng., April, 1900.

Tricycle Motor—

A description of a new motor of French manufacture, with two illustrations. "The Motor-Car Journal," London, Eng., April 13, 1900.

Twentieth Century Locomotion—

Last installment of a paper recently read before a Woman's Scientific Club at Newton, Mass., by Mrs. F. E. Stanley. "The Motor Vehicle Review," Cleveland, O., April 3, 1900.

Paris Exposition
Automobile Festival at Vincennes
"Gymkhana"

The Automobile MAGAZINE

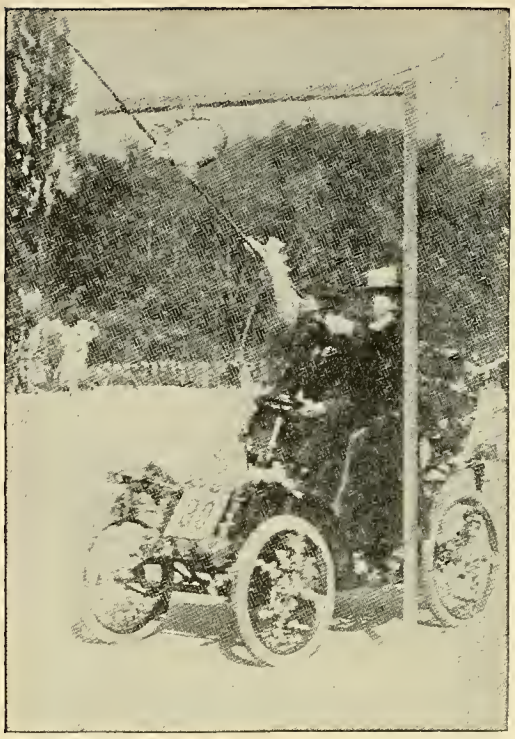
VOL. 11 JULY 1900 No. 4

Automobile Festivals at the Exposition

ON Sunday morning, May 27, sleepy old Vincennes was awakened rudely by the noisy clang of five hundred automobile-gongs. From all directions carriages came to take part in the festival which was to be held on that day. There were speedy little motocycles; voiturettes of all shapes and sizes; puffing steam-carriages, and heavy electric omnibuses. Never before had so many vehicles been gathered in one spot, and never were the good citizens of Paris more completely convinced that the automobile had permanently entered into their daily life.

That the festival at Vincennes was a great success goes without saying. The first number on the programme was a "gymkhana," a kind of automobile cotillon in which the carriages had to perform feats well-nigh incredible. The *chauffeurs* struck at painted pasteboard heads, as they filed past at full speed; they drove their machines through rings, as if mounted upon circus-horses; they took part in egg-races, needle-races, handkerchief-races, basket-races, tub-races, and almost every possible kind of contest that can be conceived.

After the "gymkhana," there were other contests which required no less dexterity on the part of the *chauffeurs*. After each man had shown the judges in a special trial how gracefully he could guide his vehicle, the automobilists were lined up for a quick-braking contest. At a given signal, the carriages all shot forward at full speed; and at another signal from one of the judges, each *chauffeur* endeavored to bring his car to a stop as quickly as possible. So skillful were some of the contestants,



Ring Sticking

that they were able to brake their carriages within a few yards.

After the trials were over the judges distributed prizes, and the victorious *chauffeurs* filed before the flower-bedecked vehicles of their admiring friends, collected around Lake Daumesnil.

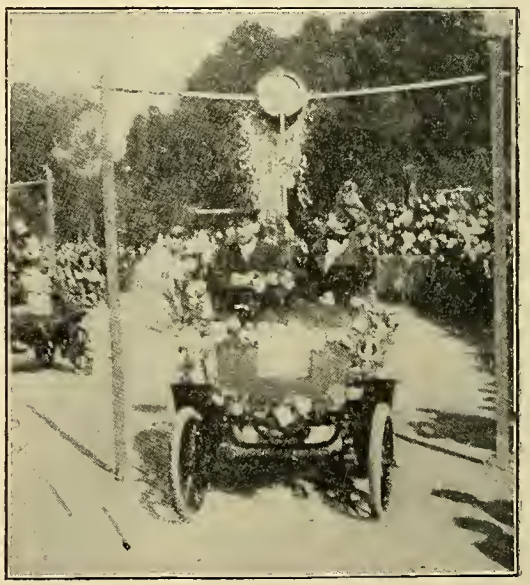
Festivals of this nature are by no means rare in France. "Gymkhanas" have been held at the Tuileries and at Pau. But without a doubt, no fête has ever been more successful than that at Vincennes. It remains to be seen whether American automobilists will follow the example of their French brethren and inaugurate similar festivals in the United States. "Gymkhanas" are fully as exciting as races and decidedly more amusing.

Among the prominent automobilists attending the fête the following were noticed:

Baron de Zuylen, President of the Automobile Club of France; Mr. Ch. Jeantaud, Mr. L. W. Ravenez, Mr. G. de Chasseloup-Laubat, Mr. Lafitte, Mr. de Dietrich, Messrs. Michelin, Mr. Lemaître, Mr. Krieger, Mr. Mouter, Mr. Georges Richard, and Mr. Archdeacon.

Also the following members of the Automobile Club of America:

Mr. John H. Flagler, Mr. C. J. Dinsmore, Mr. Alexander Winton, Mr. Jefferson Seligman, Mr. Louis Stern, Mr. Roland R. Conklin, Mr. Charles S. Weston, Mr. D. E. Stone, Mr. C. J. Field and Mr. Albert C. Bostwick.



Confetti Dropping

Doings of the Automobile Club of America

AUTOMOBILE runs in this country are as yet a decided novelty, and previous to the New York-Philadelphia event of June 2 American automobilists in a body have never attempted anything of a pretentious nature. Short voyages scarcely exceeding a score of miles have been the limit of the exponents of horseless vehicles, and the century run to the Quaker City will be remembered as the initiatory of middle distance automobilism by the Automobile Club of America.

In this run 18 club vehicles participated, the number comprising 7 steam, 7 gasoline and 4 electrically driven machines. All of the vehicles but one—a 6 horse-power gasoline omnibus, with 6 occupants—carrying 2 persons.

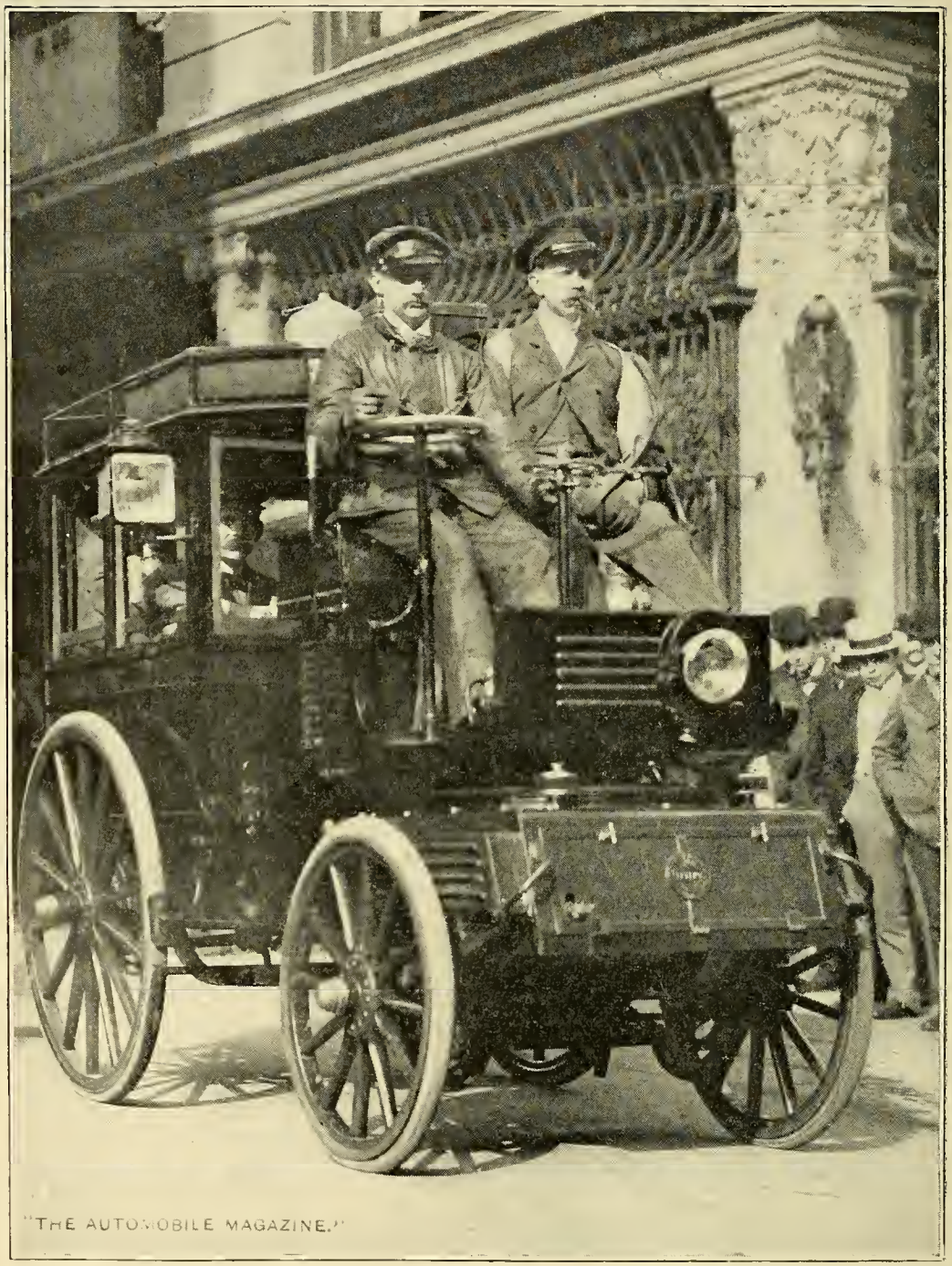
In accordance with the programme arranged by the Committee on Runs and Tours the start of the run was made at 7.30 A. M. from the Waldorf-Astoria Hotel.

The itinerary follows:

South on Fifth avenue, through Fourth street, Broadway, Bleecker and Mulberry streets, across Five Points and Paradise Park, through Park, Centre and Nassau, Broad, Beaver and Whitehall streets to the Staten Island Ferry Slip. From St. George the route led along the Amboy road to Tottenville and thence by ferry to Perth Amboy. From there it led to Metuchen, thence to New Brunswick, thence to Franklin Park, thence to Princeton, where luncheon was served. After that the road led through Trenton, Whitehorse, Bordentown, Columbus, Mount Holly, Camden, Moorestown, Merchantsville and by ferry to Philadelphia. Arriving in Philadelphia the participants proceeded to the Hotel Bellevue, where dinner was served.

Though an early hour, the start from New York was witnessed by several hundred spectators, who displayed a lively interest in the novel spectacle.

Ten minutes before the start Astor Court, the place of rendezvous, was almost deserted, but all at once a dozen automobiles wheeled in, and for a few minutes the court resembled in a degree a railroad station in the swift manœuvring of the machines. Every *chauffeur,* however, found his place in the procession, and almost before the spectators, who had been attracted, were aware the vehicles were in line and away.



By courtesy of the *Commercial Advertiser*, Saturday Pictorial Review.

Mr. E. E. Schwarzkopf's Gasoline Omnibus, 6 H. P., Carrying Six Passengers and Baggage

Doings of the Automobile Club of America

Leading the procession as pace-maker Mr. George F. Chamberlin, President of the Club, accompanied by Dr. E. C. Chamberlin, occupied a new and heavily constructed gasoline carriage of 9 horse-power.

In the line behind President Chamberlin were Mr. E. E. Schwarzkopf, accompanied, in a family bus drawn by a fore-carriage of 6 horse-power, by General Roy Stone, Messrs. William Hazleton, Winslow Busby and E. S. Hyatt; Mr. A. L. Riker with three vehicles, in the first of which he and Mr. Allen H. Whiting rode; in the second, Mr. H. M. Bylesby and Mr. Robert Graf, and in the third, Mr. H. M. McGee and Mr. John Millikin. Mr. Samuel T. Davis, Jr., had three vehicles entered; in one he and Mr. A. R. Shattuck; in another, his guests, Mr. A. W. Robinson and Captain Malcolm Rafferty, and in the third three press representatives.

Mr. George Isham Scott, with General George Moore Smith; Mr. H. R. Maxwell had as guests Mr. V. Everitt Macy, Mr. Albert Otto and two other gentlemen. Others in the procession were Messrs. Langdon, Barber, Homer W. Hedge, S. M. Butler, F. A. La Roche and C. H. Metz.

The run down Fifth avenue, West Broadway, Bleecker street and other thoroughfares to South Ferry, where the ferry was taken for Staten Island, was full of exciting incidents, pedestrians standing by and gazing in open-eyed wonder at the carriages as they sped through the streets. Seven of the first contingent arrived in time to embark on the 8 o'clock boat. The remainder reached South Ferry in time to get aboard the 8.20 o'clock boat.

St. George, Staten Island, was made at 8.30 by the first seven. On the way over the automobilists got everything in readiness for a rapid run through Staten Island to Tottenville, fourteen miles from St. George. The route lay along the Amboy road, but a number of the automobilists were a little bit mixed as to which was the Amboy road at certain places and went astray. Mr. Metz was one of these. After a ride through a sandy stretch he reached Tottenville.

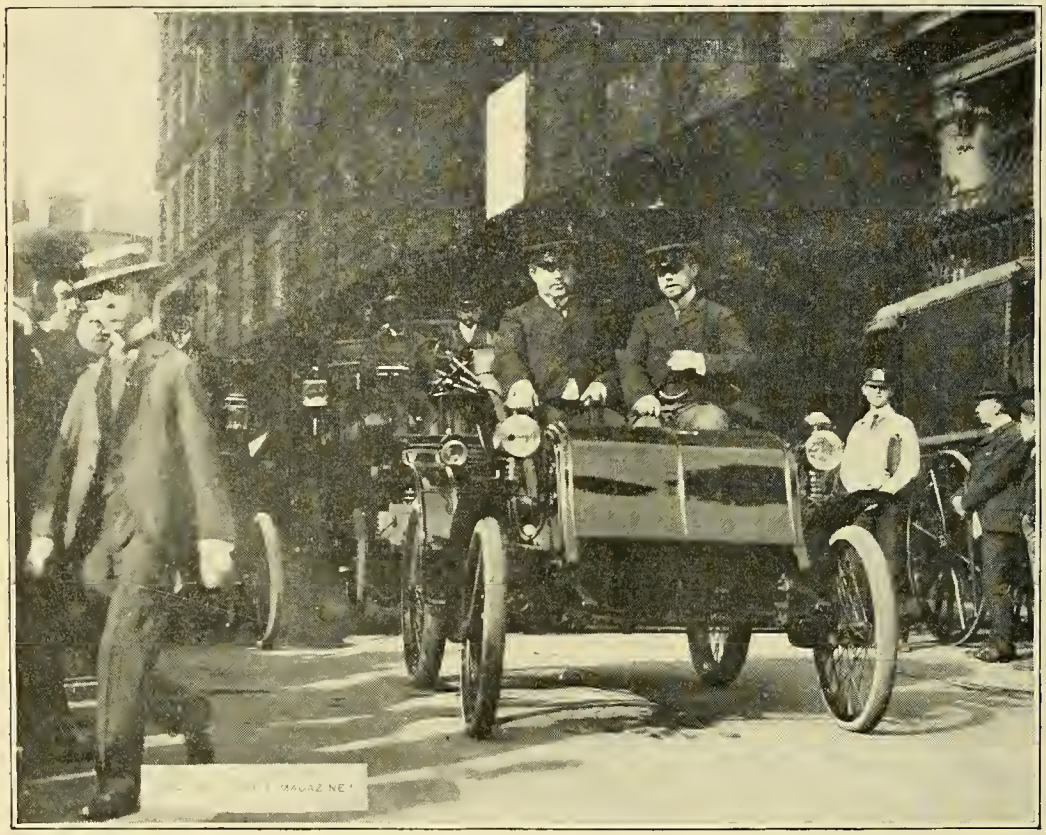
Mr. Metz was first to arrive at Tottenville and Mr. Davis second, although but little space, as automobiling goes, separated them. The little town on the southwestern end of Staten Island was reached at 9.29. A wait of twenty-five minutes for the ferry boat allowed ten of the other automobiles to come up, and when the boat drew out for Perth Amboy it had fourteen horseless carriages aboard.

Ten minutes were occupied in crossing to Perth Amboy, and

leaving the boat the vehicles shot off on the run to New Brunswick.

From New Brunswick to Princeton the route was through Franklin Park and Kingston. This section of the road proved to be both hilly and rocky for two-thirds of the way.

The electrics suffered slight accidents, but the remainder reached Princeton in good condition. Messrs. Post and Gilmore registered at 11.58; Acting President Chamberlin and Dr. E. C. Chamberlin at 12.08; Mr. Barber and Captain



By courtesy of the *Commercial Advertiser*, Saturday Pictorial Review.

Acting President George F. Chamberlin and Dr. E. C. Chamberlin, 9 H. P. Gasoline Phaeton

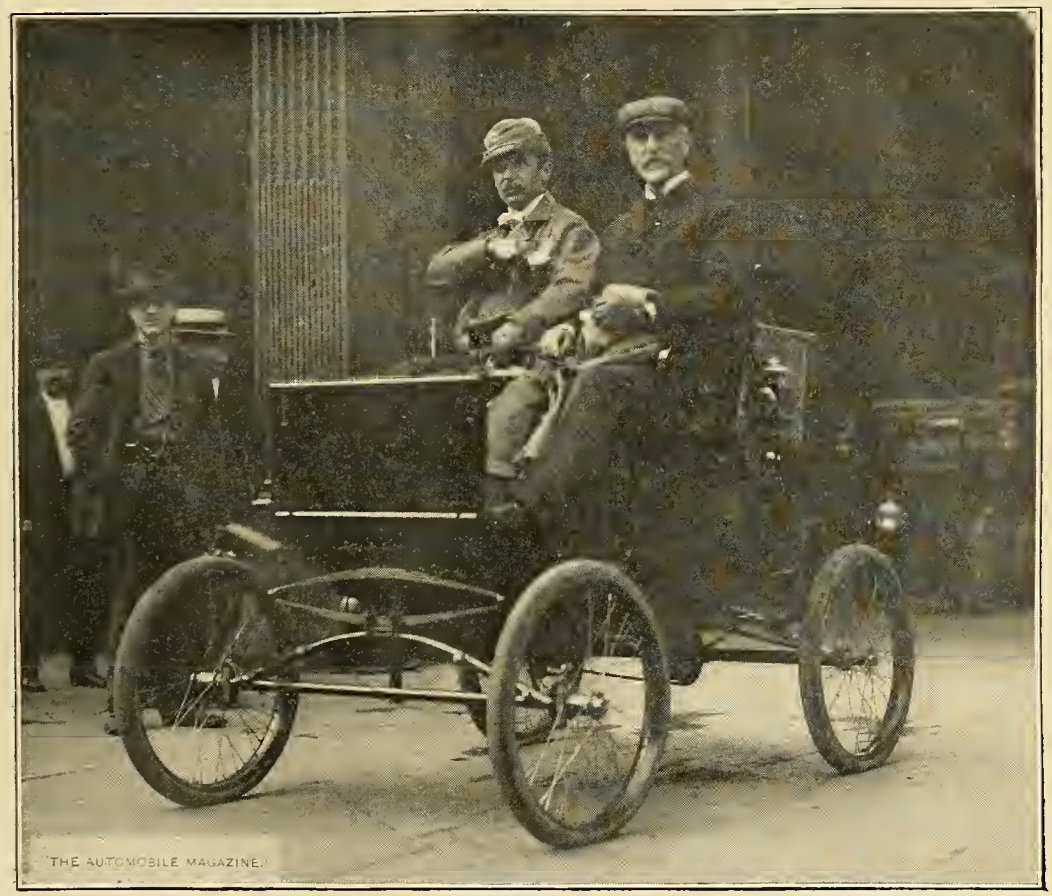
Hedge at 12.37; Messrs. Riker and Whitney at 1.11; Messrs. Hall and Fletcher at 1.18; Mr. Scott and General Smith at 1.25; Messrs. Davis and Shattuck at 2.02; Mr. Schwarzkopf and party at 2.15, and the others from then on until 3.30.

Luncheon was served at the Princeton Inn. After luncheon every *chauffeur* subjected his machine to a thorough overhauling, refilling gasoline reservoirs and water tanks, charging batteries and otherwise preparing for the final run of fifty miles. The first sixty miles having been accomplished with so little difficulty,

every participant in the run was ambitious to make the second and last stretch equally successful.

A few minutes after the procession of carriages drew out of Princeton at 3.30 o'clock a thunder-storm broke, and the run from that point to Camden developed a struggle subjecting to the severest test the abilities of the various vehicles irrespective of their weight, class, or motive power.

The rain occasioned much discomfort, but the *chauffeurs,*



By courtesy of the *Commercial Advertiser*, Saturday Pictorial Review.

Mr. George Isham Scott and General George Moore Smith, 3½ H. P. Steam Buggy

with their persons and vehicles plastered with mud, plowed on in the darkness through Trenton, Bordentown and Mount Holly.

President George W. Chamberlin was the first to reach Camden, where he embarked for Philadelphia. Arriving, he was escorted by a delegation of members of the Automobile Club of Philadelphia to the Hotel Bellevue, arriving at the hotel at 7.20 P. M.

As the vehicle drew up in front of the entrance of the hotel a forward wheel came off and the axle lurched to the pavement.

Examination showed that the ball-bearings and the cap of the outside of the hub had vanished, but all held together, somehow, long enough for Mr. Chamberlin to finish the journey of 110 miles of rocking travel from New York.

Mr. C. H. Metz, mounted on a gasoline tricycle, was the next member to arrive, coming to a stop at 7.40 P. M. From that hour until 2 A. M. the *chauffeurs* registered in turn.

Following is a list relative to the run, with names of principal participants and guests, and motive power of their respective vehicles:

Gasoline—Mr. George F. Chamberlin and Dr. E. C. Chamberlin; Mr. Percy Owens and Mr. O. S. McFarland; Mr. L. R. Adams and Mr. F. H. Gans; Mr. W. Everitt Macy and party in brake; Mr. F. A. La Roche; Mr. E. E. Schwarzkopf, General Roy Stone and Messrs. E. S. Hyatt, Winslow Busby and William Hazleton, in omnibuses; Mr. Charles H. Metz on tricycle.

Steam—Mr. S. T. Davis, Jr., and Mr. A. R. Shattuck; Mr. W. H. Hall and Mr. H. M. Fletcher; Mr. L. D. Langdon Barber and Captain Homer W. Hedge; Mr. George Isham Scott and General George Moore Smith; Mr. Arthur W. Robinson and Mr. Charles C. Moore; Mr. H. W. Curtis, Captain M. A. Rafferty and Mr. John C. Wetmore; Mr. J. C. McCoy.

Electric—Mr. A. L. Riker and Mr. Henry Byllesby; Mr. H. L. McGee and Mr. Edward Adams; Mr. John Millikin and Mr. Robert J. Graf; H. R. Maxim.

The return to New York was leisurely, Mr. George Isham Scott, with his guest, General George Moore Smith, being the first to arrive.

Lessons from the Automobile Club Run to Philadelphia.

The run, organized by the Automobile Club of America, from New York to Philadelphia on a specially selected road, has proved in all a great success. It has clearly demonstrated that for a long distance road travel the electric should decidedly be discarded, only the steam and gasoline motive powers be adopted.

The electric automobile, superior in many instances for city work, proved, in our estimation, an absolute failure on long distances. The gasoline and steam automobiles made this run at an expense averaging from about $1 to $1.50, covering 110 miles, while out of the four electrics only two arrived at the destination, and it is impossible to estimate at what price the two electrics came to Philadelphia.

Outside of the five changes of batteries it cannot be ascertained how much damage was caused to these batteries, and if

they were not even entirely destroyed. These batteries are extremely expensive and cost at an average of about $400.

Mr. A. L. Riker's electrical racer, with which he won the 50 mile race on Long Island, came to grief at the very beginning, and had to give up the struggle before arriving at Trenton. This racing machine seems to have been built for 50 mile distances.

Great credit is to be given to the Committee on Runs and Tours for selecting this road, subjecting thereby the vehicles to all road conditions—level roads, hilly roads, some stretches of dirt roads, macadam roads, one stretch of nearly 15 miles of sand and one stretch of about 9 miles of cobble-stones. The selection of the road was criticised by some daily papers having no knowledge of the Committee's purpose.

On the difficult roads, heavy rain set in about 4 o'clock, at the time when the vehicles left Princeton, and continuing until after the last arrival in Philadelphia. Notwithstanding the inclement weather, the sporting qualities of the club members have asserted themselves in the most brilliant manner. They attended to their own carriages and have clearly demonstrated that the "automobile," the last mode of terrestrial locomotion, has come to stay.

One heavy-weight vehicle, a gasoline bus, participated in this club run, carrying six passengers and about 440 pounds of baggage, and landed the whole party in Philadelphia at the expense of 9 gallons of gasoline, at 15 cents per gallon, or $1.35.

The club contemplates taking the same run again, and the members feel confident that the course will be covered next fall within six or seven hours.

Many of the club's members are still in Paris.

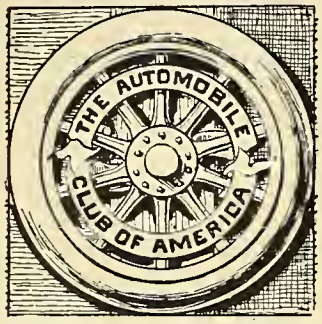
Mr. John Brisben Walker, one of the members of the club, recently announced that the House at Kingsland Point-on-Hudson has been refitted and will be in shape to entertain such members of the club as may find it a convenient stopping place. In addition to Mr. Walker's invitation is another issued by the New York Athletic Club, extending to the members of the Automobile Club of America the privileges of their house and grounds at Travers Island for the season of 1900.

The following gentlemen have been recently elected Active and Associate Members of the Club:

Active Members.—R. L. Morgan, A. B. Mohler, Harlan W. Whipple, W. L. Stow, Benjamin Stern, R. Esterbrook, W. McMaster Mills, Julius G. Kugelman, Paulding Farnham, James C.

Church, Frank W. Duryea, Charles Livingston Hyde, Ralph Brandreth, H. M. Byllesby, Percy Owen.

Associate Members.—Rollin Henry White, Frederick Mead Shepard, D. N. Seely, F. G. P. Barnes.



Insignia of the Automobile Club of America

The Board of Governors have selected and adopted the accompanying design for a badge, which represents an automobile wheel with a ribbon intertwined in the spokes bearing the name of the club. The badge is of the size of a silver half dollar, and is manufactured either of gold with the tire of the wheel of silver, or of gold with the tire of wheel of gold, or of gold with the tire of the wheel of platinum. The badges are made by Theodore B. Starr, No. 206 Fifth avenue, New York City.

THE HORSELESS STABLE

THE automobile "stable" is a logical product of the times. While many devotees of the new sport continue to shelter their automobiles under the same roof with the quadrupeds of their former equipment, the real enthusiasts have procured separate quarters in which to store their more modern vehicles.

The Automobile Storage and Repair Company, of No. 57 West Sixty-sixth street, New York City, has made the first notable provision for the reception of automobiles in the metropolis, and the company has distinguished its purpose by the adoption of the appellation, "The Horseless Stable." The company occupies 4,000 feet of floor surface and the 50 or more vehicles at present being housed form an interesting exhibit.

An array of chamois-skins and dusters and a huge stand on which the vehicles are washed furnish the only suggestion of horse-stables.

The bright and correctly appointed carriages lend to the place the appearance of a show-room, the rheostats and electric meters on the wall have the effect of an electrical laboratory, and the office and waiting-rooms suggest a club. Altogether it is a most unique institution.

The International-Cup Race

THE race for the International Cup, instituted by the initiative of Mr. James Gordon Bennett, has passed into history, and, as was universally expected, has been won by the Automobile Club of France in the person of its representative, M. Ferdinand Charron, who has thus added new laurels to his brilliant record. A race which, as *Le Velo* has set forth, beats the express-train speed between Paris and Lyons, was naturally a tremendously exciting affair. Yet in some ways it was a disappointment, for as an international event it represented only three countries—the United States, Belgium and France. Germany was on hand, but on account of an unfortunate occurrence her representative withdrew just before the start. The three other important automobile countries, as they might be called—Great Britain, Austria and Italy, whose participation had been counted upon, were not represented at all. France, with her three contestants against one from the United States and one from Belgium, won a decisive victory and made a magnificent record.

Monsieur Ferdinand Charron,
The First Chauffeur of France

The start was from Ville l'Array, at the point selected at the entrance to Saint Cloud on the Versailles road, just above the Montretout grade crossing. It was nine hours and nine minutes later when M. Charron reached his goal at the restaurant des Delices de la Demi Lune, ten miles out of Lyons, covering the 566 kilometres, or about 351 miles, at an average gait of 61.857 kilometres, or 38.4 miles, an hour.

In order to make the route cover the 550 kilometres required by the stipulated conditions, it had to be made much longer than the direct route between Paris and Lyons. By rail the distance is 512 kilometres, or about 318 miles, and the express makes it in

eight hours and fifty-seven minutes; at M. Charron's average the train time would be eight hours and sixteen minutes.

The hazardous character of automobile-racing is shown by the fact that every competitor met with accidents, mostly due, it would appear, to the terrific strain and the intensity of wear and tear to which the vehicle and its mechanism are subjected under such a test. It seems a wonder, almost, that even two of the five contestants should have been able to run the race from start to finish.

The following were the contestants who entered and started:

M. René de Knyff, France.

M. Jenatzy, Belgium.

Mr. Alexander Winton, United States.

M. Ferdinand Charron, France.

M. Girardot, France.

Unfortunately Herr Engen, who was on hand to represent Germany, did not have his tires ready at the time given for the start, and accordingly withdrew with a protest against the short time allowed for getting ready; a protest which was supported by the Belgian contestant, M. Jenatzy, whose vehicle, that had been specially built for the occasion, was not ready, so that he used an improved racer, which was objected to somewhat because its tires were of French make.

A non-entered contestant, as he might be called, was M. Levegh, who had distinguished himself in winning the Bordeaux-Perigeux-Bordeaux race against Mr. Bostwick. Had Mr. Levegh been regularly competing, possibly he might have given Charron a hard struggle. He started ahead of the regular contestants. He was seen to pass Limours at the rate of 100 kilometres, or 62 miles, an hour; at Chateaudun he had made the 125 kilometres, or 77.6 miles, in one hour and thirty-two minutes, and he passed Orleans at 5.25 o'clock.

At Chateaudun the first accident was noted, Mr. Winton, the victim, passing with a bent front wheel and punctured rear tire. At Orleans M. Charron appeared with an axle bent in taking a gutter 3 kilometres before, and at the same place M. René de Knyff practically withdrew on account of breaking his fourth speed just after passing Chartres, but did not formally abandon it until reaching Gien at 11.25. At Orleans he was followed in three minutes by M. Jenatzy with two fuses broken and several punctures. Then, just on leaving the city, M. Girardot lost his fine advantage by his ill-luck in frightening a horse and running against a curb to avoid a collision. This broke his wheel and he lost over an hour in waiting for repairs at a neighboring

blacksmith shop, not being able to resume until 7.55 o'clock. At Chervreuse M. Jenatzy was disabled by bursting both front tires. The last accident was to M. Charron, 12 kilometres before the finish, his pump broken by running over a dog.

M. Charron reached the goal much exhausted, but pleased with his victory. He was greeted by a large number of automobilists who had come out to await the end. In the evening MM. Charron and Girardot were entertained by the Automobile and Bicycle Club of Lyons.

The chief lesson of the race appears to be the need of greater care in construction. Parts should be made much stronger, and tested thoroughly to stand strains far greater than what they are subjected to on such occasions. The margin of stability should be very much increased. And judging by the experiences here, it would appear that there is as much need for the racing automobilist to carry a fifth wheel to his coach as in the case of artillery.

Following is a recapitulation of the time of the contestants at the various points along the route:

Left Ville d'Array 3.14 *A. M.*

Girardot.	Charron.	de Knyff.	Winton.	Jenatzy.
H. M. S.	H. M. S.	H. M. S.	H. M. S.	H. M. S.
	Limours, 18.6 *miles* (30 kilometers).			
35 15	38	39 30	45	1 15
	Chateaudun, 77.6 *miles* (125 kilometers).			
2 00 44	2 26 55		3 14 50	2 37 56
	Les Ormes, 95.6 *miles* (154 kilometers).			
2 35	2 41	3 27		3 32
	Orleans, *miles*.			
2 39	2 56	3 35	5 16	3 38
	Gien, 146.5 *miles* (236 kilometers).			
5 31	4 01			
	Nevers, 200 *miles* (322 kilometers).			
6 56	5 28			
	Moulins, 233½ *miles* (376 kilometers).			
	6 14			
	La Palisse, 265 *miles* (427 kilometers).			
7 50	6 55			
	Roane, 286½ *miles* (476 kilometers).			
8 27	7 49			
	Lyons, 351 *miles* (566 kilometers).			
10 30 28	9 9 48			

The Police Department on Traffic

IN consequence of the increasing frequency of accidents resulting from careless and oftentimes reckless management in vehicle street traffic in New York City, the Chief of Police has recently issued, for action by the Captains of the various precincts, an order, a copy of which follows:

POLICE DEPARTMENT OF THE CITY OF NEW YORK,
OFFICE OF CHIEF OF POLICE,
300 MULBERRY STREET,
NEW YORK, June 9, 1900.

SIR—You will give the members of your command special instruction regarding their duties in connection with the so-called "Rules of the Road," and especially with regard to the necessity for drivers of vehicles of all kinds being made to keep to the right on any thoroughfare on which they may be proceeding.

You will also instruct the members of your command that whenever any driver, motorman, brakeman or other person in charge of any car, truck, wagon, carriage or vehicle of any kind refuses to stop such vehicle promptly when an officer raises his hand as a signal that the vehicle is to be stopped, the driver or person in charge of such vehicle must be arrested. The failure of those in charge of vehicles to promptly obey the directions of police officers on crossings, at ferries, in crowded streets, squares, etc., is a dangerous practice, and one that I insist shall be checked. The interests of the officers themselves, as well as the life, safety and comfort of the general public, are dependent upon the strict observance of these regulations by persons in charge of the vehicles, and you will impress upon the members of your command the necessity of a rigid enforcement of said regulations.

Read this to your command at three successive platoon roll-calls immediately following its receipt.

(Signed) WILLIAM S. DEVERY,
Chief of Police.

The First American Automobile Show

THE Inter-State Fair which is held every year at Trenton, N. J., will have many new and interesting features this year.

The Fair will open September 24, and will include an exposition of automobiles and accessories and a series of automobile races. The automobile exposition will occupy 30,000 square feet in Building No. 3, which, in former years, has been devoted to exhibitions of carriages and miscellaneous exhibits. It will, undoubtedly, be one of the greatest exhibitions of horseless vehicles that have been seen in this country.

The exposition and races will be held under the direction of Mr. E. E. Schwarzkopf, a member of the Automobile Club of America.

It is announced by the management of the Fair Association that there will be no charge for spaces desired for exhibiting automobiles and their accessories, but all allotments of space must be secured on or before the 15th of July. The entries for races will close on September 1.

The opening day of the Fair will be devoted to the races, and the winner of the series will be presented with a handsome silver trophy to be known as the "Inter-State Fair Cup." The entrance fee for each vehicle will be $10.

Of the races there will be five events in all. The preliminary tests will be for $100 each, or a plate valued at that sum, and a ten-mile open championship race for a purse of $200.

Following is the list of the events in contemplation:

First race—Electric, 5 miles, $100 plate or cash.

Second race—Gasoline, 5 miles, $100 plate or cash.

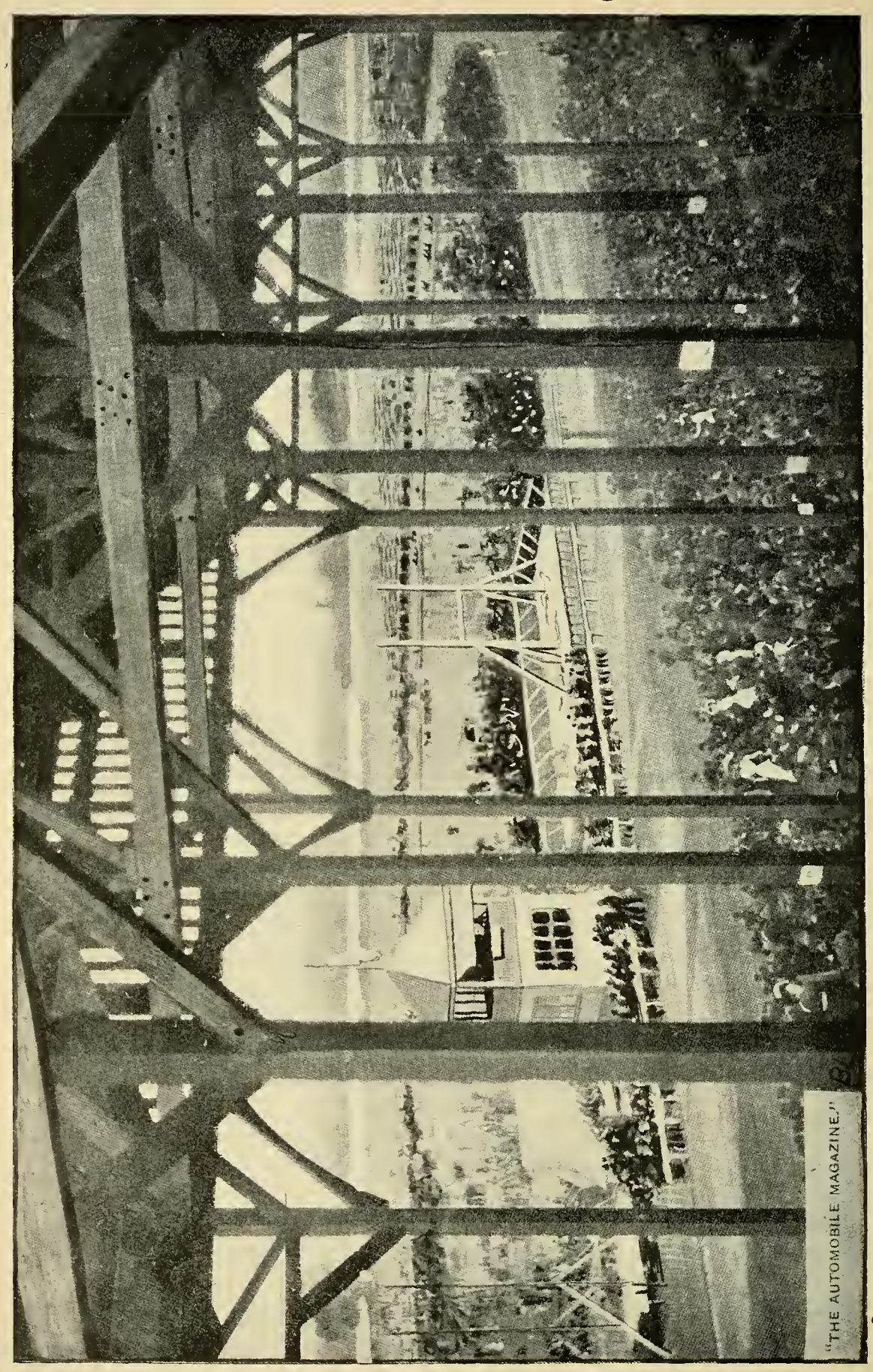
Third race—Steam, 5 miles, $100 plate or cash.

Fourth race—Open championship, 10 miles, $200 plate or cash.

Fifth race—Open only to members of the Automobile Club of America and Automobile Club of Philadelphia, Pa., 10 miles, Inter-State Fair Cup.

The Fair Association will provide for the establishment of a charging station for electric vehicles.

The stewards of the meet and the judges of vehicles and their accessories will be constituted from members of the Automobile



One-half Mile Automobile Track (65 feet wide), Greater Inter-State Fair (Trenton, N. J.)

Club of America and the Automobile Club of Philadelphia, who will sign and present handsome diplomas to successful competitors. There is to be no race with less than three competitors, and all of the races are to be governed by the racing rules of the Automobile Club of America.

The Inter-State Fair Association of Trenton, N. J., is organized under the General Corporation Law of the State of New Jersey.

The official organization consists of a President and Vice-President, elected annually by the stockholders, and a Board of twenty-seven Directors, also elected by the stockholders for a term of three years each, nine members of the Board retiring each year. The Treasurer and Secretary are elected by the Board of Directors.

Mahlon R. Margerum, Secretary Greater Inter-State Fair (Trenton, N. J.)

The real estate of the Association consists of 120 acres of land, situated in the township of Hamilton, Mercer County, N. J., adjoining the City of Trenton. The Fair Grounds are located directly on the main line of the New York division of the Pennsylvania Railroad.

Ninety acres of the tract referred to are enclosed in the Fair Grounds proper and used for exhibition purposes. The buildings and improvements consist of an oval half-mile clay track 66 feet wide. A single-deck grandstand, 427 feet long and 60 feet deep, the seating capacity of which is 5,179, comprising 168 box seats, 1,670 folding reserved chairs and 3,341 high-backed bench seats. In addition there are provided 1,516 seats on open bleachers within the grandstand paddock.

The attendance in past years has been from 50,000 to 60,000 people daily.

There are the following exhibition buildings:

Art and ladies' work and home and dairy products	80 × 160 feet.
Merchants and trades' display	80 × 160 "

Poultry, pigeons and pets	72 × 100 "
Agricultural and horticultural products	200 × 200 feet.

The stabling for the live stock department is divided as follows:

140 stalls for speed horses	10 × 12 feet.
160 " " horses for general use	10 × 15 "
252 " " cattle and horned stock	10 × 12 "
206 " " sheep and swine	7 × 10 "

The exhibits will consist of 12 departments, classified as follows:

Department A.—Horses for speed.
Department B.—Horses for general use.
Department C.—Cattle.
Department D.—Sheep and Swine.
Department E.—Poultry, Pigeons and Pets.
Department F.—Merchants and Trades' Display.
Department G.—Art and Ladies' Fancy Work.
Department H.—Home and Dairy Products.
Department I.—Agricultural and Horticultural Products.
Department J.—Farm Machinery and Implements.
Department K.—Carriages and Vehicles.
Department L.—Automobiles and Accessories.

The Fair will be open from September 24 to September 28, inclusive.

The officers of the Association are: General Richard A. Donnelly, Rudolph V. Kuser, and Mahlon R. Margerum—President, Treasurer and Secretary, respectively.

Why the Automobile Tipped Over

By Richard Leonard Bell

PLEASE can I have the automobile for the early train?"

In the almost breathless request, the hurried, fierce, and almost defiant manner, it would have been difficult for any one to have recognized the speaker. She was a girl. A young, bright, pretty girl, who, radiant in her shining ball-dress, and with the happiest face and lightest tread, in the room, had been dancing indefatigably for the past four hours. No one had seemed to enter with more joyous abandonment into the spirit of the hour, and accordingly the petulant demand, with its accompaniment of flushed cheek and quivering lips, almost took away the breath of the person to whom it was addressed.

Mr. James Smithton, the millionaire manufacturer of bath-tubs, was giving the ball—a summer ball at his summer home in the Adirondacks—for the purpose of pleasing his young cousin, Ethel Moore, and to celebrate a certain event which had his warm personal approval and sanction. The function was nearly over and it had been a great success. He was good-naturedly conscious of having given a great deal of pleasure, and was now leaning against the entrance doorway ready for the departing guests to pass through and shake his hand and offer him their congratulations. Accordingly his first reply to Miss Moore's breathless "Can I have an automobile for the early train?" was a stare of bewilderment.

"Great Heavens, Ethel! What do you mean? What have you to do with the early train?"

"Only that I am going away by it, Mr. Smithton."

"Going away by it! My dear girl! I really don't understand. Dear me, what will Tom Willing say to that?"

"Thomas Willing will have nothing to say to it. Mr. Willing has no right to say anything now. But please don't ask me any questions. I will write everything after I have gone. Only can I have an automobile?"

"Of course, my dear child, you can have an automobile. But," in tones of remonstrance, "it's nearly 3 o'clock now and to catch the early train for New York you must start by seven."

"I know—I know. I will be ready. Oh! thank you so

much, Mr. Smithton—but—but I can't stay." Then there was a sudden sob; and the next moment there was a rustle of flying skirts, and a white figure vanished up the broad staircase and was instantly lost to view.

"Wow," exclaimed Mr. Smithton, looking after her, "that's quick work; what the—but another voice at his elbow interrupted.

"So sorry to trouble you, Mr. Smithton, but can I have an automobile to be carted over to Grandview to catch the early train? It's a nuisance, but I find I've got to leave at once. I know you will forgive me for cutting short my visit, which, believe me, I regret to do. I will explain by letter. It's rather sudden, and I'm really ashamed to have to worry you with so early a start—but I must."

This speaker was a tall young man, whose serious face added to the dignity and composure with which he made his request. But a close observer would have seen that Tom Willing was, in a manner, not himself. The host, after a glance and an imperceptible raising of the eyebrows, did not attempt to argue the point, as he had done in Miss Moore's case.

"Of course, Tom, my boy, you can have anything you want," he replied. "You know it will be necessary for you to rise before you have had more than a few hours' sleep, for the train passes Grandview at a little past eight, but I will bring out the speediest of my machines to get you there in time. I'm sorry you're going, Tom, but if it is a case of 'must' the only thing to be done is to give orders at once. I will have your breakfast sent to your room, and you be at the front door at seven sharp. I'll see to it myself, and will call you in person, for the servants will be half asleep."

"I shall not go to bed," said Willing quietly, "it's not worth while; and besides I couldn't sleep if I did. I think, however, I'll go up and pack now, so 'good-night.'" He put out his hand and held that of the other for a moment. Their eyes met, but neither spoke another word.

"Now, what on earth can it be?" Mr. James Smithton cogitated with himself, as he went to give orders. "A capital match—a nice, bright, pretty girl, and a good girl, too—and with a fortune that would have been such a comfort to poor Tom, who has a mother and three sisters depending on his salary! And Tom is such a good fellow—such a good fellow, and so honestly in love. And he's a man who, I verily believe, was never in love in his life before. It seemed too good to be true. Indeed it did. And I gave this ball and have stayed up all night to let everybody

know of the engagement, and this is to be the end of it. Two automobiles ordered for the early train! That's a nice kind of an anti-climax."

A slow frown settled down on the millionaire's usually jovial countenance. For a moment he stood in a deep meditation.

"By heavens!" he suddenly said aloud, "there shall only be one automobile!"

Punctual to the moment the tall form of Tom Willing, fully equipped, stood on the front doorstep. He was looking at his watch and seemed to be nervous. The "zing" of the bell was all that told him that the smooth-running automobile was approaching the house. In another instant an open, high, two-seated vehicle stood in front of him. It was one of the many in the horseless stable of Mr. Smithton. Tom's valise and golf-case were placed on the front seat beside the driver, and Tom himself stepped sprightly to the rear seat, and waited for the driver to start.

The automobile did not move. One—two—three minutes. Tom was getting impatient. He looked at his watch nervously, but had he looked over his shoulder he would have seen another figure emerge from the hall door—a girlish figure in a gray traveling dress evidently put on in haste, for her coat collar was unfastened, her hat awry and her gloves in her hand. Moreover, the youthful traveler's face was very pale, and her eyes were very red. At sight of Tom Willing she stopped with a start. And something made Tom turn at that moment. As his eyes met hers he was motionless with consternation.

"My—my automobile; my maid. Where are they?" Miss Moore gasped as she looked blankly at the footman who had come to help her.

"Your maid went on with the baggage, Miss," replied the servant. "She thought it best, fearing that some of the parcels might get lost." The footman shivered in the cool morning air, respectfully signifying by his demeanor that he would consider it a favor if Miss Moore would hurry and let him return to bed and resume the sleep from which he had been so rudely awakened. The driver of the automobile, an intelligent American boy, in a natty livery of red and gray, grasped the motor lever and gave the bell a tiny ring just to impress the young lady that time was precious, and that if she really wanted to catch that early train she would have to mount the automobile and without a moment's delay. Was ever girl placed in such a predicament, she thought —or was ever man, thought Tom. To have to ride side by side over five miles of beautiful roadway, through scenes familiar and

attractive and in the bright sunshine of a perfect June morning, when only a few short hours before they had decided to part forever.

The footman assured Miss Moore that "no other conveyance had been ordered." Tom Willing noticed her discomfiture. It was for him to act. Under the eyes of the servants he could not put down his luggage and return to the house. So without uttering a word he jumped from the automobile and as Miss Moore walked toward it, seemingly in a trance, he gallantly helped her to the rear seat and then sat down beside her. A light robe was spread over their knees by the footman, and the driver, without waiting for a word, pulled the lever that sent the graceful machine over the garden road as if it were a thing of life.

Over the highways they rolled, their faces looking in opposite directions, and with no charm in their hearts for the singing birds, the gay colored flowers of the fields and the seemingly eternal chain of mountains stretching away before them—all of which they had once happily mingled in their love talk. Tom wondered if he had done right. Occasionally he would cast furtive glances at his luggage in the front seat and wondered how Ethel would rather have been there instead of beside him. But conventionality prevented a young lady from sitting beside the driver of an automobile or any other bygone vehicle, when there was another seat to be had. So with swelling heart and compressed lips one sat well forward hoping that her face was nowhere visible, and that the back of her neck and throat betrayed nothing. In a miserably distorted, screwed up and excruciatingly uncomfortable attitude, the other held himself well back, breathing fast and unevenly.

The automobile whirled faster and faster. Winston appeared to be a somewhat reckless driver. They swayed from side to side, and more than once narrowly escaped taking a post or the end of a bridge rail. Tom Willing would have called out sharply to the driver to be more careful, but Tom Willing was determined not to open his mouth.

He looked round uneasily, however, more than once, and knitted his brows under his white felt hat. "He'll have us over," he was saying to himself, and he had barely said this, without any thought of it being the actual truth, when there came a tremendous lurch, the automobile appeared to spring up in the air on one side, and the next moment its occupants—or at all events, two of them, were shot out and landed in some soft grass by the roadside, where both for a moment lay quite still.

Winston tugged madly at the lever and it seemed for the

moment as if the automobile had got beyond his control. The vehicle stopped and started—went backward and forward as if a devil had possessed it, and then giving a mighty spring shot over the roadway and Willing was on his feet just in time to see it bolt over the summit of a hill. Winston was on his feet, but still sticking to his post.

Tom Willing knelt by the side of his motionless companion.

" Ethel."

" Mr. Willing," she replied after a moment of tears.

" Oh, Ethel, my darling, you are not killed. Thank heaven for that. But are you hurt? Open your eyes and see who it is; it is I—Tom—tell me are you—are you hurt?"

" I—I don't think I am hurt, thank you, Mr.—Tom," faintly. " Oh—Tom—do tell me are you hurt? Oh, do say you are not h-h-hurt, Tom?"

" My poor Ethel," and Tom folded her in his arms.

Ethel sobbed vehemently. All she could say was " oh-oh-oh-oh! To-To-To-Tom."

Tom, in her ear: " Won't you tell me what it was, dear?"

" Oh, I don't think I can, Tom."

Tom, however, was sure that she could. He was kneeling by her side on the damp grass, her head was on his shoulder and her face so close to his that no one could have told when they touched each other. Now, he was not going to trifle with the advantages of such a situation. " You must tell me," he firmly said, and he reiterated this so often and accompanied the demand with so much pressure of another sort, that at last—well, at last she did tell him.

She had overheard such a dreadful thing at the ball—such a dreadful, dreadful thing. She had heard some one, but she did not know who, but the voice was quite clear, so that she could not help hearing; though indeed, indeed she did not mean to listen—but she had heard the voice say, " Isn't it luck for Tom Willing to get a girl with all that money?" Then another voice had replied that it certainly was luck, but that Tom was a good fellow.

" He said you were a good fellow," sobbed poor Ethel; " he did say that, Tom; but still he spoke, and the other fellow spoke, as if they thought, and as if everyone would think, you cared for—for my money. Oh, oh, oh! At least as if it would be a great thing for you, and, oh! Tom, I did—did think you loved me."

Tom was silent. He was hurt in his tenderest point. A poor man, but honest as the day; the congratulations of his friends, through some of which he had himself perceived a covert

meaning which none dared put in open words, had already made him wince. But conscious of integrity, he had proudly thought that time would give the lie to all such base insinuations, and with perfect trust in his betrothed, it had never occurred to him that she could either have felt any doubts on her own account or hearkened to the idle words of others. She had given him no explanation of the passionate withdrawal of her affection a few hours before.

Looking up she now beheld the deep emotion painted on his face, and cried aloud in her agony of shame: "Oh, what have I done? What have I done? Oh, Tom, I did not mean it; how could I do it. Oh, Tom, will you ever, ever forgive me. And will you—won't you marry me? Oh, please do, Tom; my Tom!"

At last the tall figure rose from his kneeling posture, drawing up with him the small and bedraggled form which he could scarcely even then consent to loose from his hold; and at last he smiled as he looked at her and at himself. "I really think we are too wet, too dirty and altogether too disreputable a pair to appear at the depot," said he, taking out his handkerchief to wipe a long dark smear from her cheek. "I really think, too, Ethel, that we never could catch that early train, even if we tried." At this moment the automobile, with Winston securely seated in his place, appeared above the brow of the hill; Winston peering about anxiously for the whereabouts of his fellow-sufferers.

"Here we are," cried Tom, rather unnecessarily; then turning again to the girl, whose bare hand lay fast in his own, he murmured as the automobile wheeled up, "We'll go back to Mr. Smithton's, Ethel, and say we had an accident, and I'll make it all right with Smithton. No one else need know anything about this, and we will not cut our visit short, after all, shall we?"

The shutters were still down all over the spacious mansion of Mr. James Smithton, and all appeared precisely as the travelers had left it an hour and a half before, when the little party returned to tell the tale of its mishap; only Mr. Smithton, who was an early riser, had come down and was on the lowest step of the stairs looking abroad to see what kind of a day it was going to be.

Ethel flew past him—she was "not fit to be looked at." Tom lingered a moment to give explanations and to add that more would be forthcoming presently. He had changed his plans, he——"All right," Mr. Smithton cut the speaker short heartily. "Glad to hear it; delighted to hear it. Get up to your room and change your clothes for breakfast. No one need know anything about this escapade; you come down to breakfast as if nothing

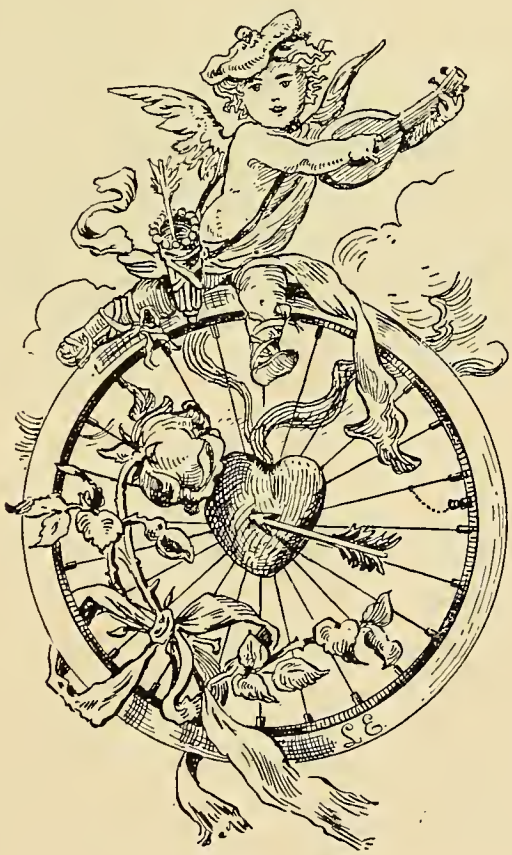
had happened, and we'll talk it over privately presently. I can see it's all right. Eh?" smiling significantly.

Tom nodded, smiling in answer.

"Good luck! I am glad. But hurry, Tom," as the young man went inside—"and Winston, I want to see you, Winston," continued the millionaire as he went up to the automobile driver, who sat imperturbable in his seat. "Well, Winston! Well! How was it? How did you do it?"

"Oh, we did very well, sir," returned Winston with an unbridled smile. "I just drove her from side to side till we came to a little hill on the side of the road, and I ran her up against the hill and tipped them over where you said, sir, and then I just made the auto bolt over the hill and stayed around the corner till it was time to come back, as you said, sir. And the automobile behaved just fine, sir. It seemed to know just what it had to do; and when I started back I found them in the roadway wet and dirty, too late to catch the train, and willing to come back—just as you said they would be, sir."

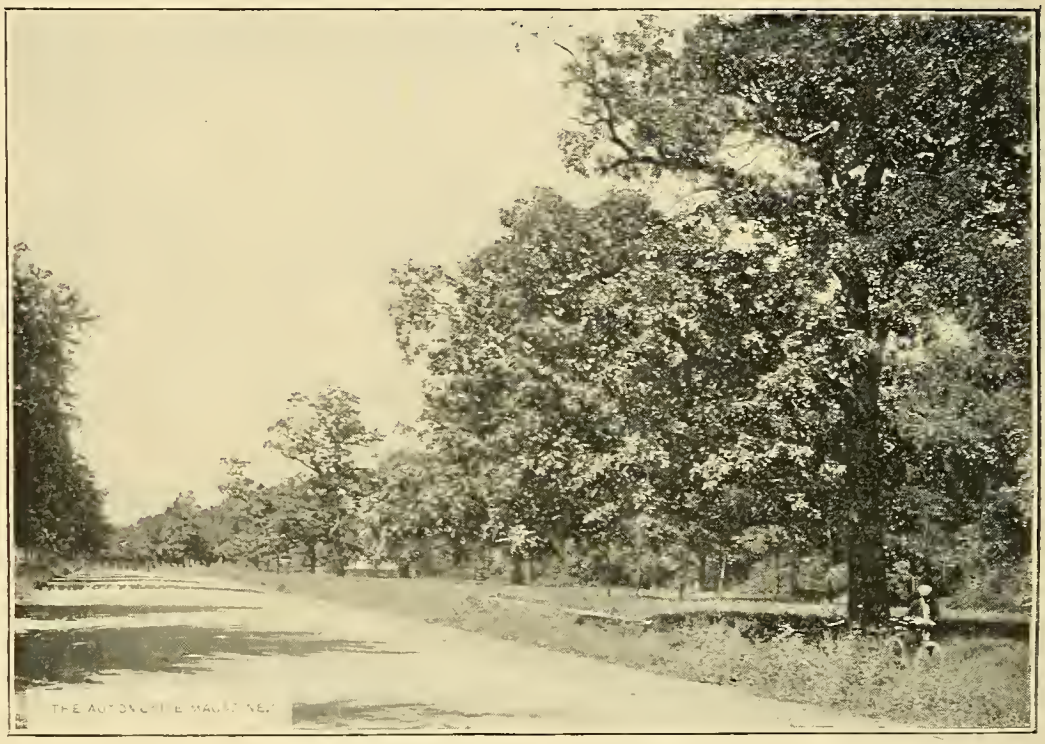
"Well done," answered Mr. Smithton, as he slipped a ten-dollar note in his driver's hand. "But don't you ever say a word about it."



For Good Roads

A Request by the League of American Wheelmen

THE Highway Improvement Committee has been working since its selection with delegates to the various National conventions for the insertion of a Good Roads plank that shall be not merely a jumble of words meaning nothing, but a pledge to appropriate money on a liberal scale sufficient to enable the Roads Inquiry Department of the Department of Agriculture to carry out the work for which it was formed.



Jericho Pike, Queens, Long Island

This Department, it may not be generally known, was established as a result of hard work done at Washington by the League of American Wheelmen. The appropriation by Congress of $25,000 a year is absurd, and has made impossible anything like the work planned.

General Stone and Professor Harrison have done all in their power with their very limited means, but progress has been made so slowly that the United States is still behind every other civilized country on the road question. In every other line indicat-

ing higher civilization it surpasses every other country in the world. While billions have been appropriated under the name of "River and Harbor Improvements," and in many cases vast sums spent for deepening and widening channels of streams used by few, if any, boats, and of interest only to some small village or town, the highways have received absolutely no attention and no appropriation from the national government. A bill introduced by the L. A. W. asking Congress to appropriate $5,000,000 has received but little attention, while days have been spent in looking up and passing upon private claims and matters effecting in no way the advancement of our great country. The belief

Cove Road, Oyster Bay, Long Island

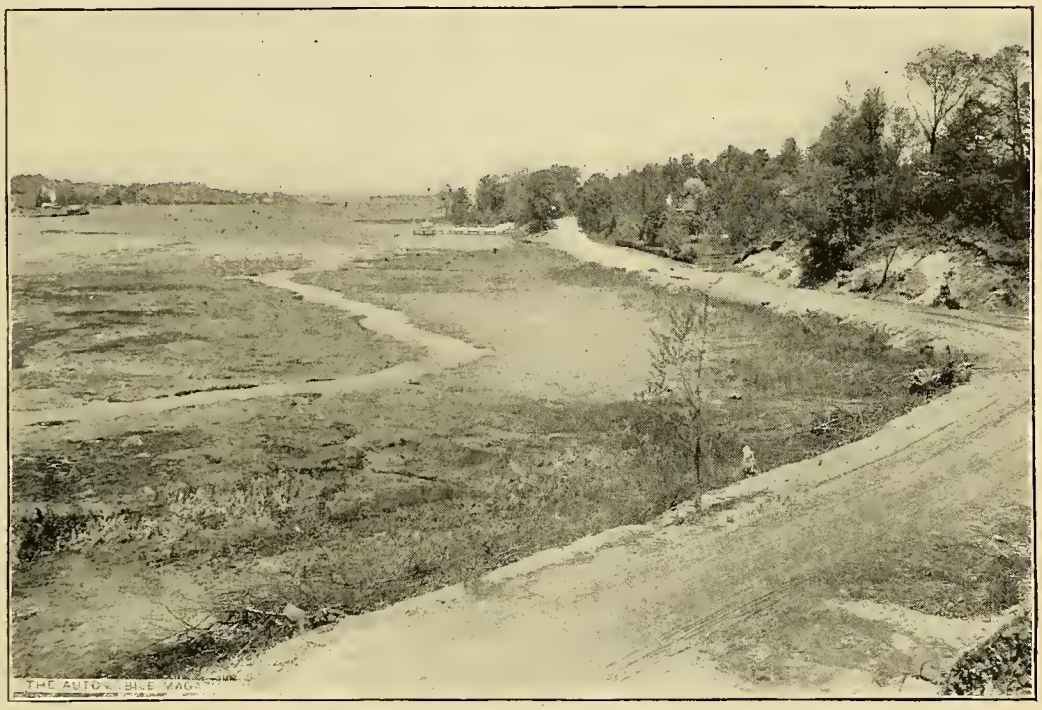
that the farmer is a foe to Good Roads and apathetic, if not absolutely antagonistic, to any legislation on this line may have been true years ago. That day has passed and the politician who to-day makes such statements either proves that he is grossly ignorant or else is making willful misrepresentations for his own selfish purposes. Every Good Roads worker knows that to-day the farmer is his best friend, and that with his aid the Good Roads laws which have enabled Massachusetts and New Jersey to advance far ahead of all other States, were passed by the votes of the rural districts, and to-day the strongest backer and Good Roads apostle is the farmer. State aid and national aid is an

absolute necessity. The agriculturists of the country cannot be called upon to pay all the expenses of a road simply because it goes by his front gate and may run along his land for a great distance. The roads in the rural districts should be paid for by the community in general just as city improvements are paid for *pro rata* by all the inhabitants. The farmer knows very well that the cost of hauling his produce direct to the consuming cities or to his nearest railroad station is a very great proportion of the expense. The agriculturalists, further, know that whereas in European country the rate per ton per mile is 8 cents or below, while in this country it runs up to 25 cents and even higher, and

Avenue of Locusts, Oyster Bay, Long Island

that not only is an absolutely unnecessary expense added to his production cost, but in certain seasons of the year he is unable to market his crops at all on account of the condition of the roads. It has been proven conclusively, and statistics are not wanting on the subject to show, that State aid laws immediately become popular after effect is seen, and that greater appropriations with the consequent taxation on every individual in the State has been asked from year to year by the farmers in every section of the State, especially in the rural districts, and that, in fact, the amount of work asked for in all the States working under State law is far in excess of the appropriation, in many cases years ahead of

the money available or in sight. A Good Roads plank in the platform of any party, either in State or national election, bringing great strength to the ticket nominated by that party, and it is no longer to be said that this particular subject is of interest only to the wheelmen. The wheelmen have answered the question for themselves, and by a trifling tax they are building in all sections of the country cycle paths particularly suitable for the wheel, and at a cost not to exceed $100 per mile perfect wheelways can be built. These side paths can be made with great rapidity and maintained at little cost. The cry of class legislation no longer holds. The Good Roads advocate, whether he be



Head of Little Neck Bay, Manhassett, Long Island

a pedestrian, cyclist, horseman or automobilist, is no longer looked on askance. His honesty of purpose can not be questioned. Loyal support is given him, and to-day the agricultural societies, automobile clubs, Good Roads associations, village improvement societies, are all working hand in hand with the League of American Wheelmen for highway improvements in every section of the United States, and if progressive citizens and every well wisher of this country would write to the delegates from his section to the national convention, a plank would be put into their party platform which would not be second in strength to that of any other used. Let us "get together" and write at

Easthampton, Long Island

once. Set your delegates thinking before they go to the convention cities, and when it is found that the sentiment from your section of the country is for some strong movement to forward the improvement of highways the formers of the party platform will find ample room—and that near the top—for a strong Good Roads plank.

Yours truly,

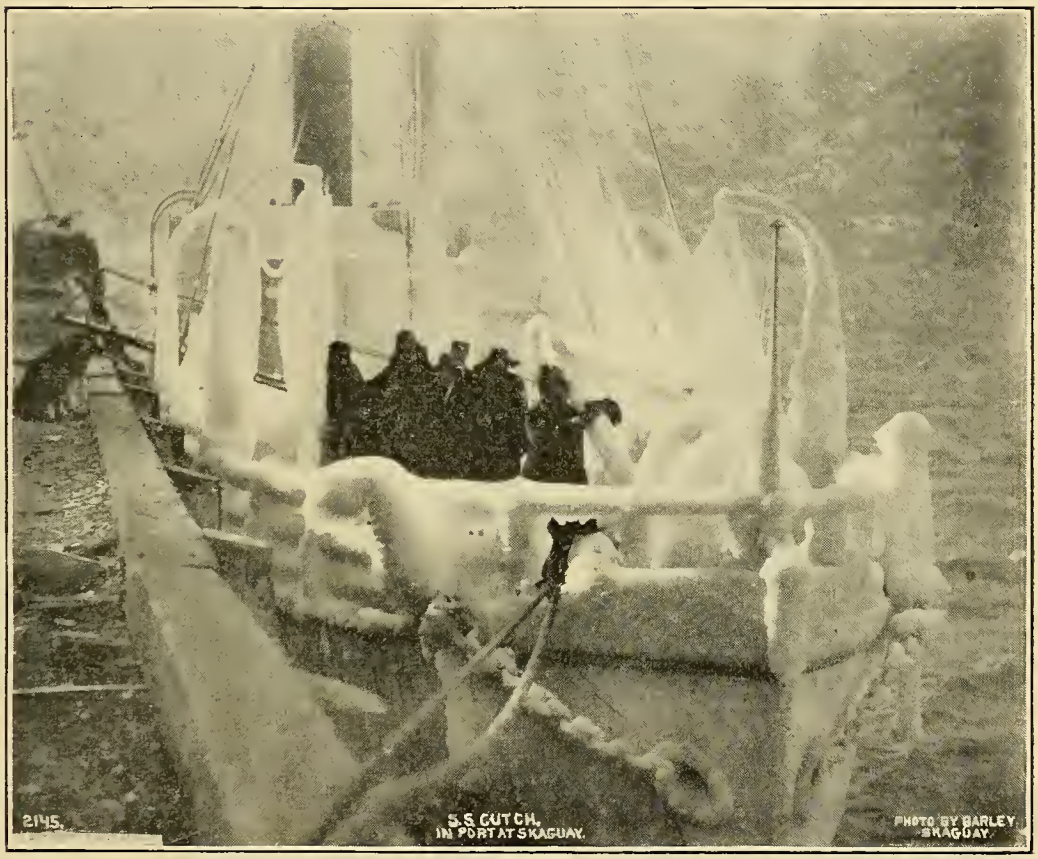
H. B. Fullerton,
Chairman Highway Improvement Committee, L. A. W.

AUTOMOBILE PARADE

An automobile parade is being organized to take place in Bridgeport, Conn., July 4, under the auspices of the *Evening Post and Morning Telegram* of that city. Prominent citizens will act as judges and Mr. T. E. Griffen, a pioneer *chauffeur,* will offer a trophy for the best decorated automobile. A series of motorcycle races also have been arranged for at Pleasure Beach after the parade.

The Automobile in Alaska

WHEN the little coasting steamer "Cutch" left Vancouver on one of her regular voyages to Skaguay last March, her manifest bore an item which had never appeared there before. It was "one automobile," of which Monsieur E. Janne de Lamare was consignor and consignee. After the ship's arrival at Skaguay the cargo was transferred to the freight-cars of the new Yukon and White Pass Railroad, and



S. S. Cutch Carrying the First Automobile to Alaska

a few days later the first automobile in Alaska rolled out upon the ice-crusted lake at Bennett. The machine carried two persons, one being Mr. de Lamare, who owns one-third of the town site of Atlin, B. C., the other his friend-*chauffeur,* Mr. Raphael Merville, a young French record-making motor-cyclist of last year. Mr. de Lamare and his friend returned to Alaska from the United States after developing a long cherished plan for the em-

ployment of an automobile as the method of rapid transit to the Klondike.

As he had traversed three times previously the 640 miles which separate Bennett from Dawson City, Mr. de Lamare entertained no illusions in undertaking the journey in an automobile. In point of fact, after a review of the situation, embracing the low and limited construction of their vehicle and the arrival of an unusually early northern season, both adventurers entertained considerable doubt as to the complete success of their expedition. The arctic automobilists arrived in Bennett the last part of March, and though the thaw in former years did not begin until

At the Great White Pass, One Way of Reaching the Klondike

the middle of May, they learned that many of the streams further north were beginning to break. This was unwelcome news, as the Fifty Mile river, which lay in that direction, had been chosen as the best automobile course northward after leaving Lake Tagish.

The itinerary from Bennett follows: North on Lake Bennett to Cariboo Crossing, situated at the end of Lake Bennett, to Windy Arm, to Naies Lake; thence to Tagish Lake; thence to Tagish, at which point the Fifty Mile river enters Lake Tagish, northward on the Fifty Mile river to Miles Canon Pass, to White Horse Rapids, which never freeze.

The route continues to Lake Lebarge, to Lewes river, by which Fort Selkirk, the future official capital of the Yukon Territory, is reached. From Fort Selkirk the course is over the Yukon river, by which the voyagers intended to descend to Dawson City.

The machine employed in the experiment was a tricycle voiturette of the Bolleé type of 3¾ horse-power. The vehicle, which may answer all requirements on a good road and in a milder climate, failed to realize all that was expected of it in the Alaskan journey.

As mentioned above, the carriage was low in construction,

Winter Scene. Another Way of Reaching the Klondike

the foot-board of the trailer and the motor, which was attached to the rear wheel, being within a few inches of the traction-base.

After a few days in Bennett the *chauffeurs* left the little mushroom city followed by the shouts and the "good lucks" of the townspeople, who turned out *en masse* to watch the start of the carriage. Learning of the open condition of the streams in the upper country, Mr. de Lamare found it necessary to change his original plans.

It was at first intended that the commissariat and supply of fuel should be drawn on a sled attached to the rear of the machine. With a view to the probable speed of the vehicle and

the unusually bad condition of the route, this plan was abandoned as impracticable. It was then proposed to proceed without the supply of provisions and depend on a possible meeting with prospectors or Indians, but that plan also was put aside, as the store of gasoline was not to be ignored. As there was not an inch of unused space on the carriage the *chauffeurs* were compelled to engage a native with sled and dogs to follow with the provisions and fuel as best he might.

For the first few miles the lake-trail was good, and it was not until the vehicle had covered 15 miles did the suggestion of sub-

The Modern Way of Reaching the Klondike

sequent difficulty present itself. At this distance from Bennett the trouble of the *chauffeurs* began. Huge snow-drifts which freezing under a temperature of 52 degrees below zero at night became brittle on the crust under the sun's rays. In some places where the snow had been blown away, leaving the ice visible, water to the depth of two and sometimes three inches was encountered. But in spite of these obstacles the little machine maintained a speed of 15 miles an hour. The uneven trail made by the half-frozen drifts caused the vehicle to "kick" and "skate," performances holding forth no bright promise for the long survival of the motor. After many shocks and jars, each of which seeming to

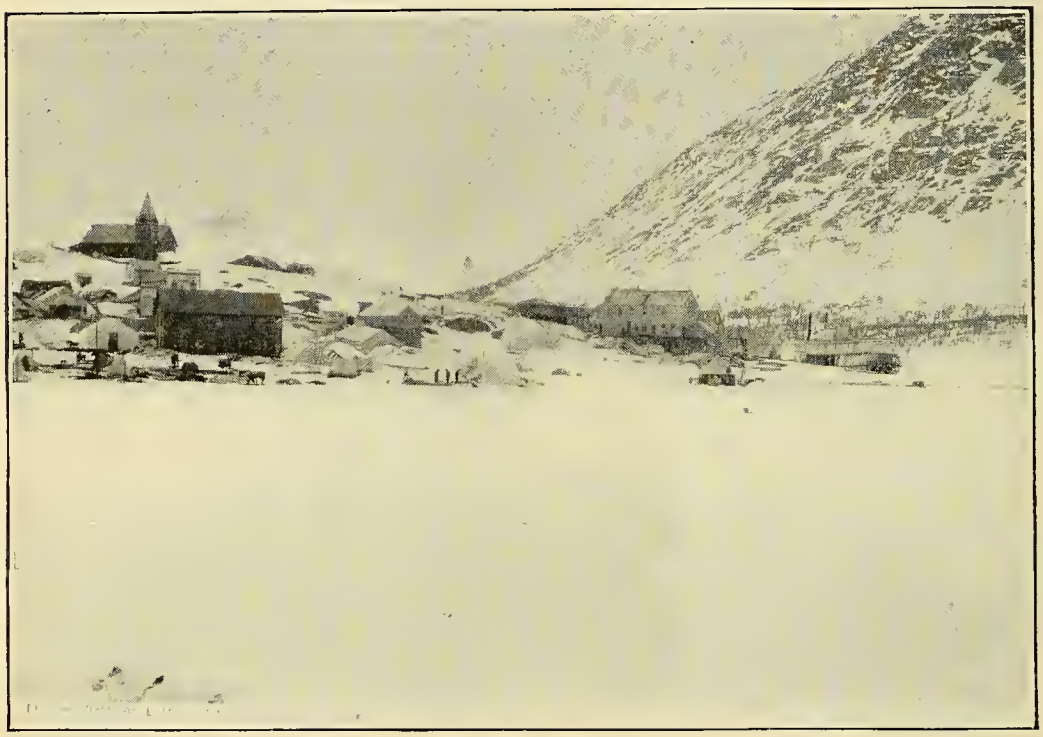
be the last, the *chauffeurs* reduced the speed of the carriage one-half. The trail became worse and worse, and when the expedition had put 22 miles behind, the solder broke away from a portion of the gasoline conduit, which was swathed in strips of flannel to exclude the cold. A leak resulted, and the fluid running out on the fabric took fire. This necessitated a stop, and by the use of snow the flame was extinguished. As there was no solder at hand to repair the rupture, the repair was made by winding wire around the injured portion. This operation occupied two and a half hours, after which the outfit slowly and carefully proceeded to Cariboo Crossing, 28 miles from Bennett, arriving five hours

An Alaskan Caravansary

later. At Cariboo Crossing a blacksmith was found and the machine was repaired *a la* Klondike. At this point Mr. Merville, who, suffering from exposure resulting from the halt for repairs on the lake, fell ill, and the adventurers remained at Cariboo Crossing for the night. During the night the commissariat came up and Mr. Merville having recovered sufficiently to proceed the expedition set out on the following morning on the second stage of their journey. Though the running during the day cannot be described as "smooth," the trail was not as slushy as that of the previous day. Passing Windy Arm, which is a small peninsular a few miles north of Cariboo Crossing, the

chauffeurs drove out across Naies Lake, which, at its northern extremity, joins Taku Lake in the east and Lake Tagish in the west. Few of the motor-wrenching hillocks of the day before were encountered on Naies Lake, and for the greater part of the way its surface was as smooth as glass. Due to a lowering of the temperature the pneumatic tires remained dry, and the adjustment to the fore-wheels of a novel set of runners, included in the outfit, was found to be unnecessary. ,

Though Mr. de Lamare was in possession of knowledge concerning the probable condition of the Fifty Mile river, he hoped



Atlin, B. C., from the Lake

to reach it before a thaw, making auto-navigation impossible, began in earnest. Therefore on reaching Tagish, after a rough and eventful journey across Lake Tagish, the voyagers were downcast on finding the river, which enters the lake at that point, open. This circumstance having defeated their purpose to reach Dawson, the intrepid *chauffeurs* determined to subject the machine to a further test by essaying a journey to Atlin, 83 miles from Tagish. Leaving Tagish the duo turned eastward, returning by the old trail to Naies Lake. Crossing Naies Lake they entered Taku Lake. The trail improved as they proceeded, and

during the night the machine at some points maintained a speed of 40 miles an hour by moonlight.

Golden Gate, a small place situated on the west side of a peninsular separating Taku Lake from Atlin Lake, was the first objective point of the adventurers.

Fifty miles had been covered, and at a time when the journey promised to be speedily accomplished the cap of the motor's carbureter became dislodged and was lost on the trail.

Without provisions and unable to proceed with the vehicle, the *chauffeurs* waited thirty-six hours for the commissariat to

Arrival of Messrs. De Lamare and Merville in the First Automobile at Atlin, B. C., April 14th, 1900

come up. After its arrival temporary repairs were made and they proceeded at a reduced speed to Golden Gate. From Golden Gate the trail on Atlin Lake was good, and on the 4th of April the automobile arrived in Atlin.

In Atlin the machine was overhauled, and a few days later the *chauffeurs* started on the return trip to Bennett, where they arrived after a passage no less eventful than the trip out.

The expedition was purely an experiment, and as such it cannot be said that it is without its good results.

Before his departure for Paris, Mr. de Lamare made the statement that next year, in an automobile of 6 to 8 horse-power, of

Typical Street Scene, Atlin, B. C.

American manufacture, he will experience no difficulty covering the 640 miles between Bennett and Dawson City in forty-eight hours.

BADEN-POWELL'S JOKE

The officers of the Mafeking garrison were at mess—and what a mess!

"Cheer up, lads," remarked Col. Baden-Powell, taking his second helping of mule steak. "We might be worse off."

"Indeed? I can't imagine it," growled the dyspeptic major.

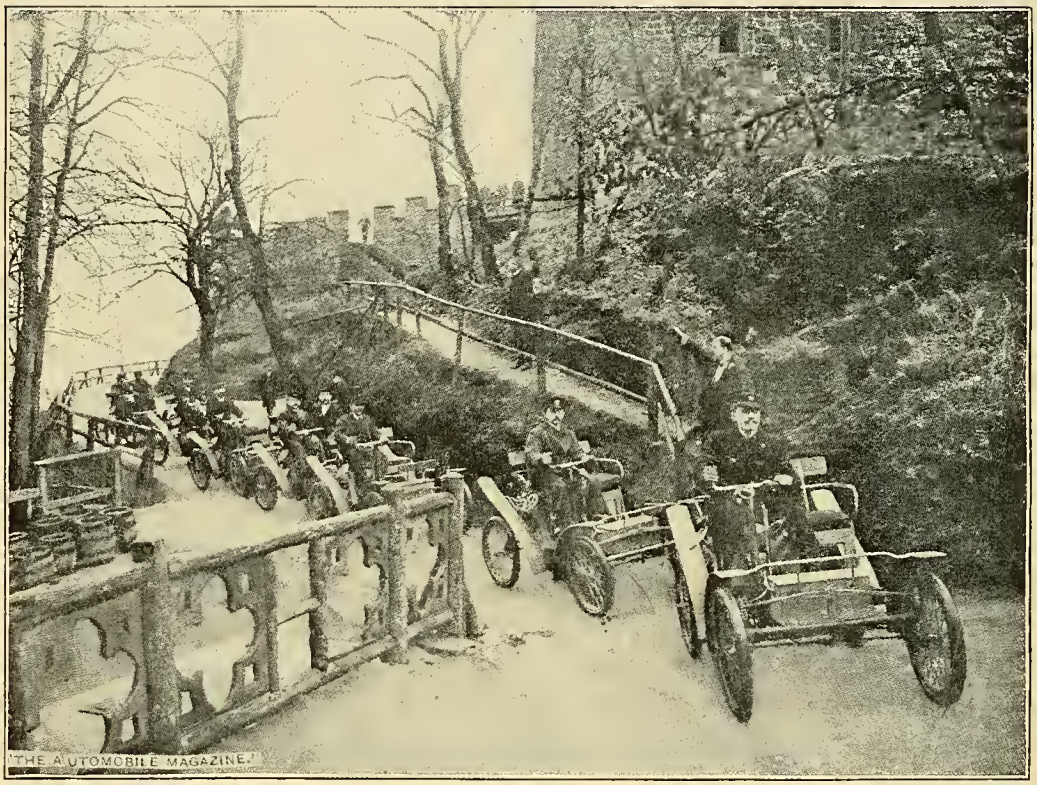
"Well, just fancy our diet if the automobile had been introduced here."—*Collier's Weekly.*

The Automobile Abroad

(By Our Own Correspondent)

THE most notable event of the season is the formation of the new organization, the Moto-Club de France. It is significant as denoting a democratizing tendency which is making the automobile a more popular and universal instrumentality of progress and taking it beyond the aristocratic and plutocratic auspices that have exercised the sponsorship so largely up to the present time. The significance of the new departure is evident from the fact that the founders of the Moto-Club have been most prominent in the membership of the Automobile Club, and, for the most part, original members of that organization—men like MM. Serpollet, Paul Meyan, Pierre Giffard, René Varennes, and J. Berlier, all members of committees. These, together with M. Ernest Archdeacon and forty other members of the Automobile Club, formed the nucleus of the Moto, which evidently has an important future. The impetus was given at the annual meeting of the Automobile Club, when the President announced that out of a budget of 361,000 francs only 5,000 francs would be allotted for racing purposes. There had been a growing feeling that the encouragement of automobile interests has been subordinated to social considerations, and this announcement precipitated matters. Immediately on the close of the meeting active steps were taken to organize the Moto-Club. The Automobile Club is dominated by aristocratic influences, and with its palatial quarters it has become one of the most luxurious clubs of Paris. It is noteworthy how the club that represents the mechanical substitute for the horse takes its color from the sporty, fashionable aspect of the new instrumentality and thereby has become a rival of the Jockey Club, which represents the sporty and fashionable aspect of the horse itself. The club, therefore, is too swell in its character to suit many serious devotees of the automobile, and their dissatisfaction has been aggravated by the fact that the controlling interests in the club are hostile to the government and therefore without influence in furthering the automobile cause affected by regulative and restrictive tendencies. The Moto-Club, on the other hand, is to be confessedly democratic in character. It will be unpretentious in form, will have no club-house but simply a spacious apartment requiring but a moderate rental. It will make the encourage-

ment of the automobile industry its special aim, and therefore will find particular favor with manufacturers. Expenses being kept down, there will be considerable sums available for encouragement of automobile interests in various ways. There is not, necessarily, any antagonism between the old club and the new, and their aims being so different there is room for both. Many members of the Moto will retain their membership in the Automobile. The fact that Paul Rousseau, who started the secession movement by his indignant remarks at the Automobile Club's annual meeting, is a member of the Moto, gives assurance that



An Automobile Ride to The Wartburg

it will be the centre for automobile sporting interests. Although the Moto has been nicknamed "l'Automobile Club des Pauvres" by the older club, the relations between the two clubs will probably be amicable.

The Council General has allowed 100 francs for showing at the Exposition an important set of documents relative to the corporation called the Federation Centrale des Chauffeurs-conducteurs-macaniciens.

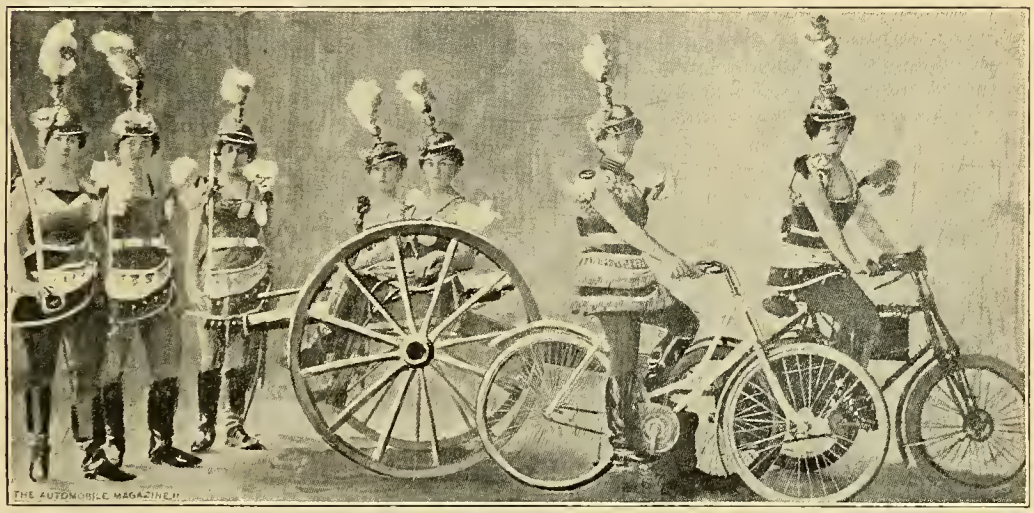
A correspondent of *La France Automobile* writes from Narbonne advocating the employment of two motors in automobile

practice, one for regular work and the other as an auxiliary, to come into use on difficult pieces of road.

Julius Loewy, Director of the Extrablatt of Vienna, recently made the journey to Paris by automobile. He took ten days for the trip, making it in short stages, very comfortably and with great pleasure.

The eminent automobilist, M. Ernest Archdeacon, having been arrested for violating the new regulations limiting the speed of automobiles to 20 kilometres an hour, proposes a competition in the Bois de Boulogne, offering to forfeit 10,000 francs if he cannot surpass a cab-driver in stopping and turning at the same rate of speed.

The Touring Club of France shows at the Exposition a "carte electrique" that presents nine complete itineraries, with



A Scene from "How Berlin Laughs," at the Metropol Theatre, Berlin

Paris for the centre, showing a development of 2,500 kilometres and covering more than 5,000 kilometres.

An automobile service has been established between the bureau of the New York *Herald,* in the Avenue de l'Opera, and Fontainebleau.

General Gallieni is to be accompanied to Madagascar by Count de la Valette with six automobiles.

I have mentioned the fact that automobiles famous for records bring prices occasionally that compare with the sums given for swift and cup-winning horses. Your young countryman, Mr. A. C. Bostwick, who, as son of the Standard-Oil magnate and multi-millionaire, evidently has "money to burn," lately arrived here from the United States and has taken an active part in automobile sports, purchasing for $12,000 the 20 horse-power

automobile with which M. René de Knyff won le Tour de France last year and this season the race from Paris to Nice. With his purchase Mr. Bostwick participated in the Bordeaux-Perigueux-Bordeaux race of June 3 and 4, the great meeting of the year for southwestern France. Mr. Bostwick had for his particular rival M. Levegh, with a vehicle of the same power, and was beaten by four minutes, which, in a race of 116 kilometres, means 4 kilometres, or 2½ miles, ahead. Much, therefore, depends on the handling of the machine; a veteran like M. de Knyff would probably have been an easy victor. Your countryman appears to have achieved very speedily a promotion to the ranks of the aristocracy, for I note that in the accounts of the race given in the press his name is given as "de Bostwich."

Baron Arthur de Rothschild lately made the journey by automobile from Paris to Homburg, in Germany, in sixteen hours, by way of Strasburg, Stuttgart, Heidelberg and Frankfort. He made the run to Homburg from Frankfort in eighteen minutes, beating the time of the fastest train by seven minutes.

An important feature of the Exposition is the collection of military automobiles. There are twelve of these, representing as many different types. Of these two are operated by steam, one by petroleum and nine by gasoline. These include a heavy tractor for use in artillery and engineering service, a medical wagon containing an equipment of surgical apparatus, medicines, etc., besides a folding tent for conducting operations. A telegraph wagon contains a complete outfit of apparatus for field use, and another vehicle is for transporting telegraphic materials. There are also an automobile for the military postal service, an omnibus for the transportation of personnel, a vehicle for the commanding officer, a rapid automobile and a smaller vehicle for the use of officers, a motocycle for the transmission of dispatches, etc. They were built by various prominent manufacturers. The greater number are painted a uniform gray, which is the color of the army and marine palace on the Seine, near the Champ de Mars.

July is to be a great month for automobile sports at the Exposition. The director of the sports, your countryman, Mr. A. G. Spalding, has given out the following programme:

Contest of speed for all vehicles, divided into three classes, according to the classification given in the rules of the Automobile Club of France for 1899. This contest will take place under a special provision yet to be asked of the authorities.

The vehicles will run during one week, Thursday excepted, five heats, or from 300 to 400 kilometres each, starting and

finishing at the Pont de Joinville. The carriages will be sent out in file from the ground of Vincennes to the Pont de Joinville, from which point the departure will be timed. On the finish the carriages will be timed at the Pont de Joinville. From there they will pass to the track of Lake Dumesnil, of which they will make two circuits. An optical telegraph and semaphores, established at the track of Dumesnil, will announce the arrival of the carriages at the Pont de Joinville.

Prizes—Class I., Carriages. Nine cash prizes. First prize, 8,000 francs; second prize, 6,000 francs; third prize, 5,000 francs; fourth prize, 4,000 francs; fifth prize, 3,000 francs; sixth prize, 2,000 francs; seventh prize, 1,000 francs; two prizes of 500 francs each. Total, 30,000 francs.

Prizes—Class II., Voiturettes. Seven cash prizes. First prize, 4,000 francs; second prize, 2,000 francs; third prize, 1,000 francs; four prizes of 500 francs each. Total, 9,000 francs.

Class III., Motocycles. Thirteen cash prizes. First prize, 2,000 francs; second prize, 1,500 francs; third prize, 1,000 francs; four prizes of 500 francs each; six prizes of 250 francs each. Total, 8,000 francs.

In the month of March the number of horse accidents in France was 718, while the railway, the bicycle and the automobile are to be credited with 170 between them. The horse was responsible for 52 deaths. The bicycle accidents numbered 75, including 5 deaths. There were 52 automobile accidents, 4 of them fatal. The lowest number of accidents was due to the railway, but out of the 43 there were 13 deaths.

The transportation charges for automobiles on the French railways are so high that it costs 259.25 francs to carry a vehicle of 350 kilograms from Paris to Nice, while from Paris to Berlin, owing to the moderate charges on the German railways, the cost is only 94.75 francs.

The military authorities in France have ordered a number of traction engines, each of which will draw a train of 30 to 40 loaded wagons. For turning corners an ingenious form of coupling has been adopted, so that the entire train follows exactly the curve described by the engine. The wagons may be left at given points, one by one, and drawn to their destination by horses, if required.

The new Rallye Auto-Club has established a chalet at Meulan in a beautiful situation close to the Seine, with fine opportunities for boating. The day of the inauguration was marked by an automobile canoe-regatta, promoted by the Cercle de la Voile.

The feature of motocycle races has been successfully intro-

duced into the cycling programmes for the Parc des Princes here in Paris. Now that indiscriminate road-racing is under the ban, the French public is reconciling itself to the confinement of the sport where it properly belongs as a racing feature—on a special track within enclosed bounds. The motocycle races are therefore a most attractive feature.

Wherever go the French, good roads are sure to come into being, and the automobile follows as a matter of course. This is true of Madagascar, where an automobile service is to be established between Mahatsaro and Antananarivo, a distance of 250 kilometres.

Salute to Passing Automobilists

At the Vincennes *fête automobile* there were 25,202 persons who paid for admissions.

The casualties resulting from the thousand-mile tour were only four, and the subjects were all animals: a dead dog, a broken-legged horse, a hen and a sheep.

Miss Mary E. Kennard, who went through the thousand-mile tour in one of the smaller vehicles, writes, in the *Motor-Car Journal:* "We proved that the voiturette of to-day is not a mere plaything, but a vehicle capable of surmounting steep gradients, of carrying its passengers in safety over good roads and bad, and of doing 120 miles in the day."

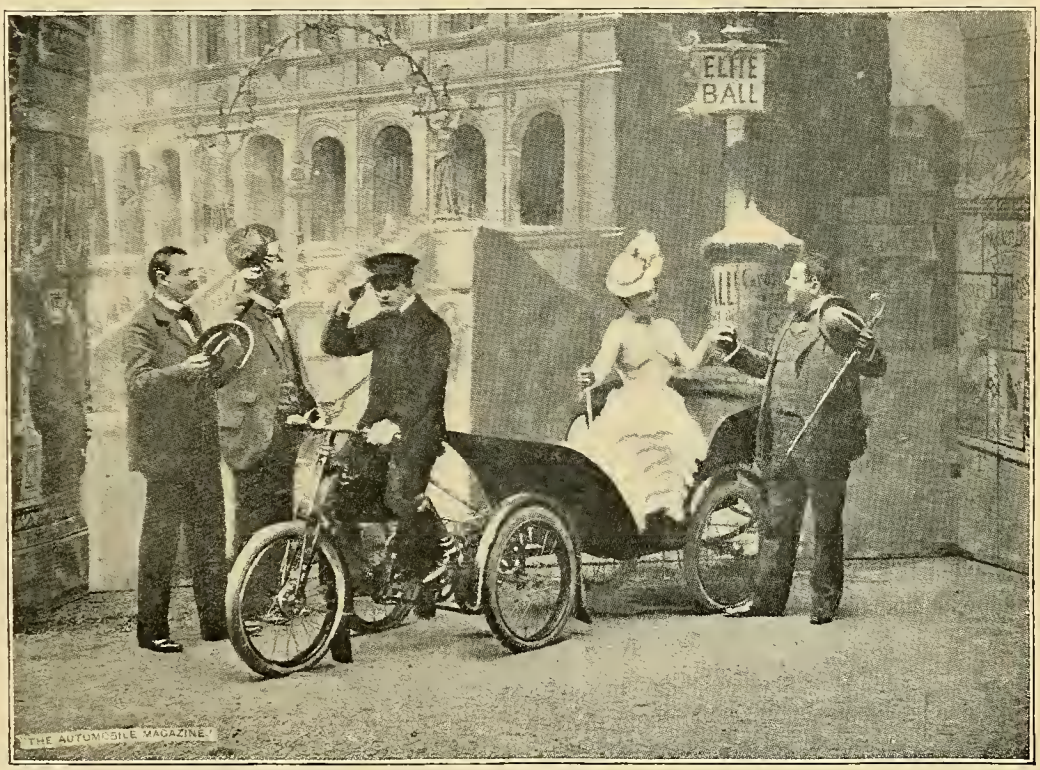
In Scotland a motor-vehicle service is to be installed between Aberdeen and Torry.

The Salon de l'Automobile et du Cycle, at Antwerp, held late in May, was very successful and was visited by about 10,000 people.

In Spain an automobile company has been formed to transport passengers and freight between Logrono, Soria and Osma.

It is said that the Italian Ministry of War has decided to substitute the automobile for animal traction so far as possible.

A novel form of accumulator, invented in Turin, is reported to give excellent results.



A Scene from "The World Reversed," at the Metropol Theatre, Berlin

At Turin recently, at the conclusion of a three-days' automobile meet, Gasté made some road-trials at short-distance records and succeeded in bettering by one-fifth of a second the Beconnais record for two kilometres with flying start.

The Thuringian City of Eisenach is the home of the Mitteldeutscher (Central German) Automobil Club, as well as an important centre of automobile manufacturing. Eisenach has the good fortune to have a rarely beautiful and picturesque environment, offering many delightful tours. The first excursion of the season was to the famous old castle of the Wartburg, near at hand. The Wartburg was never a ruin, having by good

fortune escaped the devastations of the thirty-years war and other periods of strife that destroyed the greater number of the evidences of ancient days in the land. It is the best preserved and the most beautiful old castle in Germany—a perfect example of feudal architecture, rich in history, legend and tradition, the centre for the assembling of the Minnesingers in their contests of song, and consequently the scene of Wagner's "Tannhäuser," and also the residence of Martin Luther during an important period of his life. It was here that Luther worked on his translation of the Bible that created the German language as a literary tongue as well as revolutionized the religious world. The place where Luther flung the devil out of his inkstand against the wall while engaged in this sacred duty is still shown in the "Luther-zimmer," or Luther-chamber, but the huge blot of ink made by his Satanic Majesty on coming in violent contact with the wall has to be renewed occasionally to make good the depredations of tourists. The summit of the hill occupied by the castle is nearly 700 feet above the level of the valley, and so precipitous are the sides that the attempt to ascend it by automobile looks to the stranger an impossible undertaking. But the tortuous road rises by easy grades and our excursionists found it a really light task. On arriving the party was hospitably taken in charge by the Captain of the Castle, Major von Cranach, a descendant of the world-famous painter of that name and an enthusiastic automobilist. Familiar as the Wartburg may be to a visitor, the enchanting prospects which it commands, beheld from a foreground so romantically picturesque, never pall upon one, and the automobile visitors from the neighboring city enjoyed the occasion most thoroughly. But what would Luther and the Minnesingers have said to the procession of automobiles invading the historic precincts? Would it not have seemed like a segment of the Apocalypse, more wonderful and dreadful than the seven-headed beasts and other monsters of the apostle's vision?

As preliminary to a long-distance mountain tour in the Thuringian Forest, instituted by the Mitteldeutsche Automobil-Club for Sunday, May 6, the evening before was devoted to a conference of representatives of various automobile clubs throughout Germany, with a view to the formation of a national league, or "bund." Steps were taken toward this end at Heidelberg three months before, but the project there framed fell through. The clubs represented were the Deutscher and the Mitteleuropäischer Motor-Wagen Verein (Central European Motor-Carriage Society) of Berlin, Rheinischer of Mannheim, Fränkischer of Nuremberg, and the Frankfurter of Frankfort-on-the-

Main, beside the Mitteldeutscher of Eisenach. A committee was appointed to call a meeting of representatives of all the German clubs at Berlin, to consider articles of federation. By means of such a federation it is expected that an important influence will be exerted upon legislation, and that the adoption of restrictive measures that might be highly injurious to automobile interests prevented.

The start for the trip was witnessed by a huge crowd, but order was preserved and security assured by the employment of bicycle riders as couriers, so that with all the crowding there was not even a hint of accident, either to spectators or automobiles. The course lay from Eisenach by way of Waltershausen, Oberhof and Zella, to Meiningen and thence back to Eisenach. The way was of such a mountainous and uneven character that the participants, including men of experience in some of the longest automobile journeys in Europe, declared it the most difficult they had ever rode over. That the trip was made with comparatively little difficulty testifies to the sturdy endurance of the automobile.

The Deutscher Automobil-Club of Berlin opened its palatial new house opposite the Reichstag building and fronting on the noble park, the Thiergarten, under the protectorate of the Grand Dutchess Anastasie of Mecklenburg-Schwerin and the Presidency of the Duke of Ratibor.

The attractiveness of the automobile as a stage-feature finds a remarkable instance in its use in the spectacular operetta, "Verkehrte Welt" (The World Reversed), which is played to crowded houses in Berlin.

Even in the far-away Malay peninsula the automobile is about to take possession of the field, the Malay Transport Syndicate, Limited, having been organized to establish regular transit services between the different centres of that thickly populated region. The roads there are excellent, as a rule, so the opportunity offered is a tempting one. The principal mode of conveyance is at present the slow-going bullock cart, and it will be a long jump from that to the swift automobile. The tiger has been the terror of the solitary farer on the highways in that region, and even wheelmen hesitate to use the fine roads, as otherwise they would. But the "striped terror" would probably hesitate at pouncing upon a passing automobile.

Trend of Progress of the Automobile

By R. H. Thurston

Second Paper

SEVENTY years, two generations, ago (1831) a committee of the British Parliament, after a long and painstaking investigation of the working of automobiles in and near London—where there were, a little later, twenty or more at work, traversing thousands of miles and carrying thousands of passengers annually—after consulting the great mechanical engineers of the day and catechising the inventors, makers and users of the machine, and after cross-examining their opponents among the stage-coach proprietors and drivers, reported that they had become convinced that "the substitution of inanimate for animal power, in draught on common roads, is one of the most important improvements in the means of internal communication ever introduced." They considered its practicability to have been "fully established," and predicted that its introduction would "take place more or less rapidly, in proportion as the attention of scientific men shall be drawn, by public encouragement, to further improvement." The success of the system had, as they stated, been retarded by prejudice, adverse interests and prohibitory tolls; and the committee remark: "When we consider that these trials have been made under the most unfavorable circumstances, at great expense, in total uncertainty, without any of those guides which experience has given to other branches of engineering; that those engaged in making them are persons looking solely to their own interests, and not theorists attempting the perfection of ingenious models; when we find them convinced, after long experience, that they are introducing such a mode of conveyance as shall tempt the public, by its superior advantages, from the use of the admirable lines of coaches which have been generally established, it surely cannot be contended that the introduction of steam-carriages on common roads is, as yet, an uncertain experiment, unworthy of legislative attention."

Gurney had run his carriage between 20 and 30 miles an hour; Hancock could sustain a speed of 10 miles; Ogle had run

his coach 32 to 35 miles an hour, and ascended a hill rising 1 in 6 at the speed of 24½ miles. Summers had traveled up a hill having a gradient of 1 in 12, with 19 passengers, at the rate of speed of 15 miles per hour; he had run 4½ hours at 30 miles an hour. Farey thought that steam-coaches would be found to cost one-third as much as the stage-coaches in use. The steam-carriages were reported to be safer than those drawn by horses, and far more manageable; and the construction of boilers adopted—the "sectional" boiler, as it is now called—completely insured against injury by explosion, and the dangers and inconveniences arising from the frightening of horses had proved to be largely imaginary. The wear and tear of roads were found to be less than with horses, while with broad wheel-tires the carriages acted beneficially as road-rollers. This parliamentary committee finally concluded:

"(1) That carriages can be propelled by steam on common roads at an average rate of 10 miles per hour.

"(2) That at this rate they have conveyed upward of 14 passengers.

"(3) That their weight, including engine, fuel, water, and attendants, may be under three tons.

"(4) That they can ascend and descend hills of considerable inclination with facility and safety.

"(5) That they are perfectly safe for passengers.

"(6) That they are not (or need not be, if properly constructed) nuisances to the public.

"(7) That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses.

"(8) That, as they admit of greater breadth of tire than other carriages, and as the roads are not acted on so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than coaches drawn by horses.

"(9) That rates of toll have been imposed on steam-carriages, which would prohibit their being used on several lines of road, were such charges permitted to remain unaltered."

The one positive obstruction, legislation for adverse interests, practically killed the automobile before 1840, although here and there an inventor or an enthusiastic automobilist struggled against all artificial as well as natural impediments.*

The Commercial Evolution of the lighter automobile systems practically dated from about 1895, though a few makers and users were earlier in the field after the renaissance of the art. In fact, here and there an enthusiastic mechanic and inventor has

*The writer rode in a steam automobile as late, or early, as 1860.

operated automobiles, usually with steam as the motor, from the time of the decadence of 1833. But the recent remarkable evolution of so many competing systems and classes of motor has given an interest coming of wider competition that the enterprise formerly lacked and has aided in the stimulation of the development of the automobile most wonderfully. Within two or three years, the business of manufacture of all practicable—and of some utterly impracticable—forms of automobile has been undertaken by many capitalists, mechanics and engineers, and in some cases on a very large scale. Electric, steam and petroleum motors seem to have come to stay, each for its special work.

With a hundred, possibly two hundred, manufacturing and exploiting companies in the field, it is obvious that a majority must soon "go to the wall"; but there will undoubtedly, legislation permitting, be a few systems which will conquer all obstacles and a few companies that may secure a market and make a financial success with mechanically practicable forms of vehicle. There will unquestionably result complete failure with the great mass of ill-considered and amateur schemes. There are now a very few, not a half dozen, making the electric automobile, about as many producing the internal-combustion machine and a somewhat smaller number building the steam-automobile. There were, probably, January 1, 1900, less than a thousand automobiles, of all classes, actually operated in this country, and not half that number with entire satisfaction. Perhaps two-thirds of these machines are electric and these are mainly employed in the large cities.

The progress of the automobile has been particularly rapid during the year just closed, especially in England, where the statute which has at last freed all such vehicles so generally from the earlier restrictions has been productive of an immense advantage, and in this country, where native inventive genius has only recently been generally and earnestly attracted toward this great and now most promising field. Should the evolution of the automobile continue unrestricted by unfairly discriminating and hampering legislation, either due to real apprehension of danger, in cities and on the highways, or through the tendency of some legislators toward "strikes" against enterprises involving the extensive use of capital, the progress of the immediate future seems likely to be in the nature of an acceleration, and of astonishing rapidity, extent and importance. The art has passed well through its preliminary stages of experimentation in the cases of the steam-engine as a motor and of the electrically impelled vehicle, and probably is well-advanced in the field of internal-

combustion motors and of carriage construction. Even progress in the use of the heavier and safer petroleums, both as fuels and as working fluids, is exhibiting some marked advances. Petroleum-spirit motors, however, have thus far led this advance and have a long start in this respect. The French have hitherto been in the van in the operation of the latter class, and England with steam-motors; but the indications are that the United States will soon be an acknowledged leader in all lines of improvement of the automobile, as previously with the bicycle. In electric-motor construction, the difficulties still remain largely with the accumulator, or storage battery; the size, weight and cost of which have not been greatly reduced, except at the sacrifice of durability and reliability. Should the storage battery become satisfactory in all respects, we may look for an enormous advance in that line of work; although in that direction, as in all others, the shadow of the professional speculative promoter of the giant corporation —on paper—falls heavily over legitimate enterprise.

The automobile now finds its way into every part of the civilized, in fact into many portions of the uncivilized, world. Large numbers have been sent to South Africa for use in supply-trains and the transfer of horses to the seat of war in such immense numbers has caused their replacement in London streets by the "auto-vans," now almost as numerous as were, formerly, the omnibuses, and, it is reported, with a very appreciable economy. Profits on sales of horses and gains by use of the automobile are together adding greatly to the dividends of the companies. In this country, electric cabs and other vehicles are coming into use extensively in our large cities, and the Baltimore and Ohio Railroad passenger department is about establishing such a cab-service in Washington, with a fifty-cent fare. A well-proportioned automobile will traverse any respectable road and go wherever the horse can fairly be expected to travel. It should ascend a ten-per-cent. grade readily and ride over obstructions that would stall any horse-drawn wagon. Ice may stall it, but snow should obstruct its movements less than those of the horse and its carriage.

Washington insisted on the promotion of national roads and the encouragement of the production of horses for transportation. Hamilton recognized the influence of facilities for transportation in the promotion of the industrial advance of the country, and we all to-day see clearly, as never before, that every new method of improved transportation is a great gain. Motor wagons and carriages have probably now come to stay with us, and the displacement of the horse in commercial work generally, and possi-

bly even in a considerable degree in pleasure travel, seems certain to occur soon. Self-propulsion is itself an enormous advantage and the improvement of the roads by the substitution of effective road-rolling, in the use of the vehicle, for the destructive action of the hoofs of horses is also a larger gain than is commonly realized; while release from the physical defects of the horse used as a motor is, sanitarily and psychologically, hardly less important.

Rated Powers of motor-vehicles are often greatly over-stated, and the automobile rated at 2 or 4 or 10 horse-power is often found, under the truth-revealing test of the Prony brake, to be capable of working up to less than two-thirds, sometimes less than one-half, its stated power. On a good pavement, and with a light carriage, one and a half or two horse-power proves quite sufficient for any safe speed over any usual city-gradients, and a rated 4 horse-power motor may thus not fail in its work under any ordinary conditions, even though far below its rating in actually available power. A correct rating, however, as established by the brake, is essential to a real knowledge of the action of the machine and to its intelligent design and improvement. The correct rating is the power it is capable of exhibiting at any time, and for any length of time, under the brake when at its regular and normal speed, precisely as if in operation in its place in the automobile on the road.

The difference in power required on a level and ascending a hill, or on a smooth and on a rough road, is rarely appreciated by the automobilist-amateur; though familiar, through many trying experiences, to the old hand. Two horse-power, actual and deliverable against the brake, will, on a good road, drive an automobile weighing 750 to 800 pounds 12 miles an hour easily, but on moderate up-grades the speed will fall to 8 miles or less. In some cases, on a smooth pavement, this expenditure of power may drive the carriage at the rate of 15 and 18 miles an hour on the level. With good speed-changing gear, the engines or motors may be made to deliver their full power at whatever speed of carriage the varying grades may cause the work to be done, and, if one choose, the power available at low speeds, rising a hill, may be made higher than that employed at high speeds on the level. Twelve or fifteen hundred pounds of carriage and passengers may be propelled, on a level, at 20 miles and upward by 4 or 5 horse-power; but a grade rising but 200 feet in the mile will pull down the speed to perhaps 15 miles an hour. Ten horse-power per ton should give some such figures as the above, if the motor supplies the power for which it is rated, or say a half horse-power

for each hundred pounds of carriage and load. The actual power required on a very smooth level road, as an asphalted street or a good macadamized suburban road, would be properly not far from 1 horse-power to 500 pounds weight transported, including the automobile itself, for 10 miles an hour, 1½ for 15 miles, 2 for 20 miles, 3 or 3½ for 25, and 4 or 5 for 30 miles an hour. These figures are increased about twenty-five per cent. for each increase of elevation of *one* per cent. or of 50 feet to the mile. Four or five per cent. is not an uncommon elevation in even comparatively level countries and grades of ten per cent. and upward must be encountered occasionally in hilly districts. An actual 10 horse-power machine, of a thousand pounds weight, with its load, which may speed up to 30 miles an hour under the most favorable circumstances, may fall to one-third that speed on a less than ten-per-cent. rising gradient.

The Wheel Resistance alone of a wagon or carriage on the city street may be taken as from 40 pounds per ton on asphalt, to 50 pounds on a smooth cobblestone, and 60 to 75 on macadam pavement, smooth and rough. These figures correspond to about three-quarters of a horse-power at the lower limit, and to one horse and one and a quarter at the higher resistances, at 7 miles an hour, or to from one to one and a half or three-quarters at 10 miles an hour. One horse-power per ton at 10 miles an hour, for good construction of vehicle and roadbed, may be considered perhaps a fair average figure in city work, and a maximum speed, and three-quarters of a horse-power, or a trifle less, at the usual speed of 7 miles, increasing to a full horse-power on rough streets or with very moderate rising gradients. The horse, however, if compelled to work at 7 miles an hour in city work, cannot usually be depended upon to do more than about 20 miles a day, and thus exerts about one rated horse-power for only three hours a day working time.*

Automobiles would seem to be less affected, in speed and steadiness of action, by variations of condition of roadbed than are horses; but precisely why this should be, it is difficult to state with confidence. Possibly the inertia of the mass and the steadiness of the former, and the jerky and varying pull of the latter, may account for the difference. But automobile and horse-drawn vehicle are alike greatly affected by variation from a level track and it is elsewhere shown how both power and pull, as well as speed, are affected, as measured in terms of energy, work and pull. The automobile, as a rule, maintains a higher average rate

* See Transactions Am. Inst. Electrical Engineers, November, 1899, for the paper of Messrs. Sever and Fliess, in which are collected some of the most valuable data yet obtained.

of speed than the equine machine and thus utilizes a considerably larger amount of power. Where the horse averages 7 miles or 8, the automobile probably averages 8 or 9, or even 10. The resistance per ton at a given speed, with equally good construction and similar wheel-diameter should be the same. The weights, however, are not strictly comparable; since the automobile carries its own power and is thus debited with weight in excess by that amount; the weight of the motor in the other case being separately carried on its own feet and, in all usual data, left out of account. Further, the greater weight on the wheels of the automobile, where not fully compensated by increased breadth of tire, causes deeper wheel-track and higher resistance per ton than with the horse-drawn apparatus. But the competing automobile will do easily twice as much work per day, in commercial employment, as will the horse and can, if desired, be kept in action night and day, except that time must be allowed, with electric vehicles, especially, for charging, or, better, exchanging batteries or storage tanks. When the finances of the case are considered, the best automobiles stand far in advance of the best of the older system.

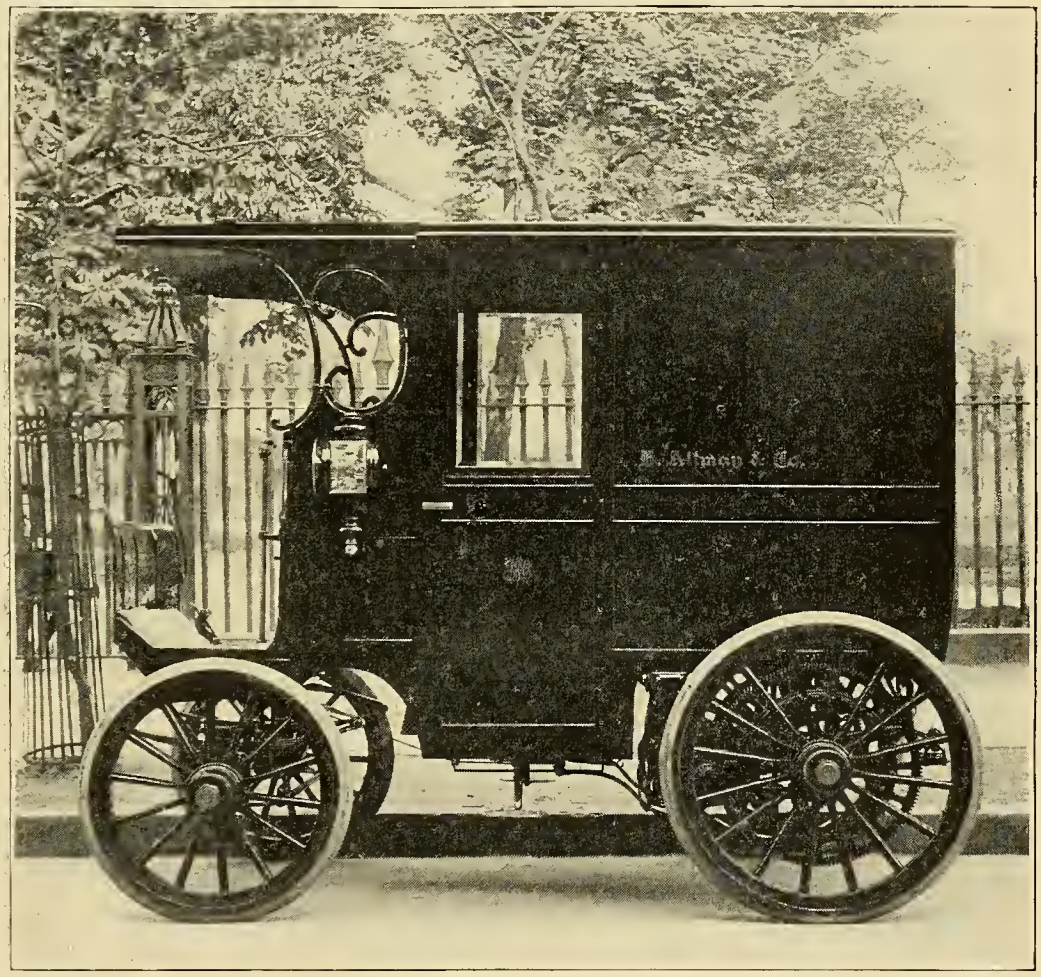
Fuels—Of the available fuels for the heat-motors, coal and coke are the cheapest and will presumably be ultimately found the proper fuels for purely commercial use, and the laws against smoke will probably compel the choice between anthracite and coke. The crude oils and the tarry and other by-products of gas-making follow in availability and costs and have advantages in heat-production for the unit weight or volume and also in their convenience. The petroleums are of highest value and the safest petroleums are most costly and are most troublesome in use in the internal-combustion engine. Heat-contents range from 10,000 to 15,000 *B. T. U.* in the coals, to 20,000 *B. T. U.* per pound, in the oils. Liquid fuel is much superior in stowage, both in condensation into minimum volume and weight and in convenience of handling. Unpleasantness in handling, however, noisome vapors, and their explosive character in the case of the lighter fluids, and, even the noisy combustion, are disadvantages of no small importance. Vaporizers and atomizers are often troublesome and the heavy petroleums and tarry products do not always work steadily and with certainty.

(*Third paper next issue*)

Electric Delivery Wagon

THE delivery wagon shown in the accompanying illustration is one of three electric delivery wagons built for B. Altman & Co. by Frederick R. Wood & Son, of New York City.

The novel features of these wagons lie in the gear and in the arrangement of body, which is of the brougham type. Side



doors are provided, enlarging the body materially, as the carrying capacity is precisely double that of the type of Altman wagons familiar to New Yorkers. The total length being but ten inches longer than the latter type. Great care has been taken in the finish and upholstery, which is equal to any fine carriage.

The speed of these wagons is ten miles per hour and thirty miles on one charge is attained.

Forty-four cells of the chloride battery are placed in the body, distributed in three crates in the rear and one in the front.

Thirty-six and forty-two inch wheels are used on front and rear, respectively.

The Gibbs Pedestal Gear is used, making it possible to hang the body lower than is customary, which adds to the appearance materially.

This gear is an adaptation of the familiar pedestals used on locomotives, and consists of pedestals bolted to the sills, in which the axles are free to move vertically. There being no reaches running fore and aft and connecting the axles, each axle is free to move independently of the other and thus no destructive strains are transmitted to the gear. All strains of driving and also those encountered on rough roads are taken directly by the pedestals and not through the leaves of the springs.

The motors are of a new type designed by the General Electric Company, as are also the controllers.

Rawhide pinions of large pitch and face are used to minimize the noise, and after long test it is found that they last fully 5,000 miles.

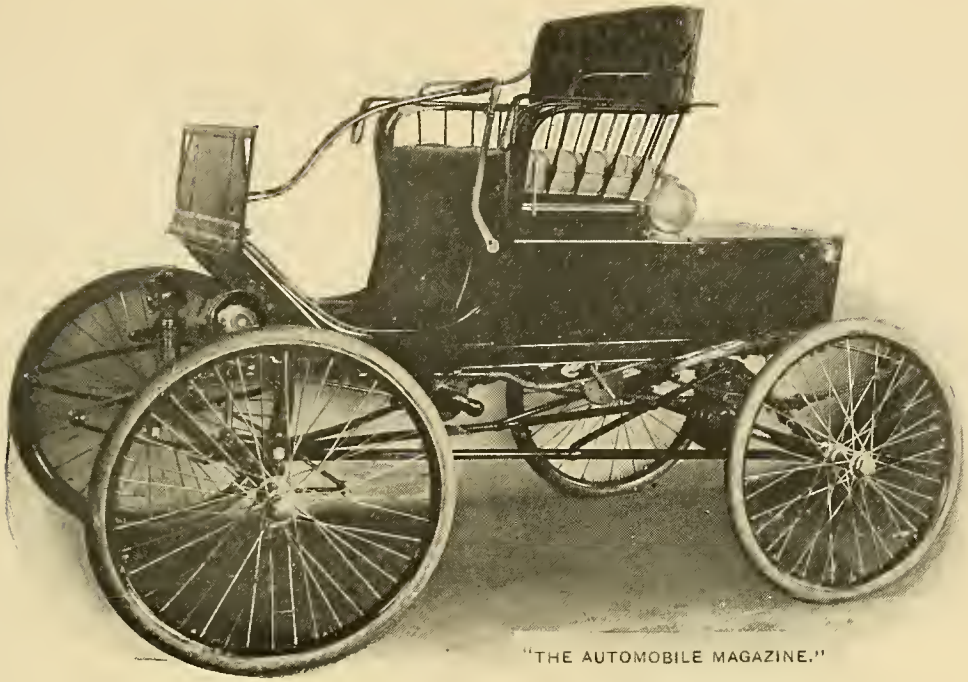
American Gasoline Runabout

THE illustration shown herewith represents the 1900 model Gasoline Runabout of 4¼ horse-power manufactured by the Autocar Company, Ardmore, Pa. The total weight of the carriage is 650 pounds. This includes sufficient water and gasoline for a run of 70 miles over ordinary roads. The running gear is constructed of steel tubing, the front and rear axles revolving on ball bearings. The compensating gear, which allows the vehicle to turn corners freely is all incased in a malleable iron casing. A band break, which is operated by the foot, is applied to the rear axle so that, in case the chain should break, the occupant of the vehicle can prevent it from running away. The body is of size sufficient to seat two persons comfortably. One controlling lever governs the variations of speed and reverse. The speed ranges from about 2 miles up to 18 or 20 miles per hour, the slow speed being the hill climbing device.

The gasoline is carried in a nickelled cylindrical can at the rear of the seat. The motor is of the four-cycle type, having two cylinders, and the crank set at 180 degrees. The button, which is shown on the lap of the seat, is connected to the gasoline vaporizer, which is automatic at any speed.

In the front of the vehicle and under the foot-board is located

American Gasoline Runabout



Gasoline Runabout of the Autocar Company, Ardmore, Pa.

a large radiating can for the circulating water. Water from the water jacket is forced through this radiating can by a small centrifugal pump.

The transmission of power from the motor to the rear axle is by means of chain and sprocket, and the variable speed mechanism is said to be entirely new. The muffler, which in the illustration will be seen under the body and below the seat, is sufficiently large and effective. Wire wheels with 2½-inch pneumatic tires are used. All parts of the gear are handsomely painted and nickeled.

This type of carriage is made either with a spindle seat of the runabout type, or with hood and storm apron, the latter being particularly adapted for physician's use.

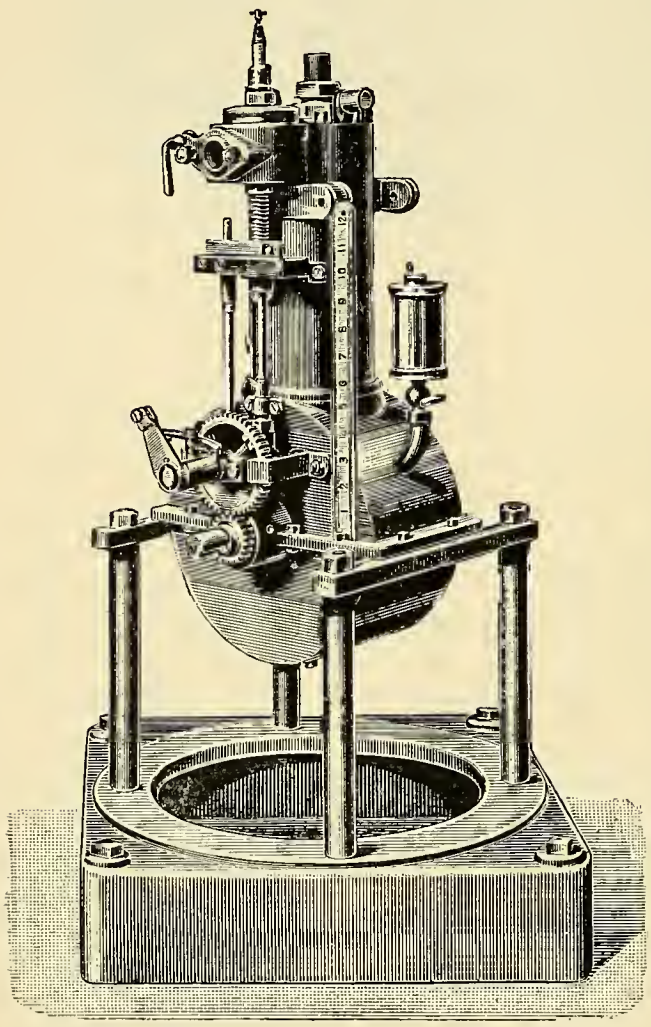
The oiling of the motor and various parts is automatic, a small pump supplying the oil from a reservoir to the different bearings and cylinders in proportion to the speed at which the engine is running.

The engine varies in speed from 300 revolutions to 1,000, having, in addition, a variable speed mechanism in the countershaft. The under frame, which is supported by the springs, carries all the machinery and mechanism so that the body of the vehicle can be changed.

The ignition of the motor is furnished by a dynamo of special design, which gives the motor an explosion by one revolution of the fly-wheel.

The Wellington Motor

THIS motor, which we illustrate herewith, is entirely of British design and manufacture, having been designed by Mr. J. Morecraft Wellington, engineer of the company, and built by Messrs. The Wellington Motor Car Company (Limited), of No. 37 Victoria Road, Battersea, S. W. It is intended for use in the smaller class of automobiles, such as voiturettes, dog-carts, etc. It comprises a single vertical cylinder bolted to an enclosed crank chamber. So far it follows conventional lines. There are, however, several mechanical details about it which serve to differentiate it from others of its type. The cylinder is 3 inches diameter by 4 inches stroke. It is water-jacketed, as is the cylinder cover. These jackets are quite independent of each other, and the cover can be easily removed for inspection, the joint between the cover and cylinder head being metal to metal, forming a V joint—no packing of any kind being used.



The crank or fly-wheel chamber is in two portions, which are united by horizontal flanges bolted together. It is thus very easy to get at the main bearings and cranks. Ball bearings of a special type are used in these important parts, and from repeated tests made with them and plain ones, Messrs. The Wellington Motor Car Company

(Limited) find that by the use of ball bearings they save, so they assure us, quite half a horse-power. The inhaust and exhaust valves are neatly arranged so that either can be quickly overhauled without disturbing the other, the inhaust valve being placed immediately over the piston, which thus gets the full advantage of the explosive impulse.

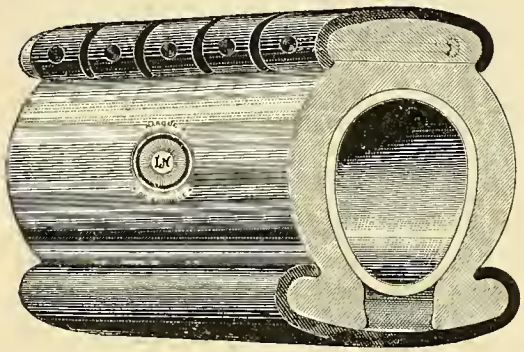
The make and break mechanism of the electrical ignition is so arranged that no oil which is used to lubricate the distributing gear can possibly get on to it to so spoil the contact, as it is placed high up on the side of the cylinder. We should state that this is, of course, a second motion shaft as seen, the motor working on the Otto cycle and using petrol as fuel. This motor has been very carefully and repeatedly tested, with the mean result that at 1,400 revolutions per minute it gives 3.8 B. H. P. It is, however, classed by its makers as a 3½ H. P. motor, so as to allow a margin within which it can be guaranteed. Its weight is, exclusive of induction coil and batteries, 110 lbs., and the consumption of petrol, at full load, being ⅞ pint per H. P. hour, and at half load ⅝ pint per H. P. hour; the cost of running being thus (taking petrol at 11⅞d. per gallon) 1⅛ d. per H. P. per hour.

We have inspected the motor and can testify that it is thoroughly well made and substantial. It should prove a very reliable one in ordinary hands. We understand that Messrs. The Wellington Motor Car Company (Limited) are manufacturing motors of this type for the trade, and as there are no royalties or license fees they can be produced at a reasonable price. One of these motors will be exhibited at the forthcoming exhibitions.

The Iron-Clad Pneumatic Tire

OUR engraving shows a section of a new type of pneumatic tire, of which the exterior is protected by an endless band of rubber provided with small juxtaposed plates of iron and secured to the envelope by vulcanization.

Some of the advantages claimed for this arrangement are as follows: The springing of the tire from the rim is prevented; the tread does not, like one of rubber, slide upon wet or slippery ground; and the metal renders any chipping, fissuring or puncturing of the rolling surface impossible.



This tire, although iron-clad, preserves its full degree of elasticity and its own independence. It rolls, in a manner, upon the band that invests it, and, while yielding under the pressure of an obstacle, is incapable of adapting itself so readily as rubber to cavities in bad pavements, or of binding in the tracks of street railways. The use of the band under consideration also greatly reduces vibrations. The increase in weight is insignificant, say about four and a half pounds for a wheel of ordinary dimensions. For light weights, moreover, the iron may be replaced by aluminium, which will render the envelope as light as any of the ordinary kinds.

At first sight, it might seem as if these iron plates would produce a noise like the rattling of a lot of scrap-iron; but, as a matter of fact, they roll as silently as does an ordinary unprotected rubber tire.

Several carriages are now provided with this tire, and it is to be hoped that the experiments that are being made with it will give satisfactory results.

New Accumulators for Automobiles

AMONG the accumulators tested at the ever-memorable *concours* of the Automobile Club de France, few, indeed, attracted more attention than the battery made by the Société pour le Travail électrique des Métaux. The plates of this battery are not homogeneous, both being of different types.

As Fig. 1 shows, the positive plate is composed of a number of superposed, waved bands of lead 0.5 mm. (0.02 in.) thick and 8 mm. (0.32 in.) wide. These bands engage two leaden rods which divide the plate into three equal parts in the direction of

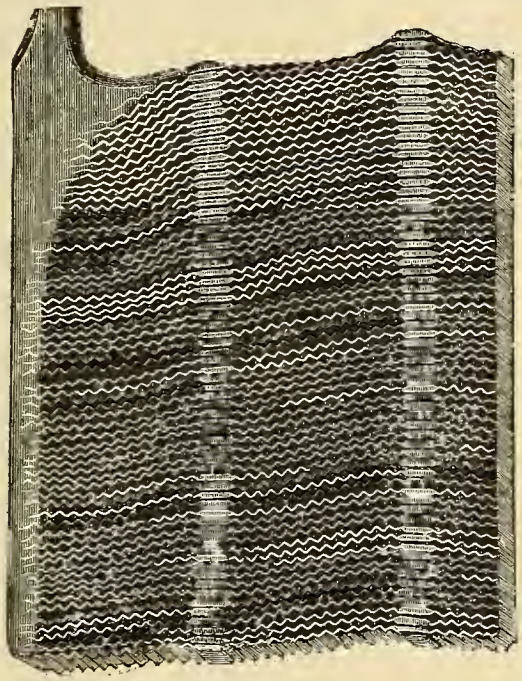


Fig. 1. Positive Plate

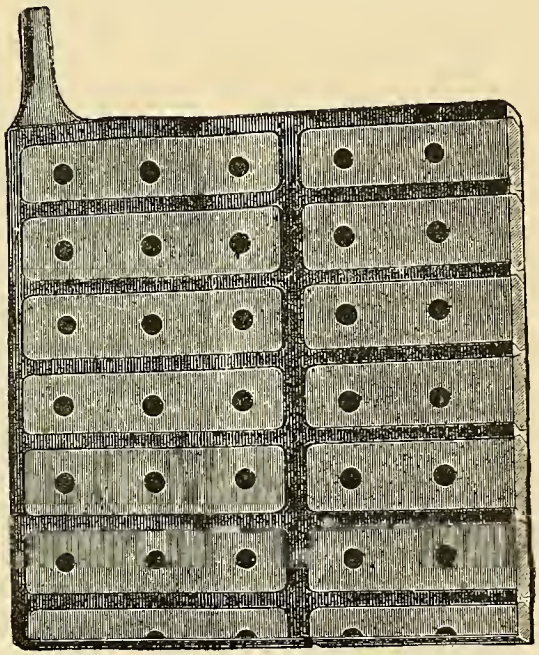


Fig. 2. Negative Plate

its width. Where the leaden rods cross the bands, the latter are reinforced by small pieces of lead, which also serve the purpose of separating the bands. At the edge of the plate opposite the connecting piece, each band is again strengthened; and these additional reinforcing strips are soldered together so as to form one of the upright posts of the plate. On the side of the connecting piece the bands are embedded in a much heavier soldering, from 4 to 5 mm. (0.16 to 0.20 in.) wide, constituting the second post. Finally, the entire series of bands is held in place between the two by a light soldering which secures each end of the two

rods, previously mentioned, to the uppermost and lowermost bands. There are 120 superposed bands, each having a useful length of about 120 mm. (4.8 in.). The active surface of the plate has an area of about 25 sq. decimetres. As each element is composed of 7 plates, the total active surface for 120 ampère-hours is 1.58 sq. decim., which corresponds, for a normal discharge of 120 ampère-hours, with 0.76 ampère-hours per sq. decim. of active surface.

As illustrated in Fig. 2, the negative plate is formed of a rectangular block of antimony lead divided into two equal parts. Each of these parts is again divided into four cells by three horizontal cross members. The cells are 56 mm. (22.4 in.) long and 50 mm. (20 in.) wide; and the paste which they contain is pierced with nine holes. The proper distribution of the current in these larger paste-blocks is assured by intermediate divisions which trisect each paste-block or "pastille" as it is called. Corresponding divisions on each side are riveted together. The pastilles are composed of lead chloride.

The piece connecting the positive and negative plates is located at one side, almost in the prolongation of the corresponding vertical side post.

Plates of like polarity are electrically connected by a small leaden bar soldered on the plates. The plates are insulated from each other by sheets of waved and perforated ebonite.

The electrolyte employed is sulphuric acid having a density of 1.22 and containing about 1.33 grammes of $H_2 S O_4$; that is to say, almost 3 times the amount theoretically necessary for a capacity of 120 ampère-hours. At the end of the discharge the density falls to 1.162.

The cell is made of ebonite. The terminals project through a two-part ebonite cover, an opening being also provided to permit the escape of the gases.

POSITIVE PLATES

Number	7
Dimensions in centimetres:	
Height	20.2
Width	12.2
Thickness	0.8
Weight in kilograms	1.11
Approximate weight of the side posts in kilograms	0.15
Approximate section of the side posts in square millimetres (mm.^{2})	30.00
Approximate section of the connecting piece in mm.^{2}	30.00

Active surface in dm.^{2}	25.00
Visible surface in dm.^{2}	5.

NEGATIVE PLATES

Number	8
Dimensions in cent.:	
Height	20.2
Width	12.2
Thickness	0.4
Weight in kilograms	0.5
Approximate weight of the frame in kilograms	0.25
Approximate section of the frame in square mm.^{2}	14.00
Approximate section of the connecting piece	22.00
Weight of active material in kilograms	0.25
Distance between plates in mm	4.00

CELL AND CONNECTIONS

Exterior dimensions in centimetres:	
Height	20.00
Length	13.70
Width	18.30

ELECTROLYTE

Weight in kilograms	4.90
Approximate volume in dm.^{3}	3.7
Density:	
End of charging	1.22
End of discharge	1.16
Total weight of complete element in kilos	19.10

The Phenix Accumulators

THE Phenix accumulators differ from most storage-batteries in so far as the electrodes have not the form of plates, but of numerous small cylinders.

Each of these cylinders is in turn composed of six elementary cylinders soldered end to end (Fig. 2). The elementary cylinder, as illustrated in Fig. 1 is composed of a leaden rod covered with a paste of active material. The rod has a diameter of 2 mm. and a length of 7 c. m. between the two shoulders with which it is

provided, the distance between the upper shoulder and end of the rod being about 5 mm.

The diameter of the pasted cylinder is 6 mm. The paste abuts against the upper shoulder. The lower shoulder, which is somewhat larger than the upper, slightly projects from the paste. The lower cylinder, moreover, supports a number of superposed ebonite rings which completely cover the cylinder. These rings are cut from an ebonite tube 0.3 mm. thick; each ring has a height of 0.1 mm.

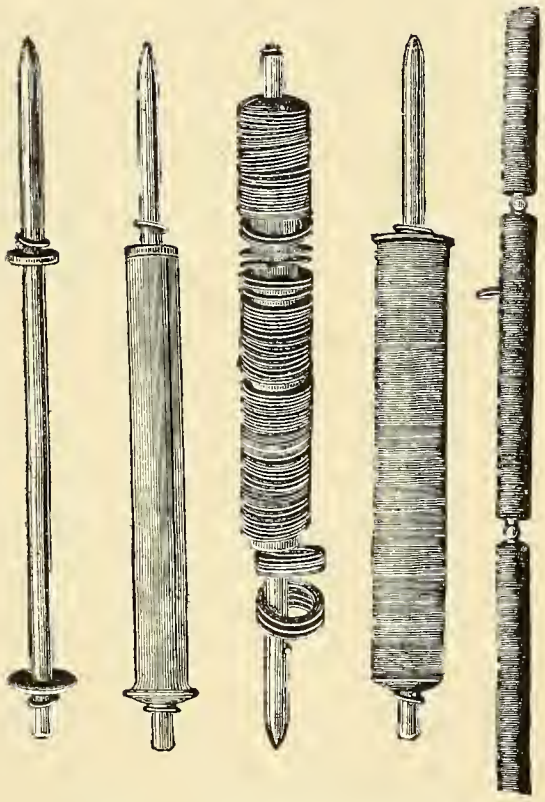


Fig. 1. Phenix Electrodes

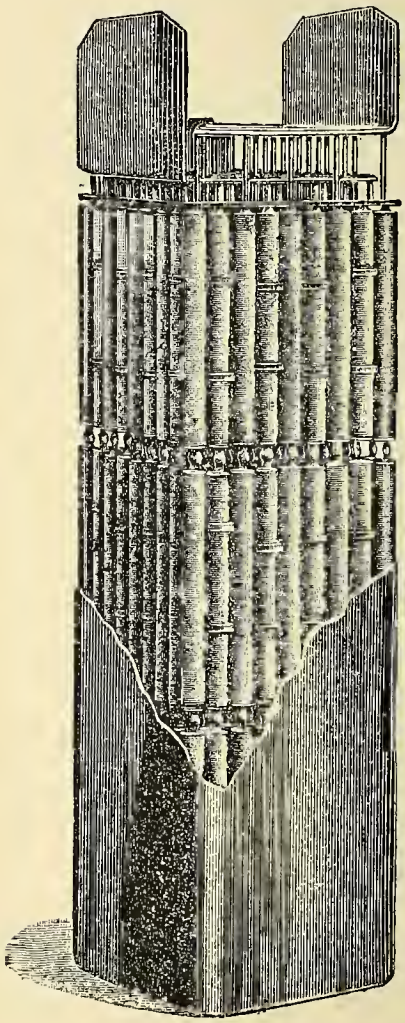


Fig. 2

The negative and positive cylinders are absolutely the same in construction.

The positive cylinders are soldered to one plate, the negative cylinders to another plate. These lead plates are superposed, the positive plate being uppermost. Positive and negative cylinders alternate. The lower plate is perforated to permit the passage of cylinders of a polarity different from those cylinders which it

connects electrically. Moreover, each of the plates is pierced with as many holes, of the diameter of the cylinder-cores, as there are series of cylinders.

An ebonite plate, apertured to permit the passage of the cylinders, rests on the lower part of the string of cylinders.

The lower portion of the rods enter the holes of a similar plate on a soldering at the end of each rod.

The weight of the electrolyte corresponds with 1,368 grammes of free acid ($H_2 S O_4$).

The cell is of ebonite. Although unprovided with a cover, it is closed by a layer of paraffine poured on the plates when the parts are all assembled. The layer of paraffine is apertured to provide a vent for the gases.

POSITIVE ELECTRODES

Dimensions in centimetres:	
Length	7
Diameter	0.6
Total weight in grammes	12.0
Weight of the support in grammes	4.0
Weight of the active material in grammes	0.0
Number of electrodes, 90 × 6 =	540.0

NEGATIVE ELECTRODES

Dimensions in centimetres:	
Length	7
Diameter	0.6
Total weight in grammes	12.0
Total weight of support in grammes	4.0
Weight of active material in grammes	8.0
Number of electrodes, 90 × 6 =	540.0

CELL

Dimensions in centimetres:	
Height	57
Length	12
Width	12
Weight in kilogrammes	1

ELECTROLYTE

Volume in dm.^{3}	3.8
Total weight in kilogrammes	4.8

Density:	
End of charging	1.274
End of discharge	1.22
Total weight of the complete element in kg	18.4

These elements have one grave defect—their construction is exceedingly difficult. In a battery of 44 elements there are no less than 47,000 soldered connections—a number which seems almost incredible.

Since the positive and negative electrodes are like in construction, the poles can be changed after the battery has been in use for a certain time. The advantages of this interchangeability are obvious.

The Fulmen Accumulator

IN the Fulmen storage-battery the active material is a paste held in a special lead grid. The positive plate is composed of two similar, superposed grids. The paste is contained in 30 rectangles, the exterior dimensions of which are 25.5 × 1.65 mm. (1.02 in. × 0.068 in.); the pellets are pierced with 8 holes.

The partitions which form the grid are 2.5 mm. wide; and the interior frame is 3 mm. wide. The junction of two partitions is strengthened by reinforcing strips.

The negative plate is like the positive with the exception that the partitions are not reinforced, and that each pellet of paste is formed with a small quadrilateral 0.5 mm. thick, which divides the pellet into twelve equal parts. Thus a network is formed which retains the active material.

The upper part of the frame of the two plates is slightly wider than the other sides and is provided with the connecting-bar, which is composed of lead and is circular in cross-section.

Plates of like polarity are soldered to a lead bar rectangular in form, and 15 × 4 mm. in size. The plates are supported above the bottom of the containing vessel by rubber brackets, the cross-sections of which are truncated triangles. The base of each triangle is of hard rubber; the truncated apex, of soft rubber. Waved, perforated sheets of ebonite separate adjacent plates.

The weight of the electrolyte is equal to 736 grammes of free acid ($H_2 SO_4$).

The containing vessels are of ebonite 3.5 mm. in thickness at the sides, 4 mm. at the bottom. They are covered by ebonite plates which extend 2 cm. into the interior of the cell. Each

cover is pierced with two lateral, circular holes, through which the connecting-bars pass, and with a central hole, closed by a plug, through which the gases can escape.

The elements are connected with one another by copper strips 0.2 mm. in thickness, clamped against the connecting-bars by copper nuts screwing on threaded bolts. The parts are all covered with vaseline.

POSITIVE PLATES

Number	10
Dimensions in centimetres:	
Height	18.3
Width	10.
Thickness	0.4

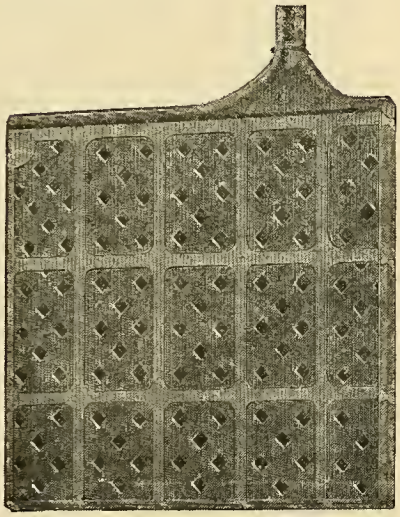


Fig. 1. Positive Plate, Fulmen Battery

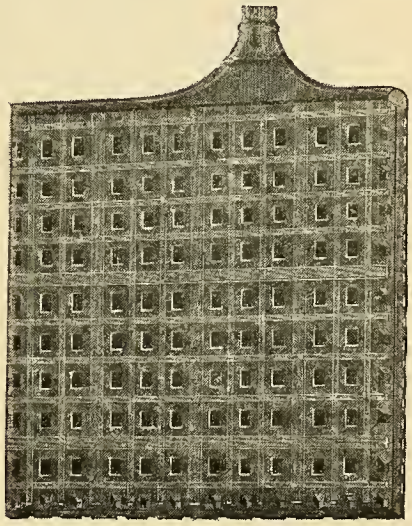


Fig. 2. Negative Plate, Fulmen Battery

Weight in kilogrammes	0.445
Weight of frame in kilogrammes	0.16
Weight of active material in kilogrammes	0.285
Section of the frame in square millimetres	8.
Section of the connecting-bar in sq.millimetres	20.

NEGATIVE PLATES

Number	11
Dimensions in centimetres:	
Height	18.3
Width	10.3
Thickness	0.4

Weight in kilogrammes	0.44
Weight of frame in kilogrammes	0.18
Weight of the active material in kilogrammes	0.26
Section of the frame in sq.millimetres	8.
Section of the connecting-bar in sq.millimetres	20.
Distance between adjacent plates in millimetres	4.

CELL AND CONNECTIONS

Exterior dimensions in centimetres:	
Height	24.
Length	18.
Width	11.3
Weight of the cell in kilogrammes	1.7
Weight of the insulating members separating the plates (kilos)	0.35

ELECTROLYTE

Weight in kilogrammes	2.2
Approximate volume in cubic decimetres	1.8
Density:	
End of charging	1.26
End of discharge	1.16
Total weight of complete element in kilogrammes	13.5

The Pope Storage Battery

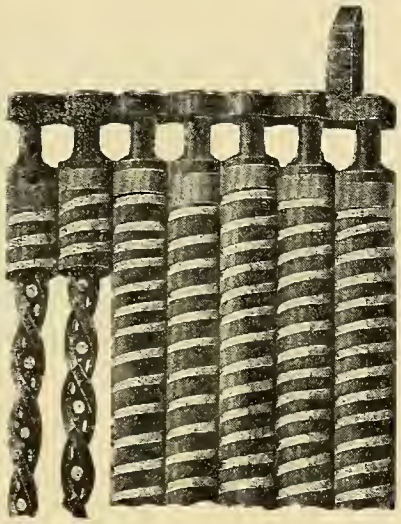
THE Pope accumulator, in the arrangement and form of its electrodes, recalls the Phenix storage-battery.

The positive plates are composed of a series of nine cylinders, 13 mm. in diameter, the upper ends of which are soldered to a cross-piece which carries the connecting-bar for the positive and negative plates. At their lower ends the cylinders are connected by a thin strip of lead, which merely serves the purpose of strengthening and stiffening the construction. Each of the cylinders is composed of a paste layer covering a slag lead core having the appearance of a spirally-twisted, perforated band. The paste completely covers the twisted core. The active material is held in place by a thin, outer band of ebonite, which is embedded in the mass. The band covers about one-half the exterior surface of the active material.

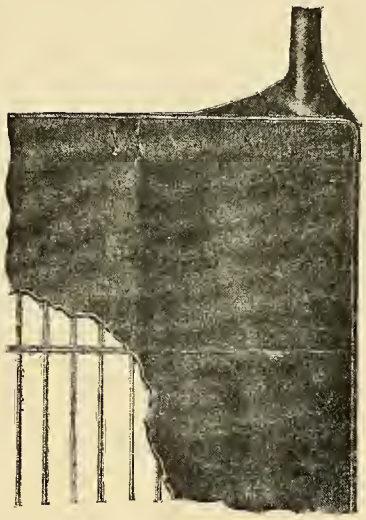
The leaden core is provided at its upper end with a round rod soldered to the cross-piece, and is riveted at its lower end to the lead strip already mentioned.

The leaden bar which connects the nine cylinders carries the connecting-bar.

The negative plate is composed of a light lead grid containing the active material. The grid is surrounded by a frame of small cross-section, provided with three longitudinal cross-pieces. The bars of the grid are of very small cross-section and divide the grid into 42 rectangles 50 mm. × 60 mm. in size. The vertical



Positive Electrode,
Pope Battery



Negative Electrode,
Pope Battery

side of these rectangles is the longer. The connecting-bar is cast on the frame.

The positive plates are inclosed in a perforated ebonite casing which serves as the usual insulated separating means for adjacent plates and finds its counterpart in a similar ebonite casing inclosing the negative plates.

The volume of the electrolyte is equal to 875 grammes of free acid ($H_2 S O_4$).

The containing vessel is made of ebonite, and is covered by a wooden closure provided with two rectangular openings for the passage of the connecting-bars, and with a circular opening closed by a plug, for the escape of the gases.

POSITIVE PLATES

Number	8
Dimensions in centimetres:	
Height	20.
Width	11.5
Thickness	1.3
Weight in kilogrammes	1.12
Section of the connecting-bar in sq. millimetres	28.

NEGATIVE PLATES

Number	9
Dimensions in centimetres:	
Height	20.
Width	11.5
Thickness	0.5
Weight in kilogrammes	0.6
Weight of the frame in kilogrammes	0.25
Weight of the active material in kilogrammes	0.35
Section of the frame in sq. millimetres	5.
Section of the connecting-bar in sq.millimetres	20.

CONTAINING CELL AND CONNECTIONS

Dimensions in centimetres:	
Height	26.5
Length	20.7
Width	13.2
Weight of cell in kilos	1.27

ELECTROLYTE

Weight in kilos	2.34
Approximate volume in cu. decimetres	1.85
Density:	
End of charging	1.28
End of discharge	1.24
Total weight of complete element in kilos	20.

(*To be continued in next issue*)

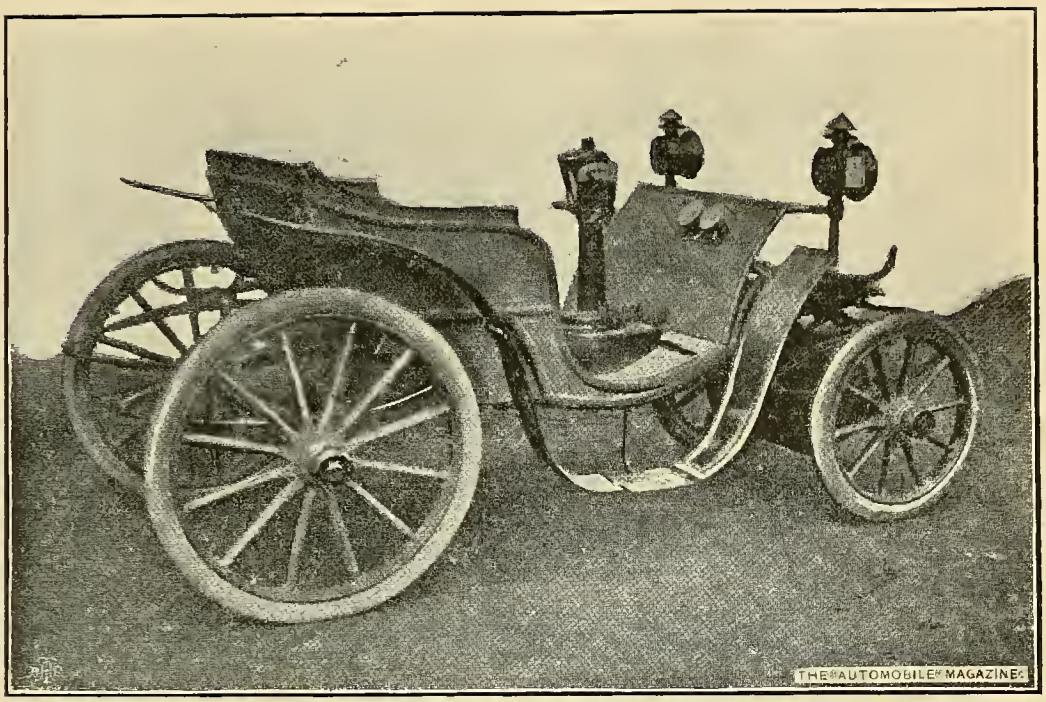


Fig. 1

The Berthier Electric Fore-Carriage

THE illustrations which we present herewith picture a new electromobile which is remarkable chiefly for its novel motor and for the arrangement of that motor and its accessories upon the fore-carriage.

The field-magnets of this motor turn in a direction opposite to that of the armature. The actual speeds are small; but the apparent speed (the sum of the two speeds) is apparently very high. The arrangement has the merit of reducing the weight by reason of the suppression of the differential, of transmission-gears, of intermediate shafts, frame-work, and the like. The lack of differential and transmission gearing naturally lowers the cost considerably. By reason of the opposite rotation of the field-magnets and the armature, the speed of the moving parts is reduced by one-half that ordinarily met with in automobiles. But this is not all; the speed is still further lowered by making the motor a four-pole machine. A two-pole machine of equal capacity would have a speed of about 800 revolutions per minute; but

the armature of the motor in question turns only at 200 revolutions.

This very compact and low-speed motor is mounted on the front truck of the vehicle (Fig. 3). A supplementary gear imparts to the field-magnets the necessary reverse movement. The armature-shaft hence directly commands one of the driving-wheels, the other driving-wheel being actuated by the field-magnets through the medium of a reversing-gear.

This combination consequently acts as a differential; for which reason the usual differential can be dispensed with. The reduction of speed and the suppression of transmission gearing has the effect of increasing the efficiency.

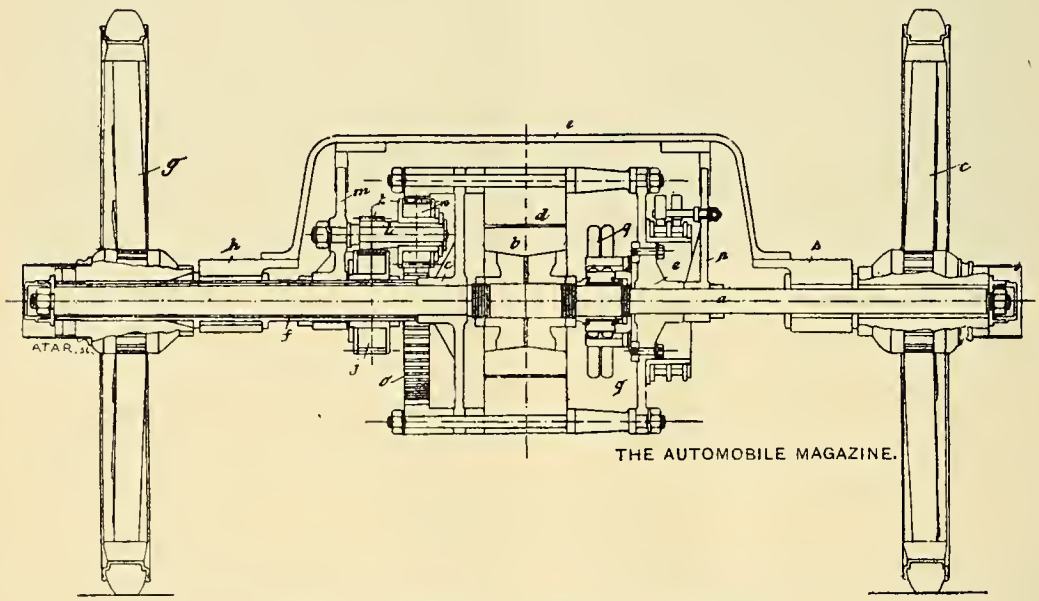


Fig. 2. Section of the Fore-carriage

The arrangement operates without noise and vibration; and the absence of unnecessary parts increases the durability as well as simplicity of construction. Since the motor is directly mounted on the axle of the front wheels, the simplest imaginable fore-carriage is created—a fore-carriage which can be applied to vehicles of almost any kind.

The reversing-gear of the motor, as shown in Fig. 2, is composed of a gear-wheel *O*, meshing with a pinion *n*, the movement of which is transmitted in the opposite direction to the wheel *J*, through the medium of a second pinion. The two pinions are mounted on the same shaft *l*; and the two wheels *O* and *J* are centred on *a*, the principal or main shaft of the entire system.

The motor is of two horse-power, and operates under a poten-

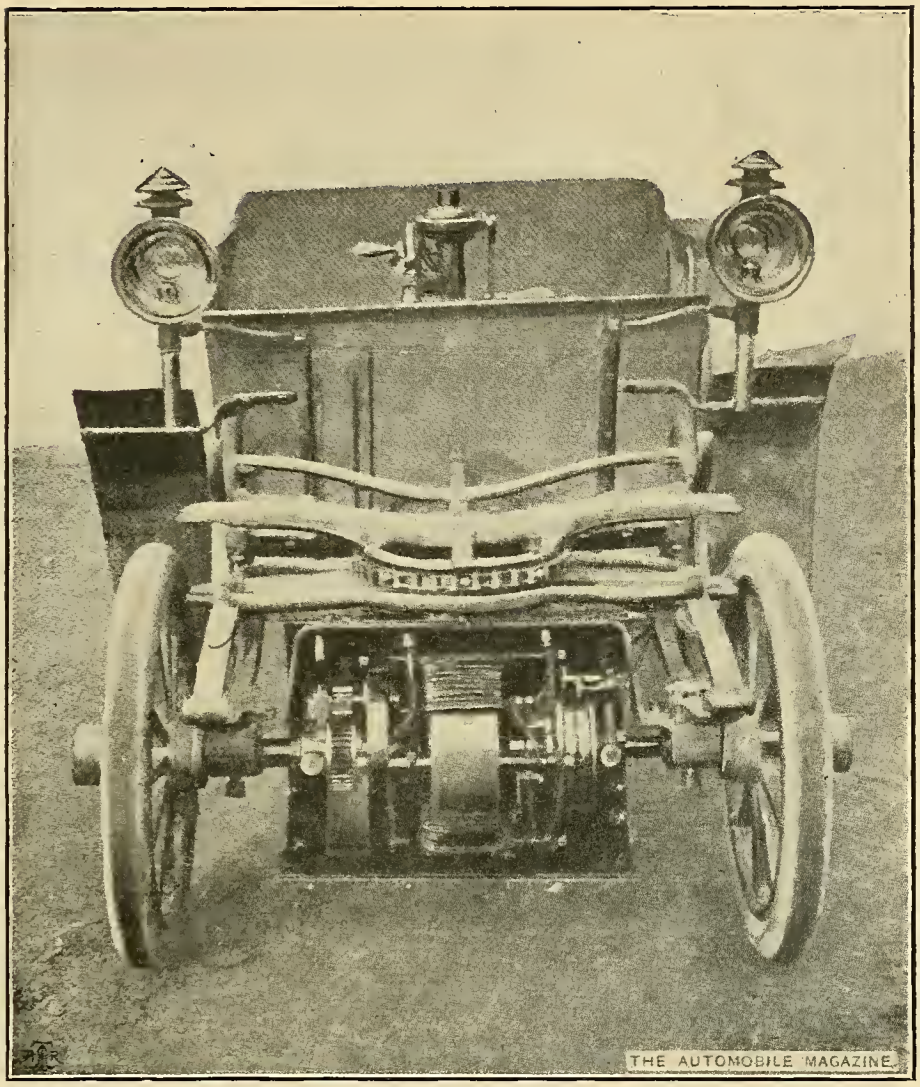


Fig. 3. The Motor and Reversing Gear

tial of 65 volts. The current is fed by means of two metallic disks and two brushes, seen to the right in Fig. 3.

The starting, regulating, and steering levers are carried by a strong central standard, as illustrated in Fig. 1.

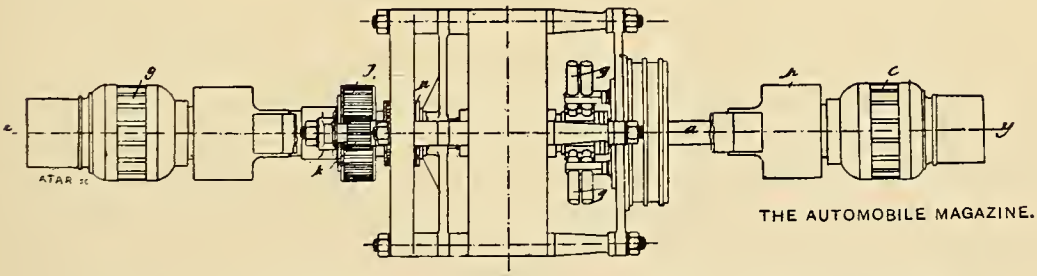


Fig. 4. Longitudinal Elevation and Section of the Fore-carriage

The Kainz Motor

THE Kainz Gasoline-Motor Voiturette constructed by Josef Kainz, of Vienna, is a very simple form of a self-propelled vehicle. The motor, placed on the front of the vehicle, is a vertical one-cylinder type, running at the rate of about 1,200 revolutions per minute and has 3½ horse-power.

The novel feature of this motor is the water cooler jacket. The weight of the motor with its cooler is 40 kilograms.

The power is transmitted by cog wheels to the rear axle and gives the vehicle a speed of thirty kilometres per hour. The change of speed gearing and reserve is secured with only one friction clutch, working on the engine shaft, so that when running idle the engine is perfectly free. This mechanism is secured in a small gear box. The complete vehicle weighs barely 250 klg. The motor is covered by patents in all countries.

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Editorial Comment

The Future of Electricity in Automobile Practice

The electric vehicle, or the electromobile, as it is conveniently called, is at once one of the most convenient and one of the most difficult forms of the motor-carriage. In cleanliness, ease of management, and safety it has ideal qualities. In its present shape its great cost, its excessive weight, and the various shortcomings of the storage-battery, together with its extremely limited radius, combine to limit its field to certain forms of urban use—in which, however, its merits so far outbalance its defects as to make it invaluable in those provinces, and as yet unrivalled by other forms of power. But these limitations make it the least flexible of all types.

The storage-battery, of course, is the source of all the above-mentioned drawbacks. The ideal electromobile would be something at once simple and durable, and in weight so light that that factor would have no more of a handicapping effect than does the weight of the water and fuel carried by existing steam and gasoline types. If, for instance, a metal like aluminum could take the place of lead in the plates of the storage-battery, so great a

reduction of weight would follow that the desired end could probably be attained. It may safely be assumed that, with all the inventive talent that is now concentrated upon the problem of electric motive-power, the ideal will sooner or later be reached. Mechanical genius knows no such word as fail, and, short of perpetual motion, there are few dreams of the inventor that the world is not likely eventually to know as a reality. The history of mechanical progress teems with instances of achievements that expert authorities had pronounced absolutely impossible. Therefore we may count upon the practical development of the electric automobile in what is now regarded as an ideal shape: light, strong, cheap, durable and perfectly tractable. How soon this result will be reached depends upon how soon the basic problem is solved—the development of a perfected storage battery or a substitute therefor—possibly in some way now hardly dreamed of; perhaps even doing away with any necessity for what is called "storage." Such ends may be achieved at any moment, or years may yet pass before the key is found. Undoubtedly great improvements in the electric automobile are steadily developing; the fact that the electric carriage of to-day is so enormously better than that of three or four years ago indicates a steady progress that must bring the goal within reach.

Various important improvements in storage-battery construction are announced from time to time. How many of these will stand the test of practical use remains to be seen. Claims are made, for instance, of great advances in efficiency. This means a considerable increase of electric output for a battery of given size and weight. Should this prove true the consequences will be immensely important. Should, for example, the capacity of a storage-battery be doubled, it would follow that either an electric vehicle of a given weight would be able to go twice as far as at present without recharging, or that its weight could very greatly be reduced and the radius remain the same.

If frequency and ease of recharging were made practicable, length of radius would become a comparatively unimportant factor, and weight could be enormously reduced. It is conceivable that improvements in efficiency and form might be carried so far that the weight of the battery could be made but a fraction of what it now has to be. In that event the storage-battery would cease to be a handicapping factor and extremely light forms of electric vehicles would be universally introduced. With the comprehensive organization of services that is a feature of our modern industrial development, series of recharging stations will be installed at frequent intervals throughout populous

regions. Such series are now proposed for France, and for the great cities and their suburbs in this country. Moreover, it should not be long before compactly populous States like Massachusetts, Rhode Island, Connecticut, and New Jersey, have charging stations in every part, so that electromobiles could go almost everywhere and find a charging-station somewhere within their radius of action. These States are gridironed by electric trolley lines, and there are electric lighting systems in nearly every town. These street-railway and electric-lighting companies could add a highly profitable feature to their business by establishing departments for automobile recharging. The vogue of the electric vehicle would thereby be immensely increased. It might be worth while for the great Electric Vehicle Company to include among its sub-companies a universal company for providing electric power for automobiles, making contracts with local companies everywhere to supply electricity at frequent charging-stations. With electricity supplied at low, and yet profitable, rates, its use would be greatly encouraged. Such a service would be particularly beneficial to lighting companies, for it would increase the daylight use of their plants, and they could afford to supply the current at correspondingly low rates. It is not impossible that methods will be devised for greatly accelerating the charging-process, so that batteries could be recharged as expeditiously as a tank is filled with water. It seems likely that electric "hydrants," so to speak, will in time be established at intervals of every block or so, in a city, with some form of "coin-in-the-slot machine" attachment, so that on the deposit of a nickel or a dime any privately owned automobile may couple onto the main and receive a supply of so and so many watts. Cabs, or other vehicles belonging to a company, could be supplied through the use of a special key to the hydrant. With a process of rapid charging a very low radius would be practicable in a city—say no more than four or five miles—and the vehicle could be made correspondingly light in construction. Less weight would mean lower cost. With such facilities a cab could be recharged while waiting for its user to make a call or do shopping. At every carriage-stand, also, there would be a charging-station.

A Possible New Form of Battery

There is a direction for battery development in which little has yet been done, but which seems to offer great potentialities in automobile practice. It is not exactly a storage-battery, and yet it is one, in a certain sense. What we call a storage-battery is

technically termed a secondary battery. Its construction is such that it has to be acted upon by electricity before it is capable of generating electric energy. The ordinary battery is called a "primary battery"; for it generates electric energy as soon as the elements composing it are assembled and connected. In both cases electricity is generated as a result of chemical action, a sort of combustion process being set up among the materials forming the battery, just as by the more rapid combustion of fuel energy is developed as the effect of heat.

The secondary battery, therefore, does not store up electricity in the sense that coal or grain is stored in a bin. For there appears to be no such thing as electricity, considered as a substance; electricity being simply a form of energy—an effect and a cause, but not a material like water or air, conducted through pipes. It is, however, a storage-battery in the sense of storing electric energy, just as mechanical energy is stored in a spring, or as the energy of heat is stored in a reservoir of hot water. The electric current passing through the battery acts upon the materials of which it is constituted and produces chemical transformations, making them capable of acting upon each other; thereby developing energy just as the materials composing a primary battery act. In this way the equivalent of the energy contained in the current is stored in the re-arranged materials forming the battery, minus the losses attendant on the process; losses analogous to the loss of mechanical energy by friction. When the cells have been wholly or partially exhausted of the stored energy the application of a fresh current of electricity sets up a regenerating process, restoring the materials to the arrangement that makes them capable of renewed action. This process may continue indefinitely, and in the secondary battery we therefore have an immensely valuable instrumentality for the storage of electric energy, vastly enhancing the efficiency of plants for lighting and power by distributing the load upon the generating mechanism more uniformly through the twenty-four hours. The great drawback to its use for traction purposes lies in its extreme weight.

The new form of storage-battery, as we may call it, is a primary battery. Some years ago it was discovered that in a certain form of battery, in which zinc was one of the main constituents, when the battery was exhausted the consumed zinc could be recovered by running a current of electricity through the cells in a reverse direction. The zinc could then be used over again, and it would represent the equivalent of the electric energy employed in its recovery. The energy stored up in the recovered zinc would

therefore make a storage-battery of this form of primary battery. An additional link in the series is necessary, however, before this discovery can be turned to practical account. The oxidizing agents employed in the battery are not recovered, and these represent a considerable portion of the total cost. It is therefore essential that one of two things should be done before the idea can be made commercially available. Either the process of recovery must be extended so as to include that of the oxidizing agents as well as the zinc, or these agents must consist of some very inexpensive material, the non-recovery of which would cut no figure. Probably one or the other of these two results will some time be reached, and then we shall have a storage-battery so slight in weight as to make the electric-vehicle a very light affair, and correspondingly cheap, both in construction and operation.

Electric Vehicles Without Battteries

There is one way, however, in which it may be practicable to run electric automobiles without any batteries whatever. It would, to be sure, be feasible only under certain limited conditions, but still it might include a very large and important range of functions. The most successful form of electric traction is the trolley car. Why not a trolley carriage as well, without any rails? It is by no means a new idea; some interesting experiments with a trolley carriage, or wagon, were conducted at Hartford several years ago, and at the time it was said that the results were promising. The proposition is essentially an easy one, amounting merely to the same thing as a trolley-car system without any rails; that is, a trolley-wire stretched along the regular highway and supplying the current to vehicles equipped with motors alone. The Hartford experiment was tried shortly before the vogue of the automobile. Had it taken place recently, it would have attracted wide attention.

With organization on a large scale such a scheme might be made enormously successful. Various difficulties would first have to be overcome. First would be that of keeping the trolley in place against the wire. This is sometimes troublesome in the case of an electric car; but the difficulties would be enormously greater with a vehicle having no rails to guide its course and moving freely about the road, sometimes on one side, sometimes on the other, and hence now nearer the conducting wire and now farther away. In the Hartford experiment, however, these fluctuating movements are said to have been allowed for and made feasible. But perhaps this might not have been the case in practical operation.

Then there are the difficulties of providing for the return current, which, in the case of a street-railway, runs by way of the wheels to the rails, and thence by buried wire back to the generating-station. With rubber tires and the absence of rails there would be obstacles in the way of the free return of the current. A double trolley, however, might provide for this. Again there is the difficulty presented by slow-moving vehicles obstructing the progress of faster ones; something that might be overcome either by frequent turnout points, with the conducting wire arranged as at switches on an electric railway, so that at such points the faster vehicles could run ahead of the slower and be subjected to no serious delay, or by small auxiliary storage-batteries that would keep enough power accumulated to run short distances independent of the trolley.

An electric trolley-carriage could not go everywhere, like a carriage carrying its own motive-power. Its course, like that of a trolley-car on an electric railway, would have to be confined to certain city streets and to main-traveled highways in the country. But even with such limitations it could be exceedingly useful. Electric transit lines in cities and from town to town in the country might thus be cheaply established without the expense of constructing and maintaining a costly railway line. Private individuals having occasion to go to and fro over regular routes every day could also use it to advantage for their vehicles, and it would be immensely serviceable in freight traffic. A transportation company having no track to maintain could afford to make its rates correspondingly low, and the public would gain accordingly.

With the advantages of the principle once demonstrated it would pay to equip the fine systems of State highways in Massachusetts and New Jersey, and the excellent roads that are such a credit to Long Island, with trolley plants. This might be done either by the State itself or by private companies given franchises for the purpose. In cities and towns with local electric-lighting companies or municipal lighting plants the same thing could be done, and trolley-vehicle routes established through all the principal streets. As in the case of the system of electric charging-stations for automobiles, heretofore mentioned, this would create a great daylight demand for electric power, the load on the plant would be evenly distributed and the current could be supplied much more cheaply, much to the benefit of all classes of consumers. The amount of electricity delivered to each vehicle could be accurately registered by meter, and paid for accordingly. Instead of an overhead trolley-line, to which there are serious objections on the score of looks and otherwise, it is

not impossible that eventually some system may be devised whereby the current will be distributed along the highways in underground electric conduits and picked up by passing vehicles as required. The great economies that would characterize the trolley principle as applied to electric vehicles—as in the distribution of power from a central plant where it is generated on a large scale and at a correspondingly low cost, and in the lightness of construction and corresponding cheapness both in first cost and in operating charges—should appeal to capital so strongly as to make it worth while to undertake its application on some favorable route; establishing an omnibus service either in some large city or over some frequented and well constructed road in the country running between two populous points.

The foregoing indications of the course of development that may attend electric automobile practice, furnish ample ground for confidence that the future of the electric vehicle is rich in promise of a great and healthful growth, while there appears to be no prospect that it will supplant the other forms of motive-power that have now established themselves so strongly.

The Making of Parts for Automobile Construction

In the early stages of automobile manufacture in this country there has naturally been a painful lack in the special manufacturing of necessary parts. Progress has been much hampered by this deficiency; with specialized work the number of automobiles now in use would be several times as great as they are. Makers have not known where to turn for this and that thing needed in their work. They would gladly have obtained it ready made, if possible, but they could not, and so they have had to make it themselves, much to the complication and retardation of their production. Slowly and surely the desired change is coming about. This country is peculiarly a country of specialized manufacturing. The automobile industry will be no exception to the rule, and in a comparatively short time we shall see manufactories of motor-vehicle parts springing up everywhere. There are few things that will more advance the general introduction of the automobile than this. The history of the bicycle industry shows what may be expected in automobile production. Even the greatest concerns that manufactured nearly everything in connection with their bicycles did not do it directly, but had subcompanies for making this and that part; a rubber-company for

manufacturing the tires, for instance, and a tube-company for making the tubing. And beside using the output in their own machines, they supplied the trade at large very extensively. The automobile trade is taking a similar direction. Beside the great establishments that make nearly every part of the automobile in their own several works, there are numerous concerns—many of them of minor importance and many of very considerable magnitude—which have to depend on the makers of individual parts. It is very poor economy for parties who have taken up some valuable improvement in the automobile to dissipate their energy by attempting to manufacture complete, with the improved device as a special feature, instead of limiting themselves to manufacturing the improvement and supplying the trade with it—a work in which they would find they had all they could do. Makers will go to carriage-builders for their bodies, to wheel-makers for their wheels, and to different manufacturers for their motors, their storage-batteries, their tires, and so on down to the various minor parts. It having been known that one of the greatest industrial establishments in the country was experimenting extensively in automobile work, it has been widely reported that it was about to embark in the manufacture on an enormous scale. But this proves to be unfounded. The concern, having devoted the energies of its splendid engineering staff to the production of certain improved types of the automobile, and having secured patents on the various improvements made, proposes to content itself with manufacturing the motive-power, which is its own particular province, and, furnishing the patterns of the vehicles to various makers, license them to manufacture them, finding its profit in the royalties and more particularly in supplying the motive-power machinery.

The enterprising course of three young men we know of, employed in a great manufacturing establishment, indicates what will soon be going on in all industrial parts of the country, furnishing the basis for great advances in automobile work. They are inventive young fellows of decided mechanical talent, and perceiving that there will be a large demand for something of the kind, they have designed an excellent form of gasoline engine. The castings of this they supply to the trade to be finished up in machine shops here and there according to careful drawings which they furnish. Such motors are, of course, in great demand, and since the makers supply something in which the trade can place confidence for assured excellence, the reputation gained promises to assure them a large and growing business. Meanwhile they have employed their leisure in building admirable

automobiles for their own use, with the aid of the parts that they have been able to assemble here and there, and they will have a great deal of wholesome enjoyment therefrom.

The making of automobile parts is certain to found various extensive industries in this country and create a vast amount of new wealth. A great trade will also develop in the production of automobile accessories, as it has so notably in the case of the bicycle. It is, of course, inevitable that standards will soon be agreed upon in all these specialties, greatly to the mutual convenience of the makers and the good of the public at large.

Automobile Market-Wagons

Whoever has seen or heard the long strings of heavily laden market-wagons lumbering their toilsome way into a great city in the wee small hours of the day, moving at a pace slower than cold molasses, will appreciate the improvement that will come with the application of the automobile to that phase of transportation. These heavily burdened teams are powerful factors in wearing out the highways, and in these days theirs is a most wasteful form of locomotion. A good strong automobile market-wagon could be constructed with sufficient motive-power to take two or three of these ordinary wagons behind it in a train and move over the ground at least twice as fast, enabling marketmen to set out at a much later hour and yet arrive with their produce at the same time as before. The cost of transportation would also be very greatly reduced. One automobile wagon would do the work of a considerable number of horses. The introduction of the fore-carriage, which can be speedily manufactured and applied at once to existing vehicles, would greatly accelerate the change in fields of transportation like this. There is such a manifest demand for the device that its manufacture in this country should be a highly profitable undertaking.

The Reckless Driving Nuisance

In France the reckless conduct of automobilists on the road has reached the degree of a public nuisance and called for stringent regulating measures. In this country "the boot is on the other leg," so to speak; it is the automobilists who have to complain of the reckless actions of the drivers of horses. In France the offenders are chiefly persons who use motocycles; here there are few motocycles in use, as yet, and those who run them are, as a rule, as careful as the drivers of the larger automobiles. But

the careless actions of a large proportion of the drivers of horses has long been a matter of complaint, and now, with the increasing use of the highways for other forms of traction, it has become extremely perilous. With the multiplication of bicycles horse-drawn vehicles have for some years been in a decided minority on the roads of a large part of the country, including all populous sections. With the present rapid development of mechanical traction it is evident that very soon new regulations for the use of the highways, adapted to the new order of things, will soon have to be made and rigidly enforced.

In England highway traffic is very strictly regulated. Accordingly, the era of mechanical traction is signalized in its progress by comparatively little friction in its contact with the old order. In London, for example, the crowded and comparatively narrow streets, simply by rational regulation, are made to accommodate a vast amount of traffic. In our great American cities the same streets, if subjected to a similar degree of use, would be hopelessly congested. Judicious police regulation accomplishes this end. Traffic is compelled to follow very strictly the rules of the road; the currents of vehicles passing in opposite directions are kept to their respective sides of the way as definitely as if separated by a wall. Any departure from the rule in the slightest degree, even in little deviations which with us would be made as a matter of course, inevitably gets a driver into trouble.

But in our great cities there is a helter-skelter occupancy of the streets that with simply a comparatively moderate degree of use confuses traffic even in ample thoroughfares. There appears to be no idea of what the rules of the road call for. People drive to the right or the left according to their whim. In turning, many persons are liable to go indiscriminately either one way or the other; in consequence when an automobile is following such a vehicle and using the utmost caution he is liable to run into it. Another source of vexation and danger proceeds from horses commonly driven in pairs, but occasionally hitched singly. If such a horse has been driven on the " off " side his tendency is to keep well on the left of the road, greatly to the inconvenience, and even danger, of traffic in the opposite direction. One of the most common of practices, and something in which the horse sins equally with the driver, is the general custom of violating the rule of the road by cutting sharply across corners when turning into a connecting street running at right-angles. When a vehicle is coming in the opposite direction at such a point a collision is inevitable.

Editorial

Under present conditions the prudent automobilist will not tempt Providence by going out in a large city on a Sunday afternoon, when butchers, grocers, etc., who know little about driving, hitch their commercial horses into a buggy and rattle their reckless way through the streets. A common cause of trouble for an inexperienced driver, and even many who should know better, is the tendency, at the approach of an automobile, to give the horse a fright by suddenly yanking at the reins, thus warning him to look out for something horrible. In reality the driver scares his own horse more than the automobile does. If the driver would keep steadily on the chances would be in favor of his horse taking the matter coolly.

A REMARKABLE FEAT

The remarkable thousand-mile run of the Automobile Club of Great Britain has been marked by one of the most extraordinary feats yet accomplished in the history of the new form of transit. One of the most expert of the participants was Mr. Grahame White, who drove a Daimler automobile from Paris. It appears that when about 17 miles north of Alnwick Mr. White good-naturedly permitted one of his companions to try his hand at steering. In consequence the party was ditched and the bracket of the steering-gear was broken. They were 52 miles from the end of the day's run, but it occurred to Mr. White that by resorting to steering with his foot they might get on. So, just as a skillful seaman with crippled rudder navigates his craft by steering with his sails, raising or lowering them according to change of direction desired, so Mr. White rested his left foot on the off step and kept his right on the off front wheel. In this manner he steered his carriage all the way to Newcastle. He did not proceed at any snail's pace, either. For the whole 52 miles he averaged 10 miles an hour, passing over several steep hills, applying the brake two or three times, and stopping fifteen minutes for tea at Morpeth, attending meanwhile to the manipulation of valves, etc. Both cool head and skillful hand—not to say foot—are demanded for such work. It was a feat of the feet, so to speak, as well as of the head.

Automobile Clubs

NOTHING indicates more clearly the rapid rise of automobilism than the gradually-increasing number of clubs formed by *chauffeurs*. Casting an eye to France, we find first of all the *Automobile Club de France,* with its membership of 2,200. In the provinces automobile clubs are to be found in the following cities: Bordeaux, Pau, Toulouse, Périgueux, Nizza, Marseilles, Salon, Béziers, Avignon, Romans, Grenoble, Lyon (two), Clermont, Ferrand, Dijon, Lons-le-Saunier, Nancy, and Rouen. In all there are eighteen French organizations.

In Belgium there are five clubs, distributed in Brussels, Liège, Charleroi, Antwerp, and Flanders. In England there is only the Automobile Club of Great Britain and Ireland, the five sections of which are located, respectively, in London, Birmingham, Dublin, Edinburgh, and Liverpool.

The Swiss Automobile Club has its headquarters in Geneva and has 300 members.

The Italian Automobile Club is distributed in the cities of Turin, Milan, Venice, and Florence.

Besides the Austrian Automobile Club, there are in Austria a few organizations in Graz, Budapest, Innsbruck, Prague, and in the resorts near Vienna.

Germany has its *Deutscher Automobil-Klub* and also clubs in Aix-la-Chapelle, Dresden, Frankfort, Munich, Stettin, and Stuttgart.

Holland's single club is located in Nymwegen. Spain has an organization in Madrid; and Russia clubs in St. Petersburg and Moscow. If to this list be added the Automobile Club of America, whose home is in New York, it will be seen that the number of motor-carriage associations bids fair to rival our one time numerous bicycle associations.

Other American cities boasting of automobile clubs include Philadelphia, Chicago, Baltimore, Rochester, Paterson, Columbus, Cleveland, Cincinnati, Minneapolis and San Francisco.

By the foreign clubs the Automobile Club of America is the recognized corresponding club and authority in matters of national and international transaction.

Book Notices

Dunod, of Paris, has just issued a neatly-printed pamphlet entitled *Les Automobiles à Pétrole,* which is a very admirable treatise on the petroleum automobiles so widely used in France. The author of the book, L. Bochet, has treated his subject with a praiseworthy care and discretion. What he describes is told as briefly and as clearly as possible. No words are wasted; nor are there any involved technical descriptions of impracticable appliances and apparatus. Although the book contains no information which has not been previously imparted by other treatises, it is nevertheless a valuable contribution to automobile literature, and as such is well worth reading.

La Traction Mécanique et les Voitures Automobiles, by G. Leroux and A. Revel, has been sent to us by the publishers, J. B. Baillère and Son, of Paris, France. The book contains 394 pages of reading-matter and 108 illustrations. The authors discuss in turn steam, compressed-air, and gas tramways, as well as electric and cable roads. Three systems of steam traction are described, and various systems of electric traction are discussed, such as the overhead wire, surface contact and storage-battery methods of electric transportation. The last three chapters are devoted to a description of the principal types of automobiles now in general use.

In a fine octavo volume containing 481 pages, embellished with 234 cuts, MM. E. Aucamus and L. Galine have discussed anew the subjects of tramways and automobiles. The various forms of traction have been methodically treated, each system being well defined from other systems of similar character. The most recent foreign and French inventions, as well as important tests and trials, find a place in the volume. In the chapter on the automobile, the authors have kept well abreast of the times and have very wisely selected for discussion only those types of vehicles which have withstood the test of actual use. The book is more technical than most automobile-treatises, and for that reason will be read chiefly by men who are apt to regard the motor-carriage not as an ordinary vehicle to which a motor has been applied, but as a power-driven contrivance in which the strains and stresses must be calculated with the same nicety as in a bridge or other framed structure. The mathematical formulas and demonstrations found in the book are such as all engineers employ in their work. *Tramways et Automobiles* is no popular book; it is intended for men who are thoroughly familiar

with modern constructional methods, and for that reason, discusses its subjects with an exhaustiveness which cannot be expected of a work written for general reading. The book, it should be added, comes from the publishing-house of Vve. Ch. Dunod, of Paris, France.

The first issue of a unique publication known as the *Road Maker* made its appearance in May. As may be inferred by its title, " good roads " is the burden of its song. In introducing itself the *Road Maker* says:

" The need of such a journal as we propose to publish is apparent to all observers of American highways. It must be clear to any one at all familiar with correct methods of road building and road repairs that the present unsatisfactory condition of our roads is chiefly due to two causes. First, to the lack of knowledge of the true principles of road making on the part of those to whom the care of our roads is entrusted, and second, to the improper laws under which our officers are compelled to operate. It is no more reflection on the average officer's intelligence to say that he is not a road builder than to say that he is not a doctor or a lawyer, for road building is an art based on scientific principles that cannot be acquired without much study and reflection. We realize that to the average busy road officer this is no easy task, as the information he must seek is scattered through scientific treatises, much of which can only be found in pamphlet form in the transactions of various scientific societies, where it is buried in a mass of technical matter that is mere rubbish to most busy men. We propose, therefore, to sort out this matter and publish the valuable parts in such practical form that ' he who runs may read,' understand and put into practice the best principles of the road maker's art."

The *Road Maker*. Monthly. Illustrated. The Road Maker Publishing Co., Port Huron, Michigan.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Accumulators—

Competitive tests of accumulators by the Automobile Club of France (Concours d'Accumulateurs de l'Automobile Club de France). By A. Bainville. An account of the tests made, with criticisms. "L'Electricien," Paris, April 7, 1900.

Detailed technical description of portable storage batteries for the operation of automobiles. "Automobile," Berlin, May 10, 1900.

A short article relative to a new light-storage battery of European manufacture, attached to a vehicle of new design. "La France Automobile," Paris, April 29, 1900.

A technical description of a new dry battery of German manufacture. "Der Motorwagen," Berlin, May 15, 1900.

A brief description of a new accumulator of minimized weight and cost. "Zeitung für Fahrrad- und Motorwagenbau." Berlin, May 20, 1900.

Advice to Prospective Buyers of Automobiles—

Detailed instructions and rules for amateurs for the buying, care and proper use of automobiles. "Le Chauffeur," Paris, May 11, 1900.

Alcohol Motor—

A description of an alcohol motor of European invention. With four illustrations. "The Automobile Magazine," June, 1900.

Aluminum and Partinum—

A brief review of the possibilities of the metals in the manufacture of autocarriage bodies. "The Automotor Journal," London, May, 1900.

A New Value for Explosion Motors—

A recently patented device of European invention. "The Motor Age," Chicago, May 3, 1900.

Automatic Boiler Feed—

A technical description of a new device of American invention. With one illustration. "The Motor Age," Chicago, May 3, 1900.

Automatic Interrupter—

A technical description of the new Rochefort interrupter, designed for exploding the mixture in the interior of the cylinder. "L'Industrie Automobile," Paris, May 25, 1900.

Automobile Construction—

Detailed recapitulation of the general views of one of the best known French manufacturers of automobiles, regarding modern automobile construction. "Das Journal für Wagenbaukunst," Berlin, April, 1900.

Automobile Lamp—

Technical description of a new automobile lamp, operated on a new principle of carburated air. "Le Chauffeur," Paris, May 11, 1900.

Automobiles—

A technical description of different types of "Pieper" gasoline and electric carriages. With one illustration. "El Automovilismo Ilustrado," Barcelona, May 15, 1900.

A brief description of an improved chainless carriage of European manufacture. With one illustration. "The Automotor Journal," London, May, 1900.

A description of a new gasoline vehicle of American manufacture. With one illustration. "The Motor Vehicle Review," Cleveland, May 15, 1900.

The Automobile of To-day in Europe and America. Henry Sturmey. Read before the Automobile Club of Great Britain and Ireland. Reviews the advances made, the types used, the progress in different countries, etc. "Automotor Journal," London, Eng., April, 1900.

Automobile Spring Bearing—

Technical description of recent American invention. With one illustration. "The Motor Age," Chicago, May 3, 1900.

Automobiles as a Source of Revenue for Electric Stations—

A paper read before the National Electric Light Association, Chicago, May 24, 1900. "Electrical Review," June 6, 1900.

Axle-tree Motor—

An illustrated technical description of the new axle-tree Chaboche motor. "La Locomotion Automobile," Paris, May 31, 1900.

Boring Mills—

A special machine adapted to the manufacture of automobile parts. With one illustration. "The Motor Age," Chicago, April 26, 1900.

Carbureters—

A brief article on a new carbureter devised by Ch. Le Blon. "Le Chauffeur," Paris, May 11, 1900.

A description of a special device of European manufacture, designed for voiturettes. With one illustration. "The Autocar," Coventry, May 26, 1900.

Descriptions of new carbureters of European manufacture. With illustrations. "L'Industrie Automobile," Paris, May 25, 1900.

A description of a simple form of carbureter of European invention. With one illustration. "The Autocar," Coventry, May 26, 1900.

Clutches for Automobiles—

A description of double and triple friction clutches of European manufacture. With two illustrations. "The Motor-Car Journal," London, April 20, 1900.

Connection Between Motor Frame and Running Gear—

Detailed technical description of a new invention, by which the motor is rendered independent of the carriage body with respect to flexibility and tension. With two illustrations. "Zeitung für Fahrrad und Motorwagenbau," Berlin, April 29, 1900.

Construction of Differential Gears—

A technical article. With one illustration. "The Motor Age," Chicago, April 26, 1900.

Cooling of Motors—

Technical article regarding the importance of this question. "Cycle et Automobile Industriels" (from "Petites annales de l'Automobile"), Paris, May 20, 1900.

Delivery Wagons—

Power Consumption and Operative Cost of Automobile Delivery Wagons. By George F. Sever. A study of the comparative costs of operation and maintenance of horse and electric delivery wagons for city service. "Electrical Review," March 28, 1900.

Electric Automobiles—

A technical article describing the great progress of electrical automobiles, stating the future of same depends less on the increase of power than on the increase of the proportion between power and weight. "Tous les Sports," Paris, May 19, 1900.

A brief description of two new carriages of European manufacure. "L'Automobile," Turin, May 15, 1900.

Serical article on electric generators. With three illustrations. "La France Automobile," Paris, April 29, 1900.

Light Carriages—

"The Light Road Carriage." By Edward de Nôreme. Discussing the class termed by the French, "voiturette," illustrating various types and describing the characteristic features. "Automobile Magazine," April, 1900.

Liquid Fuel Burner—

A technical description of a liquid fuel burner recently introduced in Europe. With two illustrations. "The Automotor Journal," London, May. 1900.

Magneto-electric Ignition—

A description of an igniter and timing gear of European introduction. With one illustration. "The Autocar," Coventry, May 26, 1900.

Metal—

A short article on a new American anti-friction metal said to possess remarkable qualities." "Le Chauffeur," Paris, May 11, 1900.

Modern Locomotion—

By Sir David Salomons. A paper read at the meeting of the Anglo-French Association in London May 26, 1900. "The Motor-Car Journal," London, June 2, 1900.

Motocycle—

A technical description of the new Renaux tricycle. With thirteen illustrations. "Zeitung für Fahraad und Motorwagenbau," Berlin, June 3, 1900.

Motor and Controller—

A description of a new motor and controller of American invention. "The Motor Vehicle Review," Cleveland, May 22, 1900.

Motor Carriage—

A description of a new motor carriage of European invention. With four lllustrations. "The Automobile Magazine," June, 1900.

Motors—

A technical description of five new motors of European manufacture. "L'Industrie Automobile," Paris, May 25, 1900.

A description of the new Heffner motor. With one illustration. "La Locomotion Automobile," Paris, May 30, 1900.

A technical description of a new petroleum-spirit motor, of European manufacture. With six illustrations. "The Motor-car Journal," London, June 2, 1900.

A description of a new motor adapted for voiturettes. With one illustration. "The Motor-car Journal," London, May 26, 1900.

A description of a two-and-a-half horsepower motor, of American manufacture, adapted for light vehicles. With one illustration. "The Motor Vehicle Review," Cleveland, June 5, 1900.

A brief description of a new two horsepower gasoline motor, of American invention, adapted for light carriages. With one illustration. "The Cycle and Automobile Trade Journal," Philadelphia, June 1, 1900.

A technical description of a "two-stroke petroleum motor. With six illustrations. "The Automotor Journal," London, Eng., May, 1900.

A description of a new four-cycle gasoline motor of American invention. With one illustration. "The Automobile Review," Chicago, May, 1900.

A technical description of "L'Aigle" motor. With three illustrations. "Le Chauffeur," Paris, May 11, 1900.

A technical description of a hydro-carbon motor of European invention. "La France Automobile," Paris, May 10, 1900.

A technical description of the improved Aster hydro-carbon motor for light vehicles. "Cycle et Automobile Industriels," Paris, May 24, 1900.

A description of a single cylinder balanced engine, operating on the Otto cycle principle, of American manufacture. With two illustrations. "The Motor Age," Chicago, May 31, 1900.

Motor Tricycles—

Detailed description of the Darracq motor tricycles. A new system

of cooling with water, by which the overheating of the cylinder and binding of the piston is avoided. With two illustrations. "Automobile," Berlin, May 10, 1900.

Non-explosive Gasoline Reservoir—

Illustrated technical description of a new non-explosive gasoline reservoir of European manufacture. "Automobile," Berlin, May 10, 1900.

Oil and Gas Motors—

Description of new oil and gas motors of European manufacture. With two illustrations. "The Automotor Journal," London, May, 1900.

Oil Motor—

The Dawson oil motor. A general description explaining the principles, with a detailed account of its construction. Illustrated. "Automotor Journal," London, April, 1900.

Omnibuses—

Automobile omnibuses for service in cities. Describes types used in European cities, illustrating two. "Scientific American," Supplement, April 28, 1900.

Power Transmission—

A technical article on transmission as applied to certain vehicles of recent invention. With five illustrations. "Der Motorwagen," Berlin, April 30, 1900.

Progress—

The practical automobile of the future. By E. E. Schwarzkopf. In praise of the fore-carriage and its economy. Illustrated. "Automobile Magazine," April, 1900.

Running Gear—

A description of new running gear of American manufacture. With one illustration. "The Hub," May, 1900.

A brief description of a new American invention for electric vehicles. With two illustrations. "The Motor Age," Chicago, May 3, 1900.

Sparking Plug—

A description of a new sparking plug of recent European invention. With two illustrations. "The Autocar," Coventry, May 26, 1900.

Speed-changing Gear—

A technical description of a European invention designed for motor tricycles. "L'Automobile, Turin, May 15, 1900.

A progressive change of speed, devised by well-known European manufacturers. "Le Chauffeur," Paris, May 11, 1900.

A speed-changing gear for motocycles of European manufacture. The change of speed is maintained by the movement of a clutch, which is set in motion by direct engagement with the teeth of the pinion. With three illustrations. "Cycle et Automobile Industriels," Paris, May 27, 1900.

A technical description of a new speed-changing gear, operated by an epicycloidal movement. "L'Industrie Automobile," Paris, May 25, 1900.

A brief technical description of a variable speed gear for automobiles. "The Motor-Car Journal," London, April 20, 1900.

Starting Device—

A technical description of a new starting device for motors. With two illustrations. "The Automobile Magazine," June, 1900.

A description of a new automatic starting device by which power is obtained through a reservoir of compressed air holding pressure indefinitely. With four illustrations. "L'Industrie Automobile," Paris, May 25, 1900.

Steam Generator—

A description of a novel "flash" boiler of European invention. With one illustration. "The Automotor Journal," London, May, 1900.

Steam Ram—

A description of a simple device designed to fill water supply tanks of steam carriages. With one illustration. "The Automobile Review," Chicago, May, 1900.

The Vedovelli and Priestly Cab—

A technical description, with two illustrations. "The Scientific American," April 14, 1900.

The Weight of Motor Wagons—

Editorial discussion of the British Light Locomotives Act of 1896. "Engineering," London, March 16, 1900.

Trials—

Motor Carriage Trials. By E. C. Oliver. Describes apparatus for testing automobiles, and the method of conducting such trials so that all conditions shall be kept constant, and results comparable. "The Horseless Age," April 18, 1900.

Tricycles—

A popular article regarding the advantage of the tricycle in opposition to the views of those who disclaim any future for that vehicle. "Motor-Sport," Berlin, April 15, 1900.

Use and Management of the Automobile; What to Expect of it—

A serial article by Henry Sturmey, M. C. I. E. "The Autocar," Coventry, March 31, 1900.

Vaporizers—

The Longuemare vaporizer fully described and illustrated. By L. Berger. "The Horseless Age," April 4, 1900.

Variable Belt Transmission—

Full description and illustration of a novel belt transmission device embodying variable speed and reversing gear of recent American invention. "The Motor Age," Chicago, March, 1, 1900.

Variable-speed Gear—

Some additional technical particulars to an ingenious variable-speed gear. With two illustrations. "The Motor-Car Journal," London, June 2, 1900.

Viameter—

A brief description of an apparatus indicating on the same dial the grade as well as the total distance covered by the vehicle to which it is attached. "La Locomotion Automobile," Paris, May 31, 1900.

Voiturettes—

Brief description of two new types of voiturettes (seating 2 and 4 people, 3½ and 5 horse-power respectively), of European manufacture, "L'Avenir de l'Automobile et du Cycle," Paris, May, 1900.

A technical description of a new voiturette provided with a "Morisse" motor of 3½ horse-power, with a double cooling system, by cast fins (air cooling), and by water circulation, these two systems being absolutely independent of each other. With four illustrations. "La Locomotion Automobile," Paris, May 31, 1900.

An illustrated technical description of a new voiturette of European manufacture, provided with the German Protos motor. "Automobile," Berlin, May 26, 1900.

A brief technical account of a new French system of transmission by cable. With three illustrations. "Cycle and Automobile Industriels," Paris, June 3, 1900.

Brief description of the Antoine voiturette. "The Motor-car Journal," London, June 2, 1900.

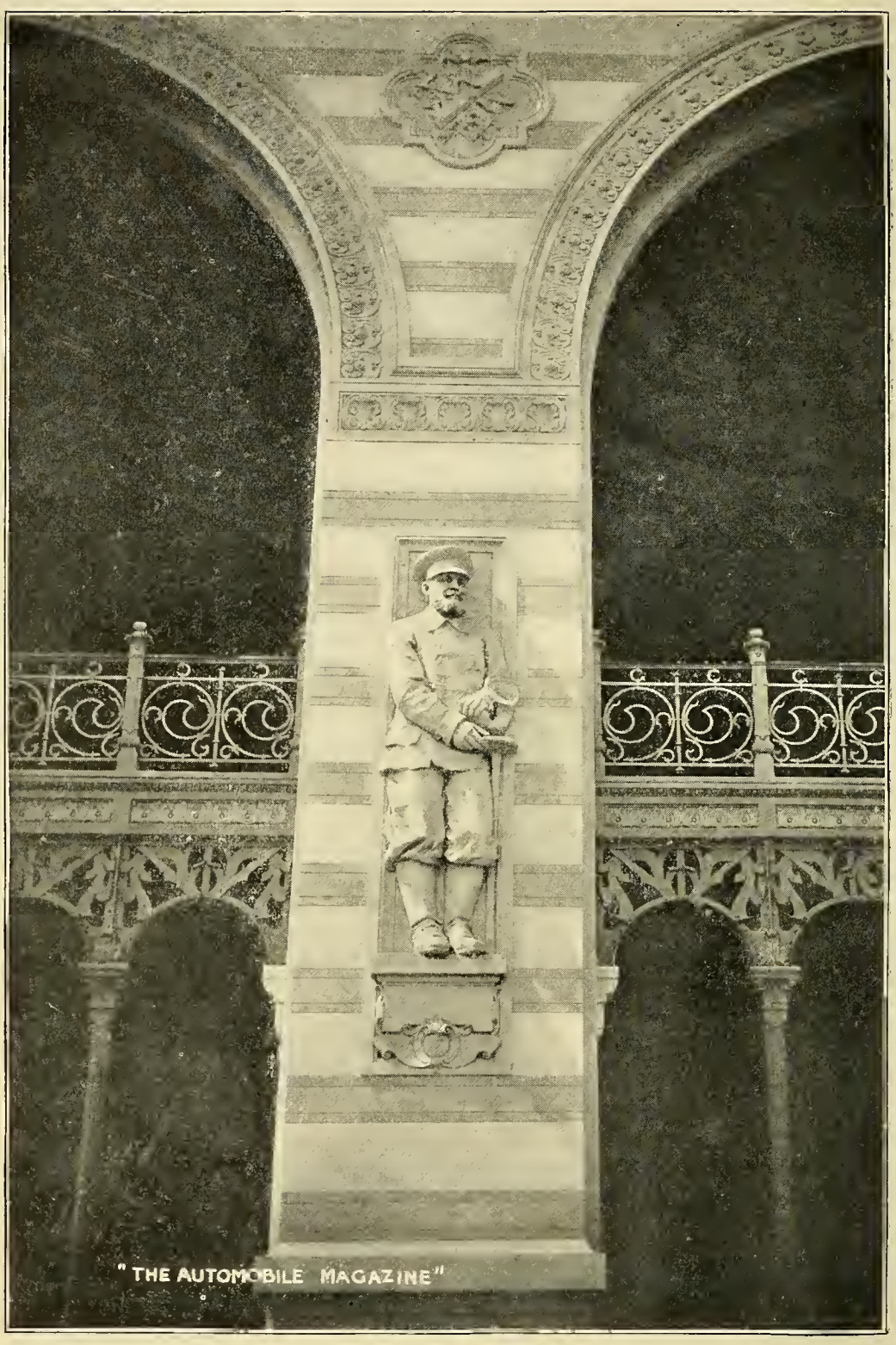
A technical description of a new voiturette, of European invention, said to possess remarkable qualities. "La Locomotion Automobile," Paris, May 24, 1900.

A technical description of the Brierre voiturette. With four illustrations. "Les petites Annales illustrées du cycle et de l'Automobile," Paris, May 26, 1900.

A description of a light carriage of European manufacture. With one illustration. "The Automotor Journal," London, Eng., 1900.

A description of a light vehicle of recent European introduction. With six illustrations. "The Automotor Journal," London, May, 1900.

A brief technical description of a new light carriage of European manufacture. "The Motor-Car Journal," London, May 12, 1900.



"The Automobilist"
Sculpture on the Transportation Palace
Paris Exposition

The Automobile
MAGAZINE

VOL. 11 AUGUST 1900 No. 5

The Automobile Section of the Paris Exposition

UNDER the auspices of the Automobile Club de France, expositions have been held in Paris from time to time, which were attended by crowds of enthusiastic *chauffeurs.* Admirable as these expositions undoubtedly were, they were defective in at least one respect—they were national, not international affairs. The automobiles exhibited at the Tuileries have been chiefly of French manufacture; few, indeed, were the vehicles which came from the shops of foreign makers. With the French carriages the *chauffeurs* were thoroughly familiar; for automobiles from every factory in France can be seen on the avenues and streets of Paris. And for that reason the *chauffeur* visited the Tuileries largely as a matter of automobile piety; automobilism was a new sport, an interesting sport, a sport that promised much, and for that reason deserved to be encouraged.

But when the Transportation and Civil Engineering Palace of the 1900 Exposition at Paris was officially opened, automobilists flocked thither with something more than the feeling of a solemn duty to be performed; for they knew that, for the first time, they would have an opportunity of inspecting the automobiles of all countries, gathered under one huge roof, and conveniently classified and arranged for examination. French vehicles were placed side by side with those of foreign make, so that the *chauffeur* could see for himself wherein French carriages differed from German, English and American vehicles; wherein they were stronger, wherein weaker.

The Americans who visited the Transportation Palace had no reason to be ashamed of the exhibit made by their countrymen.

General View of the Automobile Exhibit
Paris Exposition, 1900

Automobile Section of the Paris Exposition

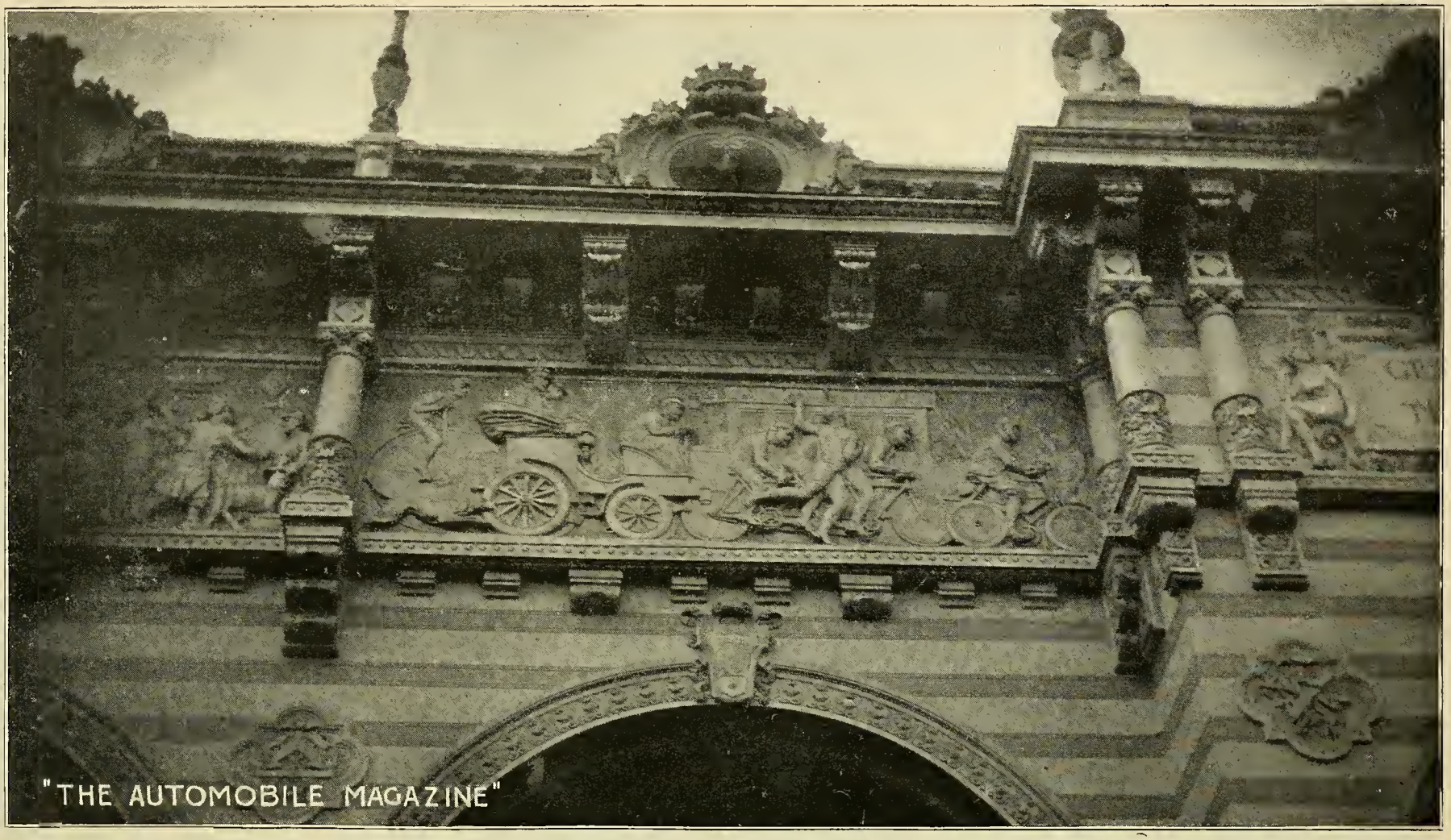
Perhaps the most comprehensive exhibit is that of the Electric Vehicle Company, of New York City; for it includes vehicles of almost every kind—broughams, phaetons, runabouts, light delivery wagons, omnibuses, ambulances, and the like. Another interesting exhibit was that of the Locomobile Company of America, with its handsome steam-carriage placed beneath the white, pillared architecture so familiar to Americans.

But the exposition of automobiles in itself is by no means the most interesting feature of the Transportation Palace. The indefatigable Forestier, Chairman of the Automobile Committee,

United States Section of Transportation Building
United States Automobile Department, Paris Exposition

has instituted most interesting competitions, which have attracted considerable attention. Of these competitions, the most recent was a motocycle contest.

Little, indeed, can be judged of the merits of an automobile from external appearance alone. A good automobile is judged by its durability of construction, by its simplicity of design, by its consumption of fuel, by its speed, and by a hundred other factors. In a *concours,* in which a schedule is carefully arranged for each vehicle, in which every circumstance is carefully noted, in which the strains and stresses are as minutely calculated as the con-



Friezes on the Transportation Building, Showing Last Century Transportation and Automobile Race
Paris Exposition, 1900

sumption of fuel, facts are ascertained which count for more than mere elegance of appearance.

Such a *concours* was the motocycle contest to which we have referred. The little cycles were made to run 160 kilometres (99.36 miles) around Lake Daumesnil, under the conditions we have described. When the verdict of the committee of judges will be published, we have no doubt that much will be added to our knowledge of the efficiency of the motocycles of various makers—much that will enable us to compare our own product

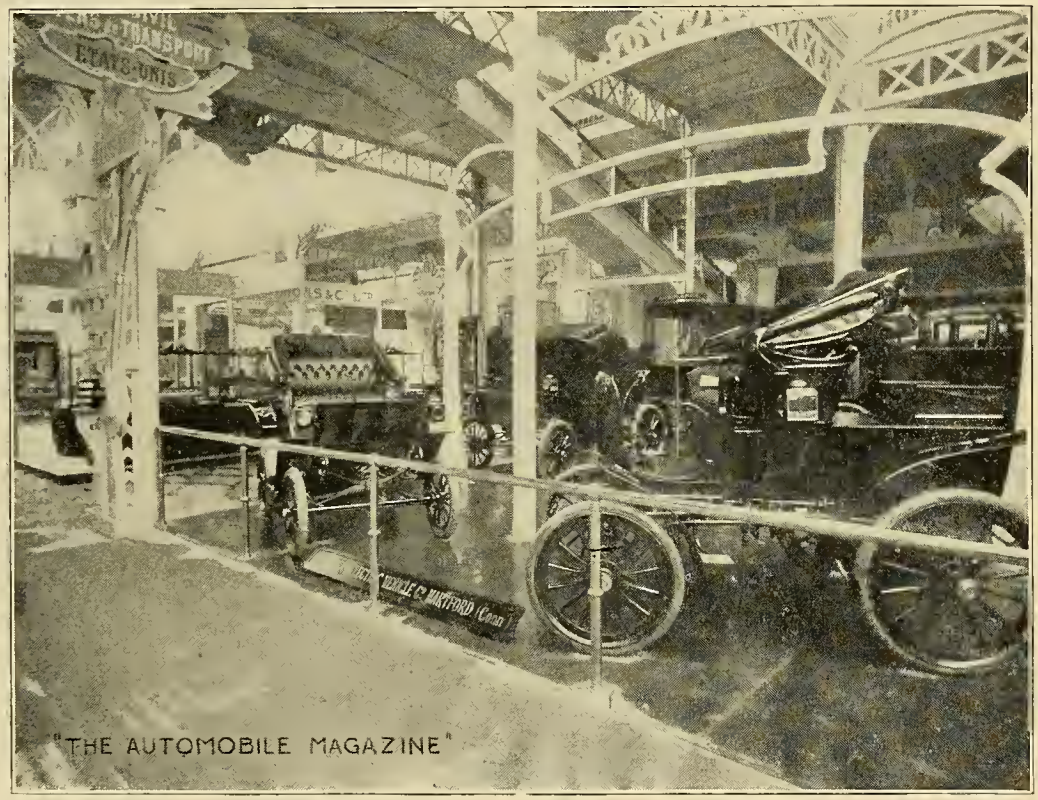
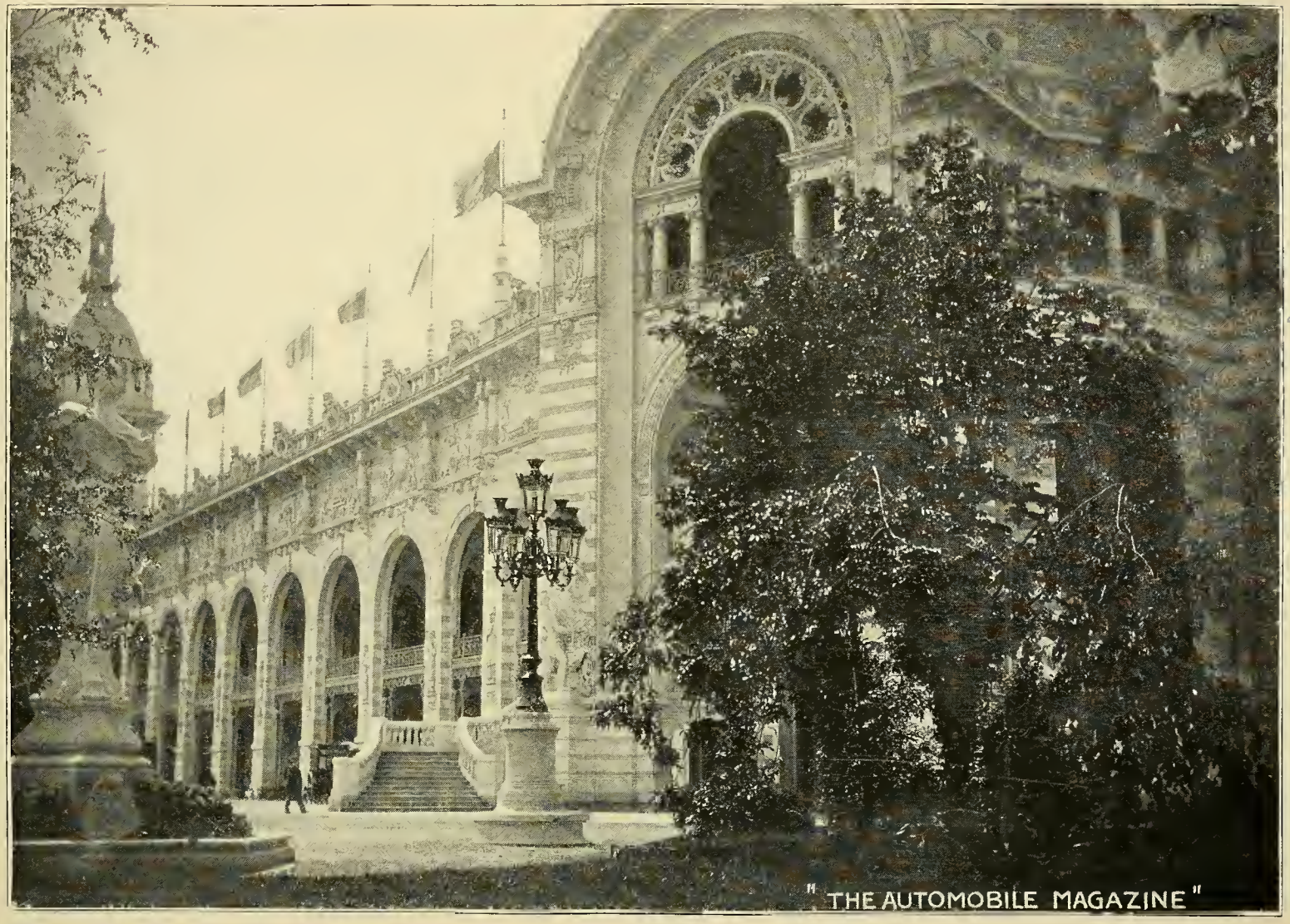


Exhibit of the Electric Vehicle Company of New York
Paris Exposition

with that of French manufacturers. Automobile makers themselves will profit by such contests; for they will ascertain where their vehicles are weak, and how that weakness can be remedied; and they will be able to place before their patrons the results of comparative tests which have proven what their product will stand.

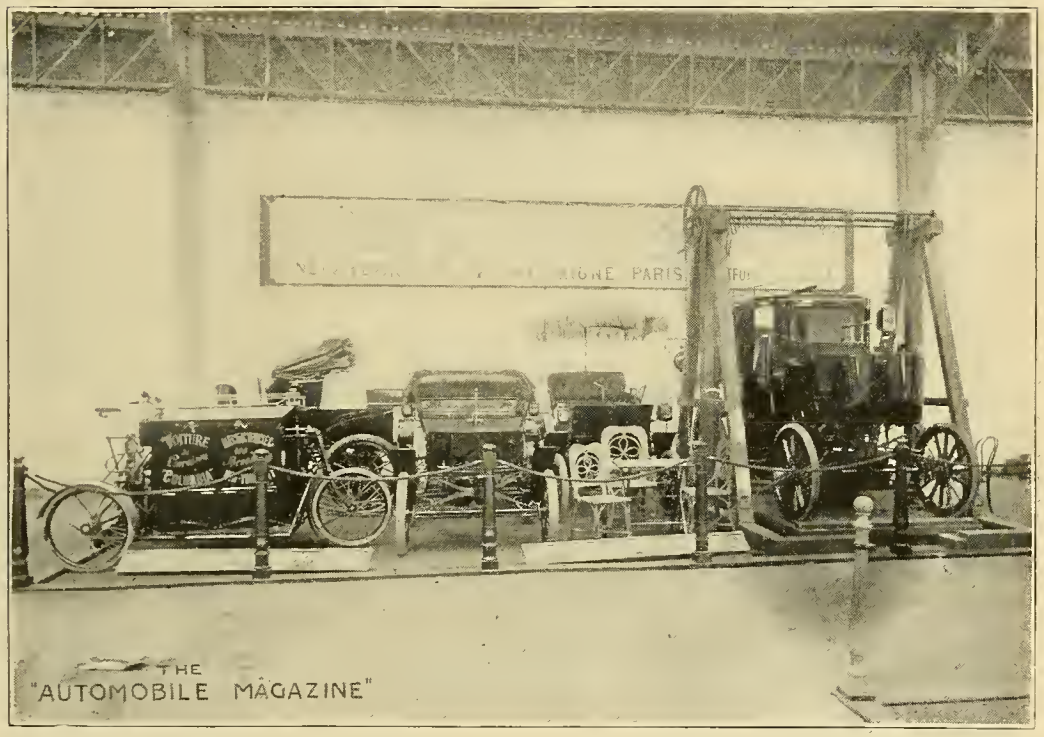
The interest aroused by Forestier's *concours* at Vincennes was exceeded only by that excited by the ever-memorable race for the Gordon Bennett Cup—a race which *chauffeurs* on both



Transportation and Civil Engineering Palace
Automobile Exposition, Paris, 1900

sides of the Atlantic have not yet ceased to discuss. Since the publication of our description of the race in last month's issue of the AUTOMOBILE MAGAZINE additional information has been received which will assuredly be of interest to every American automobilist.

As every one knows, the course was 566 kilometres (351.486 miles) long, which Charron, the winner of the race, covered in 9 hours and 9 minutes. Besides Charron, the American representative, Winton; the Belgian *chauffeur,* Jenatzy, and the French automobilists, de Knyff and Girardot, started at the signal



Part of Exhibit of the Electric Vehicle Company of New York
Paris Exposition

given by M. de Chasseloup-Laubat. The German representative, Herr Eugen, who might have been a formidable contestant, did not start, owing to the fact that he was unprepared. Mr. Winton had, probably, a hope of winning the race. The Belgian, on the other hand, indulged in no dreams; he had entered merely as a matter of form, with "any kind" of a carriage, as he said. He used a fairly good racing-machine, however.

As we narrated in our last issue, Mr. Winton's vehicle was crippled early in the race; his front wheel was bent and rear tire punctured. René de Knyff's fourth speed broke, and Jenatzy

practically abandoned the race after a series of minor accidents. Charron and Girardot were the only ones to finish. Charron had expected to cover the distance in eight hours, which would have made his average speed nearly 44 miles an hour. Why he did not succeed in maintaining this high average speed he has admirably told in *Le Velo:*

"I occupied third place at the start," he says. "Before me were René de Knyff and Winton; de Knyff started off badly;

Automobile Ambulance
Exhibited by the Electric Vehicle Company of New York, Paris Exposition

Winton was left behind, while at my left, Girardot and Jenatzy dashed by like madmen. At the tunnel of Ville-d'Avray I heard Winton tearing along behind me, and when nearing Picardie I saw Girardot and Jenatzy about 100 yards in front of me. It was not until I had reached a point between Versailles and Chevreuse that I overhauled Jenatzy. I steered cautiously and passed him at a speed of about 37 miles an hour. I smelt something burning. I looked at my tires; nothing was the matter

with them; but in front of me, Jenatzy had punctured his two rear tires. Girardot alone was left before me. I perceived that one of our carbureter plugs had been lost and that the motor was working poorly. Fournier repaired the carbureter, and soon after having passed Chartres we caught up to Girardot, who was running along less speedily. We made that kilometre (0.621 miles) in 37 seconds. Soon after one of the air tubes of our

The *Locomobile* Company of America at the Paris Exposition

front tires was torn out of its place—the only accident which happened to our tires. Six or seven minutes were consumed in repairing the injury, and Girardot passed on. I saw him no more, although I finished first. Everything went smoothly. We caught sight of Chateandun and were winding along toward Orleans, when suddenly we whipped up our speed to 55 miles an hour. Then full speed we dashed into a gutter. I do not know

how we ever got on our feet. Descending from the carriage, I saw that my rear axle was bent literally into a V. * * * I became frightened and I began slowly to walk to Orleans, in order to tell de Knyff, who would soon follow: 'I am out of the race. If I had seen that gutter nothing would have happened; but now I can do nothing; my axle is bent down to the ground.

The Gordon Bennett International Trophy

My chains cannot run properly.' But I saw nothing of de Knyff at Orleans. I saw only Chasseloup-Laubat, who said: 'Courage! You are the first.'

'First! And Girardot?

'I have not seen him!

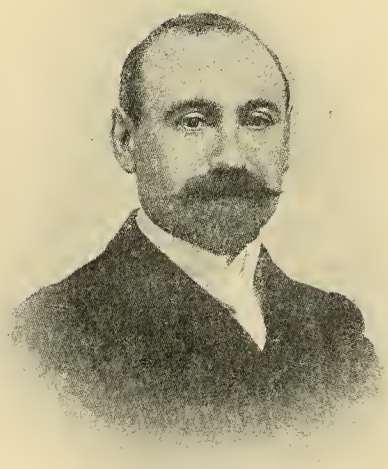
'Where can he be?'

M. Charron

"Nothing to be heard of Girardot or de Knyff I once more determined to enter the struggle. Chasseloup said the axle would not break; so we went on. And we started without news of the airy Girardot, and we passed through towns without recognizing them. * * * Then we caught up to Levegh and Huillier, who assisted us in replenishing our oil-tank. It was at Moulins, Levegh told us; we had still 10 kilometres (6 miles) to travel before reaching Lyons. * * * The road was fine and straight. A group of motocyclists and a voiturette appeared before us. Suddenly a gigantic dog sprang out of the group, barred the road twenty yards before me. He was caught in the steering gear, between the wheel and the supporting spring. The carriage leaped to the left, passed between two trees, jumped a ditch, and returned to the road, I know not how. Nothing was damaged except the pump, and Fournier held that until we won."

The race, as even the French automobile press admits, by no means proves that French carriages are the best. But the race did prove that a man risks his life in such contests. And it also proved that at least three vehicles should be in line in case of an emergency.

The speeds attained were remarkable — so remarkable that the Automobile Club of America will do well to bear them in mind before challenging.



M. Girardot

The Buffalo Automobile Club

BUFFALO'S first automobile association perfected its organization at a meeting held at the Buffalo Club July 2. It is known as the Buffalo Automobile Club. The officers who were chosen to serve for the first year are: Dr. V. Mott Pierce, President; Dr. Truman J. Martin, Vice-President; George S. Metcalfe, Secretary; Dr. Lee H. Smith, Treasurer; D. W. Sowers, Consulting Engineer; Charles J. Shepard, J. T. Budd and Charles R. Huntley, Directors. The Directors and the officers will form the Board of Governors.

The permanent club headquarters will be the Colonial parlors at The Genesee. That hotel will be the assembling place for the club runs and the business of the club will be transacted in the parlors. The regular meetings will be held on the first Monday of each month. The annual meeting will be on the second Monday in October.

Four classes of membership will be included in the club. There will be honorary members, life members, active members and associate members. The honorary members thus far chosen are Mayor Diehl, Supt. Bull of the Police Department, and Chairman Healy of the Board of Public Works. The associate membership will consist of automobilists living outside of a radius of 50 miles from City Hall. There is at present an active membership of 34. The initiation fee is $20; the annual dues are $10.

Plans for club runs will soon be made. In anticipation of an early run, the Buffalo Yacht Club extended the use of its clubhouse at the foot of Porter avenue to the Automobile Club until July 14 as an assembling place. At the meeting a vote of thanks was adopted, but it was decided not to take advantage of the invitation in view of the selection of permanent club headquarters.

Each year the club will have an automobile parade. It is planned to have the first one on September 15, by which time it is expected the club will have a large membership and will have many vehicles for the turnout.

The establishment of storage stations about the city and in the country for the purpose of recharging vehicles whose batteries have become exhausted in the course of a run, and of furnishing other supplies, is a project that will be attended to as soon as possible.

How Cupid Stole an Auto

A Story of Newport Society

IT was the morning of the automobile parade at Newport, and Mr. Richard Carrington was nervous. He was out near the stables at his place, and was directing the efforts of a half dozen men who were busy decorating his motor carriage. A framework with a dome effect had already been built over the seat, and the men were busy with a mass of lilies of the valley and bride roses.

Mr. Carrington had long been a motorist, and in obstacle contests and road races had won many honors, but on this occasion he appeared to be very nervous for a man who owned a half dozen automobiles and who had lately returned from Paris, where he had done a lot of good hard work on the road.

Mr. Carrington, it must be confessed, was in love. The object of his affections lived in the adjoining place, and the only thing that separated him from the young woman was a thick hedge, an obdurate aunt and the young woman herself, who did not think very much of young Mr. Carrington's enterprise.

"If you really loved me," she had complained at a dance on the previous evening, "you would carry me off and marry me in spite of my aunt and in spite of myself."

Now, young Carrington, whose thoughts rarely soared above automobiles, did a lot of thinking, and incidentally invited the lady to ride with him in the parade. She hesitated a little, and then, taking into consideration the fact that her beloved aunt was out of town, accepted. Then young Carrington left the dance, did a lot of telephoning, and went to bed with the proud consciousness that things were likely to happen on the morrow.

He had arisen at an exceedingly early hour, and had started off at a fast pace in one of his auto carriages, and was not seen about Newport again until very late that morning. But he returned in a very happy mood, in spite of the fact that he was very nervous. He made a careful design for the decorations of his motor carriage, and was superintending the work himself, when from the other side of the hedge he heard his name called by a voice he well knew. It was the voice of Miss Jessica Carstairs, and she was already complaining a little.

"Have I got to ride in that cage?" she asked, with a glance at the automobile which was rapidly attaining the appearance of

a movable green-house. "Why, what are you making? It looks —it looks like a marriage bell—the kind they have at wedding receptions."

Young Carrington laughed and looked foolish. "Not at all, my dear. That is a design I took from a Japanese pagoda."

"It's very pretty, at all events," said Miss Jessica, who, by the way, was gowned all in white, and when, a few hours later, she took her seat in the carriage, her gown quite harmonized with the decorations.

"If that is a marriage bell," whispered Carrington to her, "you certainly look like a bride."

"My dear boy," said the young woman with dignity, "that is a subject which I refuse to further consider. You know you promised last night to say no more about it."

"True," said Carrington, carefully steering his auto between a butcher's wagon and a watering cart. "We'll let the matter drop, for the present, at least."

The meet was on Bellevue avenue, and it was a most remarkable collection of automobiles. They were decorated with flowers of all kinds, in all sorts of designs. One carriage was covered with flowers to represent a butterfly, with wide flapping wings on either side. Another had long fish-poles fore and aft covered with flowers, and the effect of the waving floral lines was like the antennæ of some huge insect.

As Carrington and his guest came up the line, society looked at one another and smiled. Yes; it was quite significant, and little Miss Carstairs sat under the marriage bell, with its bride roses and lilies of the valley, with a smile of contentment upon her face, and looked back at the old matrons, who flashed disapproval from their stern eyes, as if she didn't care at all.

Carrington was awarded the third place in the line, and everybody said that it was quite likely that he would get the prize for the most novel and best appearing vehicle. He accepted the congratulations of his friends with smiling serenity, and now that he had his auto completely decorated, and in the parade, and Miss Carstairs with him, he seemed to have lost his nervousness to some extent.

It looked as if the parade was to be a success from the very start. To be sure, one careless automobilist had lost control of a carriage and had demolished his lawn, and endeavored to run up the front steps of his residence; but the wandering vehicle had been captured by a half dozen attendants and had been turned around and was in its place when Mr. McAllister Duncan blew the whistle, which was the signal to start.

It was a most imposing spectacle. Some of the carriages were completely buried beneath masses of roses and other flowers. The spokes in the wheels were twined with flowers, which gave them a most cumbrous effect. The women who sat in the carriages were the most beautiful ever seen at Newport, and in their light colored gowns, made to harmonize with the decorations of the carriages, they certainly made a brave sight.

The parade was led by Mr. Duncan, who had Mrs. Kensington Thompson with him. Then came Bertie Van der Vere, who had charge of Mrs. Aspinwall-Jones. Bertie, who was good at amateur theatricals, and who amused society in various ways at Newport, wore a most wonderful hat of straw made in the alpine fashion, and it only needed the addition of some ribbons and things to make it fit for any girl to wear; but Mr. Bertie didn't seem to be conscious of this, and his wide, smooth-shaven face beamed out upon the crowd with good nature and the proud consciousness of riding with the richest woman there. Bertie had visions of complimentary notices in the newspapers, and the sale of his roses and plants in which he dealt when in New York would no doubt be largely increased by this experience.

All went well, and society nodded and bowed from the automobiles to society less fortunate in their victorias and common carriages drawn by mere horses. The latter animals didn't seem to care for the parade very much, and some of them snorted and sniffed, as if they saw looming far ahead their future downfall, when every one would go about the streets in those strange vehicles, some of which went "Tef! Tef!" and which didn't seem to mind an all-day trip at all.

All went well until near the outskirts of Newport. The carriages were to wheel about a fountain in the centre of the street for the return trip. The two leading carriages went around all right, but something must have been the matter with young Carrington's machine, for it resolutely refused to make the turn. Instead, it seemed to leap ahead and was buzzing down the street, which led to the little Village of Middletown, at a most furious rate.

"Look at Carrington!" everybody cried. "What is the matter with him?"

"By the Lord Harry!" shouted Carrington to the amazed Bertie, who had turned safely in front of him without taking a wheel off anything. "I can't seem to stop this thing!"

And in an instant the automobile seemed to disappear down the road in a cloud of dust. Everybody was so amazed that they didn't know exactly what to do, and one or two of the men were

for following the runaway and offering Carrington their assistance, which he seemed to need so much. But Carrington didn't appear to be alarmed, and none of the flower-decked vehicles seemed to be in racing trim, so they let Carrington go, with the consoling thought that he would soon be able to shut off his power and return to town in time for the judging and the awarding of the beautiful silver cup which had been offered for the best appearing carriage.

"Why, Dick!" presently said Mr. Carrington's amazed guest, "what is the matter? Are we running away?" and a frightened look came into Miss Carstairs' usually tranquil eyes.

"I don't know," responded the young automobilist, beginning to fumble with the steering-gear and power-controller. "You know I can't seem to shut this thing off."

"Well, where are we going?" asked the young woman in dismay.

"I don't know," replied Carrington cheerfully. "This is rather nice, isn't it?"

They were speeding well into the country then, with green lawns on every side and here and there a country house in the distance, and with the bay dotted with white sails, and a clear road ahead. The automobile seemed to be making railroad speed, and after arousing a few stray dogs from their roadway siesta and frightening a brood of very young chickens half to death, settled down to what seemed a twenty-miles per hour gait.

"Is this a racing carriage?" inquired Miss Jessica presently, "or are you trying to see how long it will take to get to Boston?"

Now, Carrington had won more than one race with this carriage, both in this country and abroad, and he replied in this fashion:

"My dear child, I haven't had this carriage very long, so I don't know very much about it! But it goes all right, doesn't it?"

"Yes," was the reply rather dubiously. "But what will people say? I thought we were in a parade."

"We were, but events and circumstances over which I had no control took us out of it. Nothing short of a brick wall three feet thick or your esteemed aunt could stop this wagon now."

"Why, what do you mean, Dick?" inquired the maiden in alarm.

"Well," said Mr. Carrington, looking fondly at the blonde head which nestled near his own, and which upon more than one occasion had found a resting place on his shoulder. "You don't seem to like riding with me far away from everyone—but we are almost there——

"Almost where?" interrupted the young woman, who assumed the puzzled air which a woman only can successfully negotiate.

"A moment will explain all," said the crafty Dick, sagely, taking another pull at the power-controller and swinging by a handsome dog cart in the road at a terrific pace. In the carriage were two young men, who waved their hats and made some remarks, which were unintelligible owing to the speed at which the automobile passed.

"You see, my dear," continued Dick gently as the automobile settled down to a steady pace, "with your gracious permission you are going to get married. Time, high noon. Place, Old Oak Parsonage."

"What?" almost screamed the girl. "You would do a thing like that?"

"Now we'll talk sense," continued Dick with a fatherly air, highly pleased at the success of his endeavors. "It's all right," he added reassuringly. "Those fellows in the cart are my ushers. You see you are in my power this time. It's my turn now. You have been in the power of that family of yours long enough. With the help of my sturdy automobile I am going to marry you!"

"What have I got to say to this?" asked Miss Carstairs, eyes wide open, with mock amazement at Dick's sudden coming to life.

"Nothing at all," replied Dick cheerfully. "All you have to do is to be present and make the responses at the right time."

"I don't like it at all," declared Miss Carstairs, and there were symptoms of a coming storm of tears. "I wanted a big wedding, in a church, with lots of bridesmaids and flowers and—people—." She was searching about for something more to add when Dick exclaimed excitedly:

"Here we are! All out!" And he stopped the automobile in front of a quaint roadside cottage adjoining a little rustic church.

A fatherly looking old man, his face beaming with smiles, stood on the steps,with a hearty welcome for both, and when Dick and his bride entered the house all was confusion. By some miracle five of Miss Carstairs' best friends happened to be there, and several young men wandered about trying to look innocent, and they shook hands warmly with Dick and congratulated him upon his nerve.

The bride-elect had been taken away by the young women, and then a cry was heard outside, and everybody rushed to the door to see a string of carriages coming down the road, and in

the midst were one or two flower-laden automobiles which had taken part in the parade.

"Where's the wedding?" shouted Bertie Van der Vere, who was well in the van of the procession. "Are we too late? Dick, you rascal, did you suppose we would let you run away like that, especially after the judges had made up their minds to award you the prize for the best decorated machine?"

"I've won other prizes," commented Dick soberly.

Everybody got out, and under the leadership of Mr. Bertie they took the marriage bell of lilies of the valley and bride roses off the automobile and set it up in the drawing-room. Dick produced a marriage license in some mysterious way, and then good old Dr. Everitt had a little conference with the bride. And when the young woman saw the great gathering of her friends and the bridesmaids all there, she waived her objections for a conventional wedding and entered into the spirit of the occasion and said it would be best to go on with the ceremony after all.

And so they were married, and a wedding breakfast appeared in the most mysterious manner from somewhere, and Dick patted himself on the back for being so bright and doing such a lot of telephoning. And the young people wandered out on the lawn and inspected Dick's automobile, as if it were to blame for running away with the young couple.

And then they took the marriage bell out of the house and willing hands redecorated the automobile and tied white ribbons all about it, and two little white doves, which Mr. Bertie Van der Vere had thoughtfully provided. And the bridal couple started off up the road all alone, at a most dignified pace, towards Newport.

"We came down here at a rather fast pace," remarked the bride as they came to the place where Dick and his carriage had bolted from the parade. "I always supposed you knew how to handle an auto," she added, looking up at him with a happy little smile.

"I thought I did," declared Mr. Carrington stoutly. "But you never know exactly when those things will get away from you, and I am a pretty good motorist, too," he added reflectively.

"You are," she murmured softly.

Better Roads

An Argument for Improved Highways, with some Convincing Facts as to the Economic Value of Good Roads, and a Comparison of the Different Methods used in their Construction.

THE demand for good roads, so loud and constant during the last few years that the machinery of government all over the United States has been forced to heed it, has several phases which space did not permit us to cover in the

Huntington, Long Island

article on this subject written for us by Mr. Theodore Dreiser in the May number, says Mr. C. Arthur Pearson in *Pearson's Magazine* for July. The ignorance and indifference which permitted the loss of millions of dollars annually, and submitted to the constant hardships and annoyances caused by bad roads, have been replaced by a widespread recognition of the value of reliable highways, and by the most aggressive efforts to secure them. The fact that America has been notorious for its lack of great highways, and its vast network of crude and periodically impass-

able roads, is due primarily to the lack of knowledge by the masses of the people as to methods of making good roads and their vital necessity. The direct cause is found in the waste of public money collected for the benefit of highways. Sufficient sums have been appropriated and misspent, and there has been sufficient labor along *futile* lines in every State in the Union during the past century to have given this country the best roads in the world. And yet, barring the recent improvement in several States—an improvement which affects only about two per cent. of the road systems of the entire country—there are no good roads. There are plenty of fair-weather roads, good in dry seasons, but these in winter weather are anything but passable. In many States most of the farmers and residents of the smaller villages are completely isolated for periods varying from two to six weeks during the worst of the winter season. And yet among these very people has existed the greatest opposition to the expense of building a good highway.

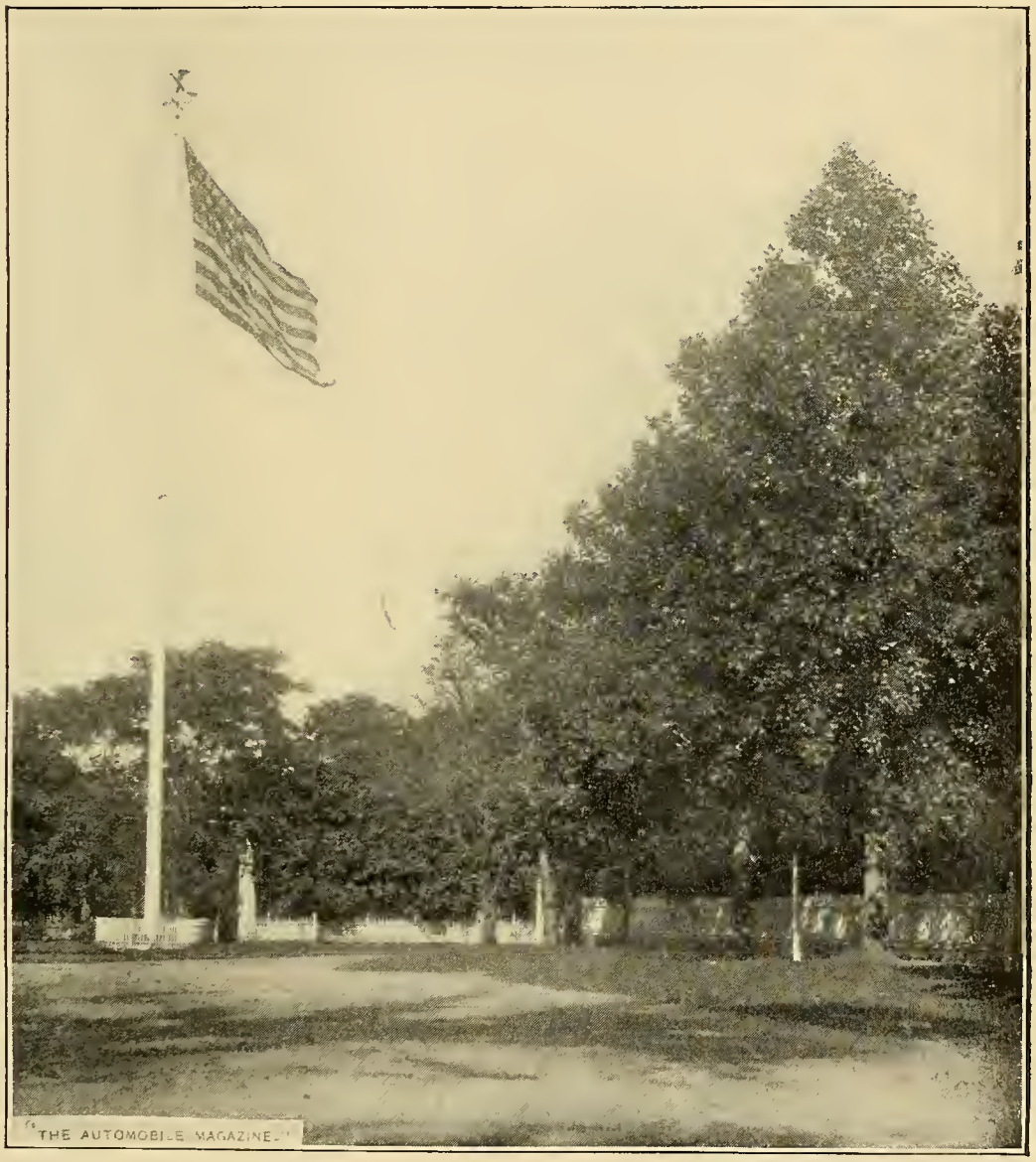
Strange as this may seem on first appearances, it is not so strange when the general ignorance concerning the simple method of building and the modest cost that attaches to a mile of good road is taken into consideration. Farmers generally would like to have good roads, but they imagine that their presence means an intolerable burden of taxation. They do not stop to consider the intolerable tax they are paying in loss of opportunity for want of them. Thus the farmers of New Jersey did not discover what they had lost until a few model roads were built in their territory, when the truth concerning previous disadvantages became startlingly plain. In answer to a general inquiry sent out by the Chairman of the New Jersey State Board of Agriculture, as to whether the roads had worked an improvement in their conditions, hundreds of replies were received—all of them affirmations, and some so concise that they may well serve as illustrations of the value of the whole movement. One wrote:

"We are very proud of the country road in our neighborhood, so recently put in shape. Even before it was laid by the State property near it advanced nearly fifty per cent. in value. A case in point is that of a piece of property right here which could have been bought for $20,000 before the road was built, and only a few days ago the owner was offered $30,000 for the same farm, and it is two miles away from any railroad station. There are many more cases here of the same sort. We favor good roads."

Another wrote:

"Prior to 1897 I lived within two miles of a stone road leading to Camden. My tenant hauled manure from Philadelphia

during the fall and winter, going down with two horses and bringing out a load with them. When he got to within two miles of home he had to double up his teams in order to bring the two-horse load the balance of the distance to my farm. It took him longer and was more fatiguing to the team to come



Bridgehampton, Long Island

those two miles than to come the entire ten miles from Philadelphia to Merchantville, and he was frequently obliged to throw part of the load off in order to get home with the four horses. It is this waste of time which makes it important to farmers that we should have improved highways. I know it is necessary to

educate the people up to this idea of stone roads, and that it requires a great deal of education in some cases.

"Before the building of the turnpikes, 25 baskets of potatoes were considered a load from the farm I now occupy to market. After the turnpike was built 50 to 60 baskets were considered no more of a load than the 25 a few years previous. And now, since the stone road has been built, our load is 85 or 100 baskets; and during the past winter our team has carted over 150 loads of manure from Philadelphia, several of which I weighed and found to amount to 6,869, 7,300, and 7,920 pounds, clear of the wagon, which alone weighed 2,300 pounds, a combined weight of about four and a half tons. Many of these loads were drawn from the city to the point of leaving the stone road with only two horses, and the result has been the saving of over $100 in my manure bill for the year."

The last one, which may be selected for the present purpose, voices much the same thought in another way. This farmer replied:

"Good stone roads—and stone seems to be the only way of making roads permanently good—are of great importance and benefit to us farmers. To make any profits we must haul heavy loads. With the taxes I pay it is but just that I be able to go to and from town with as great a load as my team can haul through town, without having to use four extra horses to insure getting through the sand. We ought to be able to work our teams all the year round, instead of having to keep idle while the frost comes out of the ground."

The average farmer out West has to haul his product and supplies about five miles. His teams are good, but they haul on the average less than a ton—perhaps not more than three-fourths of a ton—a load. The time required to make the trip averages close upon three-fourths of a day. During hauling season wages are high, and the expense of the "short haul" from farm to station is made heavier than for the "long haul" that follows by rail or boat. The substantial improvement of the roads means that just twice as much can be hauled by any given number of horses in just half the time, and *that* at any period when horses are not needed on the farm—a thing which is never possible with a poor road. For this is the worst of the whole bad-road system, namely: that when it is good enough to haul over them, the farm is good enough to work on, and horses and wagons are needed there. When they are impassable, because of mud and water, the farm is also unworkable, and horses and wagons are idle. Thus a double injury is worked.

It has been figured by an expert of the government of Minnesota, that if only the worst places in all the roads of that commonwealth could be repaired (stretches of ruts and hollows which aggregate only a sixth of all the road mileage of the State), it would enable farmers to haul a third more of a load and to haul it at a third less time.

"This means," he says, "that where it now takes three-fourths of a day to haul thirty bushels of wheat or potatoes, forty bushels could be hauled just as easily in half a day, or eighty bushels a day, if necessary. It means that where it now

Westbury, Long Island

costs $3 to market three-fourths of a ton, it would then cost but $2 to market a ton—a saving of half the expense. It means the extension of the hauling system to suit the convenience of the farmer and an opportunity to take advantage of the market. As it stands now, the markets take advantage of him. It means a net saving of at least 10 per cent. of the value of his products. If he was making money before, it means double profits now; if he was running behind, it opens the way for him to retrieve his losses and get on in the world."

All this for the repair of one-sixth of the roads of a State, and yet this is but a suggestion of the actual and enormous

advantages which invariably follow. To-day the average farmer is either compelled to haul his fifty cent wheat to market before the rain comes, or hold the crop until the following May, when it may be worth much less. The intermediate good prices might as well never exist, so far as he is concerned. The condition of the roads stops him from taking advantage of them.

It is estimated by the Secretary of the National Farmers' Congress that the wagon transportation of the United States amounts annually to 600,000,000 tons; that this has to be moved an average distance of eight miles; that it costs an average of $2 per ton to move it; and that this is sixty per cent. more than it would cost if we had good roads all over the country—an extra cost in producing and marketing our agricultural products of $700,000,000. When it is taken into consideration that the total value of all agricultural products is only $2,800,000,000, it is perfectly plain that *one-fourth* of the *home* value of our farm products is lost by bad roads.

Texas gives a startling illustration of this in the movement of her cotton crop—a labor which requires less expense for road transportation than any other commodity of equal value. There are 750,000 tons of lint and 1,500,000 tons of seed, making 2,250,000 tons. This at $2 per ton (the cost of hauling over poor roads), equals $4,500,000—sixty per cent. more than it should be. With good roads, there would be saved there alone every year $2,700,000 on the cost of wagon transportation. This would pay an annual interest on $54,000,000 of 5 per cent. bonds. Expended economically, this would build 42,000 miles of good permanent roads, and earn the State money to pay the principal. In ten years Texas could have good roads, permanent and paid for, and her treasury would be the richer for the enormous increase of land values.

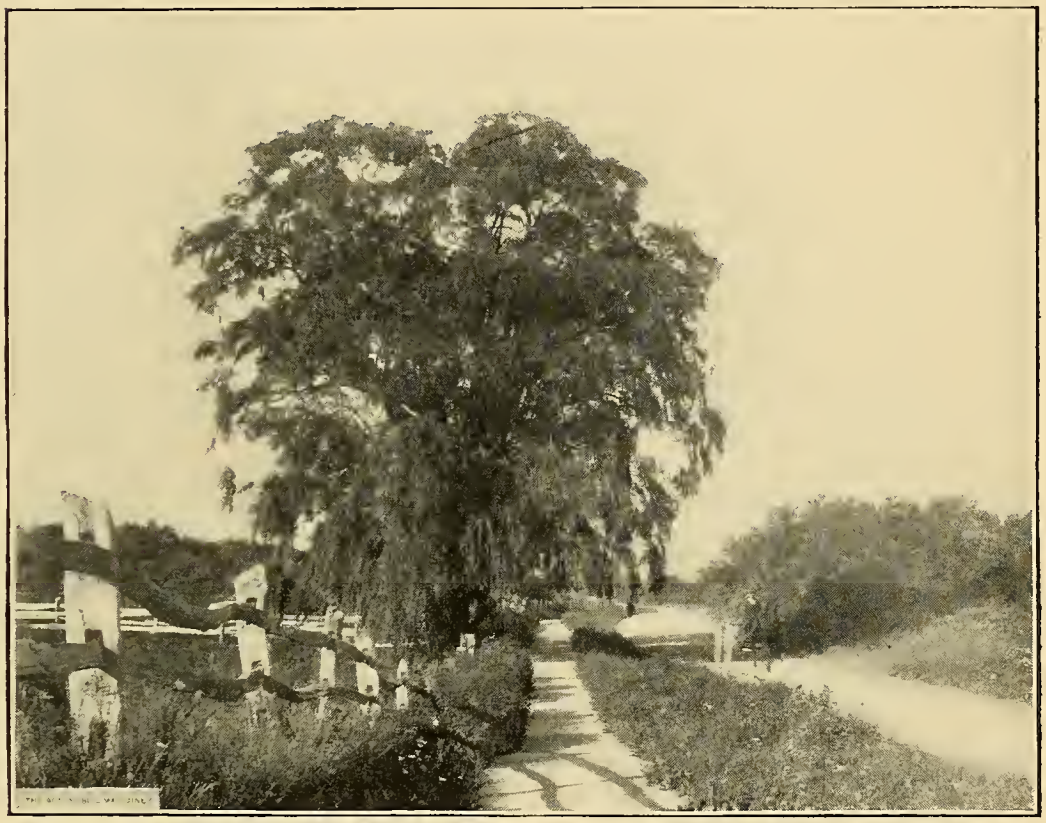
This, however, is but another instance. It has been figured out in New Jersey that land values tend to rise 30 per cent. in value wherever good roads are introduced, irrespective of other natural benefits. They are invariably the forerunners of other improvements, such as the electric railways, free mail delivery, increased demand for country residences, and so on. They create far greater social unity, they spread intelligence, they give to the isolated citizen a political significance not otherwise attainable.

So it goes after construction, but before there is, invariably, opposition. This comes, as I have suggested, not only from ignorance of cost and of results, but also of methods of building. This ignorance is so general and may so easily be dispelled, that

it becomes almost a duty to define the three classes of roads and explain how they are constructed.

As a matter of fact, there are three and only three—dirt, sand (or gravel, which is practically the same) and stone—Telford or Macadam—between which last there is little choice.

For *earth* roads, as commonly built, there is little to be said. They should be tolerated only in a new country, or where there is absolutely nothing but earth of which to make them. Yet, with earth alone, a passable road can be made and maintained, if



Old Willow Cycle Path and Road, East of Southold, Long Island

sufficient care is taken to have it thoroughly rolled and drained and the surface kept in a proper condition.

The sole value of the *sand* road is that it lasts longer than the common rolled dirt road. The real road, the good road of all the present agitation, is the stone road, Macadam or Telford, which costs from $5,000 to $8,000 a mile, and lasts for hundreds of years.

The principal difference between these two constructions is as to the propriety or necessity of a paved foundation between

the coating of broken stone. Macadam denied the advantage of this, while Telford supported and practised it. The Macadam system is the better under some conditions, while the Telford seems to have the advantage in swampy, wet places, or where the soil is in strata varying in hardness, or where the foundation is liable to get soft in spots. Under most other circumstances, experienced road-builders prefer the Macadam construction.

Macadam roads are built by covering an earth foundation with a compact crust of small broken stones. A trench about six inches deep is excavated, every foot of the surface thus exposed is examined carefully, all soft spots are strengthened, and all dead or perishable matter removed. The earth is then rolled, and over it is spread a layer of stone from two and a quarter to two and a half inches in face dimensions. The first layer is rolled to a thickness of four inches, and the top layer to a thickness of two inches. If the earth foundation is correctly prepared and sufficiently drained, if the stone layers are composed of stones of the right sizes and are carefully laid, a magnificent highway may be built in almost any locality where stone may be had at all, at an average cost of from $6,000 to $8,000 a mile. In level regions this cost may frequently be reduced one-half.

The earth foundation must be hard and dry, or the best built covering of stone in the world will prove worthless. An average of twenty-seven thousand tons of rain falls annually upon every mile of road in the United States. A good Macadam road should be waterproof. It should shed the water that falls upon it and protect the earth foundation upon which it rests. If this is done, and ditches are provided for its free passage to an outlet, sufficient drainage will be secured, unless the subsoil is saturated by springs. If this is the case, a system of subdrainage must be used.

The Telford foundation is composed of stones of various sizes, not exceeding ten inches in length and six inches in breadth on the broadest side, nor three inches in thickness on the narrow side. These stones are placed lengthwise across the road, breaking joints as near as possible; the interstices are filled with stone chips, all projecting points are broken off, and the whole structure is wedged, consolidated, and made as firm as possible.

This foundation should be covered with coarse sand or stone screenings, or if neither of these can be obtained, fine loam may be used, so that all voids may be filled, and the whole brought to a hard and uniform surface by thoroughly rolling. A layer of broken stone is then added, and treated as in the Macadam system. Where the funds will permit, and the traffic requires it, a regular

two-course Macadam surface may be placed upon the Telford foundation with good result.

The grade of a model road should never in any case be steeper than about one in twenty, and should be kept as much below this rate as possible. If the grade be made steeper than one in twenty a horse will in most cases be unable to haul his ordinary load up the incline without assistance. On first-class Macadam roads, in important localities, the limit should be one in thirty. Steep grades mean greater expense for repairs, for not only do they quicken the flow of water, which wears and scours the road surface, but they also subject it to a severe digging action of toe-calks when horses are hauling loads up the grade.

On a grade of nine feet in a hundred about four horses will be required to haul on a Macadam road what a single horse would draw on the level, and although, as before stated, a horse in pulling up hill can generally exert, for a short time, double the strength that he continually employs throughout the day, it is clear that, even with this increased exertion, he can only draw half his ordinary load up a nine-foot grade. If we subtract in each case the weight of the wagon from the gross load, we shall find the hurtful effects of the steep grade to be still greater; that is, if the gross weight of wagon and load hauled by a horse on a level Macadam road is 2,800 pounds, and the gross weight that he can haul with double effort up a short nine-foot grade is 1,400 pounds, and the weight of wagon in each case 800 pounds, then the net load hauled by the horse on the level road will be 2,000 pounds, while the net load hauled up the grade will be only 600 pounds. We see from this that a nine-foot grade more than doubles the cost of hauling.

Every State has its own peculiar problems to solve, and difficulties to overcome in its progress toward good roads. In the first place, it is necessary to awaken an interest among the people, to convince them that good roads will pay. It is then necessary to devise laws by which a successful system of building can be operated. Good soil and material are not as available in some localities as in others, but it has been found that all such problems can be solved where the proper efforts are made.

In treating with this subject of good roads, I have dwelt chiefly on the importance of the present movement from the economic point of view. This single phase of the subject has evidently struck a popular chord, our exposition in the May number of the magazine having received editorial comment from a large number of leading daily newspapers. But, in attempting to awaken a wider sympathy in the agitation; I own that I have at

heart the interests of the very large number of the readers of this magazine who are cyclists. It is the cyclists who are largely at the bottom of what has already been accomplished. In working for their own good, they have extended a benefit to the whole community, the magnitude of which could hardly be exaggerated. Better roads, then, by all means. On this subject some further articles will be published in forthcoming numbers, and I invite the co-operation of all interested citizens, whether in the form of formal action by cycling clubs, or as suggestions from individuals who have given this matter their consideration.

C. Arthur Pearson.

The First Real American Automobile Exposition

THE most important automobile exposition ever held in this country will no doubt be the Exposition of the Greater Inter-State Fair at Trenton, to be held next September 24, 25, 26, 27, 28. The Board of Governors of the Greater Inter-State Fair has wisely decided to afford all manufacturers of the United States an opportunity to show up their vehicles, without any great expense to them. They have erected a special building for the annual fair for the automobile interests and no charge is made for exhibition spaces.

Nearly every manufacturer will be represented by several vehicles of his make, also all the accessories will be exhibited. To judge at present from the applications filed with the Secretary, Mr. M. R. Margerum, more than 30,000 square feet will be needed.

Trenton is very happily located between the two big cities of New York and Philadelphia. The Automobile Department is a timely innovation, and will draw a crowd not only from the State of New Jersey, the cities of New York and Philadelphia, but from all over the country, as everybody is anxious to become better acquainted with the new mode of locomotion—the automobile.

It is easy to predict that in no distant time the United States will lead the world in this new industry, as we have the best mechanics and the best machine tools to produce the very best vehicles for the world's market.

First Real American Automobile Exposition

The managers of the Trenton Fair have offered a special trophy to the Automobile Club of America to organize a club run from New York to Trenton on September 22, two days previous to the opening of the Trenton Inter-State Fair, this trophy to be known as the New York-Trenton Cup. Another cup has been offered to the Automobile Club of Philadelphia to organize a club run on the same day from Philadelphia to Trenton. Only American vehicles to participate in these runs. These offers have been graciously accepted by the two clubs. The members of affiliated automobile clubs can participate, either in the run from New York to Trenton, or from Philadelphia to Trenton. All contesting vehicles will be on exhibition on September 24, the opening day of the Fair. Besides the five races organized for that day there will be contests of automobile stopping and automobile driving between obstacles. It will be the first time in the history of the automobile that such an exhibition will have been given in this country. A one-half mile driving track sixty-six feet wide, with curves raised two feet seven and one-half inches will afford an excellent opportunity to show all the good points of the competing vehicles in the races as well as in the other contests.

Several exhibitions are planned in the near future in the interest of the automobile industry, but we can surely predict that none will excel the Trenton Fair, as the whole industry will be represented there. The exhibition, under the auspices of the Automobile Club of America, to be held in November in the Madison Square Garden, will permit only a few manufacturers to show their makes, and will only include about a dozen or fifteen manufacturers, while in Trenton, over 300 houses will be fully represented. The Jury of Awards as well as the Stewards of the Races of the Trenton Inter-State Fair consist not only of the most notable scientists of this country, but of the most enthusiastic members of the Automobile Club of America and the Automobile Club of Philadelphia.

The grand stand, as well as the Exhibition Building No. 1, lately destroyed by fire, has been already replaced by fireproof structures.

The Use of the Automobile for Rural Traffic

THE century which is now approaching its end has witnessed the creation and development of the railway—the most efficient of all means of transportation. The extraordinary effect which the invention and extension of railways have had upon our economical and commercial development need not here be dwelt upon. The world is covered with a network of steel tracks; and the railway undeniably occupies the foremost place among all systems of transportation.

Powerfully as our commercial life has been influenced by the steam-railroad, the ideal method of transportation has not been attained, and cannot be attained by the railway with its pretentious system of stations and tracks.

Our transportation facilities have been improved chiefly for the purpose of accommodating the largest possible number of persons or quantity of goods, and of carrying them to their destination in the shortest possible time. The steam-railway has, therefore, supplanted all other means of conveyance and even degraded the horse-drawn vehicle to the position of one of its auxiliaries. The centralization of traffic has now almost reached the end of its career. In civilized countries there is no necessity for building new railroads; and the development of the lines already in existence is confined chiefly to the construction of branch and auxiliary roads running to districts not connected with the main line.

The enlargement and extension of existing roads show the limitations of the steam-railway. The railroad rarely meets the requirements of flat regions. Owing to the very small traffic, even the narrow-gage road cannot be profitably operated between small rural communities; nor can its time-tables be always adapted to the needs of places not remotely situated from one another. For adjacent villages and towns a smaller, less pretentious system of transportation is evidently required, which, though less efficient than the larger railroad, is better suited for the purpose of establishing a profitable means of conveyance. Beyond a doubt automobiles are the best vehicles for the limited traffic of the country. They are destined to connect rural communities, not only with the nearest railroad, but also with one another.

The Use of the Automobile for Rural Traffic

In districts where there is temporarily considerable passenger and freight traffic, automobiles will be particularly serviceable. Summer-resorts, for example, which during the warm season of the year are much frequented, are well-nigh lifeless during the winter. The building of a railway to such places would be unprofitable; but a line of automobiles running to and from the nearest railway would meet all requirements and would, moreover, be much cheaper.

Mechanical traction without rails is free from the disadvantages attending the use of tracks and does not necessarily entail a loss in speed. The automobile is therefore destined to play an important part in the economic development of prairie communities. In order to strengthen our argument by means of a concrete example, we have but to mention the great possibilities of the motor-car in the improvement of our rural postal service. The high speed which can be attained on good country roads would certainly bring about a quicker distribution of the mails and consequently greater efficiency in the postal service.

If automobiles are to fill the wants of country districts, it is evidently necessary that roads be built which will be adapted to the needs of the new means of communication. The highways must be as level as possible; the grades must be few and slight. The roads should be kept in such condition that the vehicles would not be jolted and subjected to violent strains. In the delicacy of its driving mechanism, the motor-carriage differs widely from the animal-drawn vehicle; and for this reason alone good roads would be a necessity.

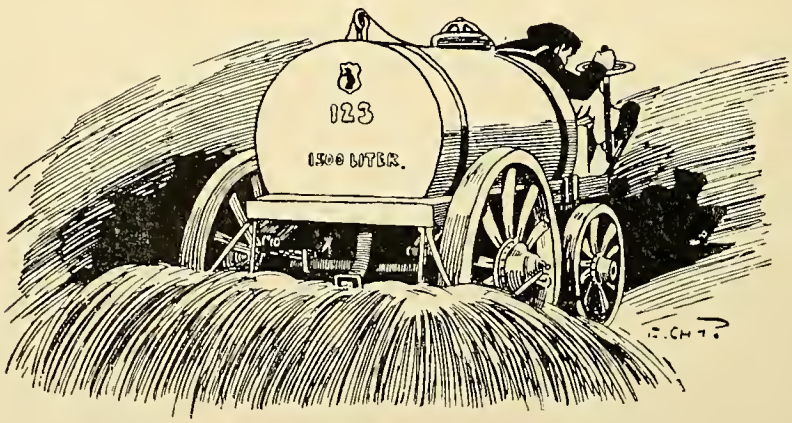
Not until the highways have been rebuilt or improved will the full efficiency of the automobile be recognized in country traffic. Any positive opinion on the automobile is therefore premature. With the present lack of facilities on our country roads, it is no wonder that the motor-carriage has not always fulfilled the expectations of its champions.

But the building of roads especially adapted for automobiles is not all that is required. It will be a matter of the utmost importance to reserve for the motor-vehicle the road upon which it is to run, and to divert to other channels the animals and vehicles which may hamper it. Special paths have been opened for bicycles; and there is no reason why automobiles should not enjoy similar privileges. A division of automobiles into light and heavy vehicles would also be advisable. If there were divided roads for light and heavy automobiles, the problem of maintaining the highways in proper condition would be considerably simplified. The light, swift carriage could then speed along without

being suddenly checked by a slow, heavy truck. The provision of sidewalks for pedestrians has been one of the means of preventing a congestion of the traffic of large cities. A further improvement could be made by classifying the vehicles according to weight and speed.

Such a division of vehicles is even now possible on our roads. To be sure there are avenues and streets which are too narrow to permit a separation of light and heavy vehicles. But something must be done, with the rapidly increasing number of automobiles, to prevent the blocking of the way by cumbersome wagons. The obstacles to be overcome in attaining the desired end are not unsurmountable, especially when it is considered how the building of roads has been modified in the course of time. The old Roman roads, which extended over half of Europe, as well as the roads built during the Middle Ages, were constructed in straight lines. They extended over the highest mountains; no hill was too steep nor valley too deep. Nowadays roads are curved and bent so as to avoid all steep inclines. Mountains are ascended by serpentine routes. The change has been brought about by the constantly increasing use of draft-animals. The substitution of the circuitous route for the direct roads of the Romans will find a parallel in the construction of automobile highways, which will fill the wants of the future means of transportation.

Improvements in road construction go hand in hand with improvements in the vehicles of trade. Every step in the development of road-building has been due primarily to better means of transportation. Highways are gradually adapted to the demands of transporting vehicles; and only when adequate roads have been provided can these vehicles develop their full efficiency.



The Automobile Abroad

(By Our Own Correspondent)

THE English Motor Club is a new organization in London. Regular Saturday afternoon runs will be a regular feature.

A gentleman from Boston, England, was recently brought into the police-court at Spilsby, charged with running a motor-cycle at a furious rate, frightening horses attached to a heavy cart. It was shown, however, that 16 miles an hour was the maximum speed of the motor, but on that afternoon it had been geared down to 12 miles an hour, and that the man in charge of the horses was both inexperienced and careless. The magistrates said it was their first case of the kind and they held the evidence to be "conflicting," so they recommended the withdrawal of the complaint on the payment of the costs, 20 shillings, by the gentleman.

Two new companies organized in England are the Ceylon Rapid Transit Company, Limited, and the Motor-Wheels Company, Limited.

A dealer in bicycles and automobiles at Scarborough, England, was lately fined for scorching with an automobile while drunk. The offense deserves heavy punishment—even imprisonment. An automobile is the last place for an intoxicated person. Total abstinence should be observed on the road.

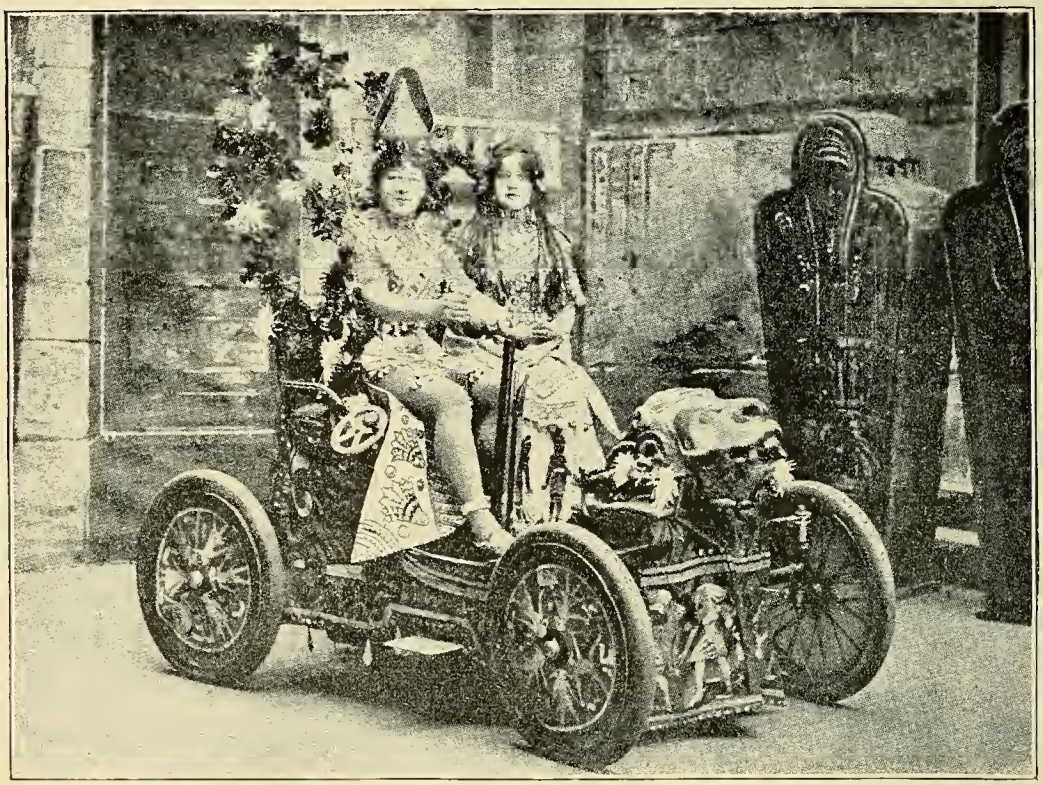
An English chronicler has discovered that the cyclometer was invented over 250 years ago, a Colonel Blunt having had one on his carriage in 1637, giving the distances in miles and thousand miles.

A very significant and important step is that of the Frankfurter Rennklub (Frankfurt Racing-Club), of Frankfurt-on-the-Main, in adapting its magnificent course at the Forsthaus to automobile racing. On July 29 the first automobile race in Germany on a regular racing-track will be seen. The regular horse-races of the club will be held on the same day.

The prominent German writer on sport, Richard Koelich, recently made a long-distance tour with his wife on a motor-tricycle with voiturette attached. He intended to make a journey of a month, but at the end of eleven days his business called him back. Owing to bad weather three days of travel were lost. In eight days a distance of 1,200 kilometres was made. The jour-

ney was through a most interesting part of Germany. Starting from Aix, the route lay to Cologne and then up the Rhine to Mayence, up the Main to Frankfurt and thence to Mannheim, through the valley of the Neckar to Heidelberg and Stuttgart, across the mountains to Durlach and again to Mannheim, and back to Aachen by the same route from Frankfurt. The entire consumption of benzine was 54 litres, or 1 litre to every 22 kilometres. The total weight, including persons and baggage, was about 300 kilograms.

A novel race was that between an automobile and a balloon,



Scene from "The Juggler of the Nile," at the Metrepol Theatre, Berlin

recently held at Friednenau, near Berlin. In spite of getting stuck in a morass for awhile, the automobile came out ahead by nearly 10 kilometres.

The Greek Government has given Konstantin Moraiting a franchise for an automobile service covering the whole kingdom, including both passengers and freight-transportation.

The third annual German bicycle fair (Fahrradmesse), to be held at Leipsic October 19-23, will have an automobile exhibition as a feature.

The automobile exhibition in Frankfurt, Germany, will be held July 14 to August 12.

The Automobile Abroad

The permanent traffic commission (commission permanente de circulation), in consequence of the complaints of residents of streets traversed by tramways, has prohibited entirely the use of the horn as a warning-signal on vehicles. Bicycles will probably also be included in the interdiction. The use of bells, or gongs, as universal in the United States, will be required, and conformity with certain models insisted upon.

Following are the totals of the prizes offered for this year's main racing-events for automobiles in France: The meet at Nice, 10,000 francs; Paris-Bordeaux run, 14,000 francs; Paris-Ostende run, 15,000 francs; Exposition road-run, 47,000 francs; Exposition track-races, 24,000 francs; Pau meet, 8,000 francs.

The course for the long-distance run between Salzburg and Vienna is to be policed by a squadron of cavalry and a detachment of soldiers on bicycles. Between the last localities traversed a military telegraph corps is to lay a light line to announce the results. It is likely that the cavalry will be more of a hindrance than a help.

The Vienna automobile exposition opened on May 31 and closed on June 10. The interest shown was greater than ever. A remarkable number of new types were shown and the exhibits were full of evidences of great progress in the past year.

The new Brussels automobile cab-service will be equipped with six-seated vehicles of German make, with six horse-power motors. The fare is five francs an hour for two persons, two francs additional for other persons, with a maximum of eleven francs for six persons. For several hours' use the charge is ten francs an hour.

The Prince of Oldenburg has lately made a tour of 500 kilometres in the Caucasus, between Novorossik and Sukhum, on a Gardner-Serpollet steam automobile.

The automobile is making itself felt in Spain, where there are many admirable roads. A motor-omnibus service is to be instituted between Oviedo, Siero and Villaviciosa.

Custom and the Automobile

IF the horseless carriage, like the poor and the single tax agitation, we are to have "always with us," it is to be hoped that we shall some day cease to miss the horse. That, though, cannot come about until some genius shall invent and persuade us to accept such forms of the new vehicle as will enable us to forget him. But in order to do that we must forget the vehicle that he drew—that is to say, we must have a vehicle whose difference from the old one consists in something more than its horselessness. Nearly every part of the one that we have has been constructed with direct or indirect reference to the animal that used to pull it, and fond recollection presents him to view as still pulling it.

Divorced from him it looks bereft, uncomfortable and helpless. It offends the eye, shocks our sense of the fitness of things and is a sore trial to the spirit generally. Probably, though, its horse-born features will remain in evidence for centuries after their origin is forgotten. Posterity will regard them as essential parts of the automatic scheme—will feel (for example) that without a "dash-board" the thing could not be made to go.

It requires generations for us to learn how best to do a new trick evolved from an old one. You shall not cast your eyes anywhere among the works of man without their resting on some "survival"—something that once had a purpose and a meaning, but has long ceased to have either, and is perpetuated by nothing but a stupid, unreasoning conservatism—a habit of continuing to do what has always been done.

I could fill this entire newspaper with instances in point. Why have so many buildings watch-towers without watchmen, battlements from which to fight no battle, bastions loopholed for archers, and so forth? Go into a cemetery and observe the number of marble, granite and bronze "urns."

When cremation was the rule (most of us think it is a new fashion), real urns were used to hold the ashes of the dead. There are ashes no more, but the urns are there all right, and in explanation we say they are symbols. That word "symbol"—what a multitude of stupidities it covers! To-day a convenience, to-morrow a superfluity, the next day a symbol—such are the genesis and development of things most precious to the sentiments. But the days are ages long.

Not all survivals are "symbolic"; only such as touch the sentiments. Most are merely nuisances; but we go on making

the thing, or doing the act, as diligently and gravely as if it were needful. The merchant vessel of to-day is frequently painted to look like a war ship with portholes for cannon. That is to scare away the pirates. The pirates have all left the high seas and gone into business on land, but that makes no difference; the traditions of the ship painting art require the dummy portholes.

Did you ever see an actor open a letter on the stage? He probably struck it a smart blow with the tips of his fingers. That was to free it from the sand which fifty years ago was used to "blot" letters, and some of which would stick to the wet ink. The actor never heard of the custom, but he taps the letter just as if he knew why.

Why do we bow? To show deference. Yes; but how does bowing show deference any better than lifting the foot or turning down the thumb? When one of our savage ancestors met another child of nature to whom he wished to be gracious he bent his head before him by way of saying: "See how I trust you! Cut it off if you want to." We have inherited the habit—it is a "survival." So is the handshake; the primeval gentleman showed his good will and good breeding (both always open to suspicion) by delivering his weapon hand into the keeping of the other person, who responded with his own.

Why does your tailor sew two buttons on the back of your frock coat? To sustain your sword belt—and you would not take the coat without them.

In England and several other European countries the railway coach is still so made and painted as to resemble three stage coaches in line. Why? Because in the mindlets of the first builders of railway coaches that form was associated with the most rapid locomotion they knew about and with the carrying of passengers.

The builder of to-day has not ventured to alter it lest some appalling calamity befall. It cannot be too often repeated that man is of an intelligence but little inferior to that of the gods. He made the gods.

So we shall doubtless have the automobile for a few centuries without material change of form—that is to say, crying out audibly for the horse. It is rather a pity, for it offers great opportunities to the artist. It could be made beautiful exceedingly.

I have no designs to submit for rejection, further than to suggest a study of the prow of a Greek galley, or a Venetian gondola, with a view to emancipation from the hideous "dashboard."—Ambrose Bierce in *The New York Journal.*

The First Automobile Lesson

LEARNING to drive an automobile probably comes as near the heart disease limit in human doings as any one event of ordinary life. When Richard III. made his famous bid for a horse, the automobile was not. There are many Bostonians, probably, who cordially echo the wicked King's cry: "A horse! a horse!" etc.; anything whatever less cranky, cantankerous, crotchety and with a more subdued enthusiasm for riding over everything but the road.

It seems so easy while one watches the "automobilier"—the man who guides an engine is an engineer; the steersman of a gondola is a gondolier, and, by analogy, the director of the energies of an automobile may be an "automobilier." The thing shoots along the boulevard at a rattling pace, corners are turned with surprising ease, the apparatus comes gracefully to a standstill; in fact, it "gees, haws and backs" with all the docility of a well trained horse. When the owner or renter takes it in hand for the first time, then it is truly "a horse of another color," and certainly of a different—oh, how different—disposition. All the vices and irregularities of the sum total of equine perversities are as nothing compared to it.

After explaining the thing and illustrating the action of the starting lever, steering bar, reversing lever and brake, by sundry dexterous turns of the wrist, the instructor changes places with the luckless beginner, and then the fun begins. Particularly if one is accustomed to horseback riding is the first trip on an automobile a strange and fitful experience.

"This is easy," the new automobilier says to himself as, with the right hand on the steering bar, he pushes the starting lever a single notch forward. This only sends the machine at a very moderate pace. The road is straight and smooth, and everything goes easily. There is a feeling of exhilaration, and, with a thought of "I wonder who I know is looking," the new operator rashly pushes the lever forward as far as it will go.

With a bound like that of a high-bred horse under the sudden sting of the whip, the machine bolts forward. The steering bar, which was so easy to handle at the slow speed, now seems to be endowed with life, instinct with some diabolical agency. It will never stand still. Instead of keeping straight ahead, the machine is continually wabbling, and woe to him who may be driving anything on that road. The perverse machine takes it all, with an absurd preference for the sidewalk.

Then the instructor comes to the rescue and saves the luckless amateur from an untimely death. With a change of heart amounting to a camp meeting conversion the machine, which was a moment before vicious, hard on the bit, balky and obstinate, lays aside all these vices and, coming back to a state of grace, darts along the road like an express train.

While the new driver is drawing a breath of relief and wondering what could have possessed the machine before, it comes as sort of a shock to hear the instructor saying: "You rather lost your head that time. Now, try it again, and keep the steering bar steady."

Holding the steering bar with a grip that almost dents the handle, the automobile speeds on. No deviation this time; straight as an arrow the thing shoots. Down the boulevard speeds the machine, when, all of a sudden, half a newspaper blows across the road. The new operator, with all his experience of horseback riding, needs no hints from the instructor as to what he should do in this emergency. Holding the starting lever firmly with his left hand—though what for, neither he nor any one else could say, as the machine is doing its prettiest already—and the steering bar in his right, he deliberately turns his horse's —no; the automobile's—head toward the fearsome object. Almost instantly the machine becomes a bicycle, so sudden is the slew that the quick turn has caused. The instructor seizes the steering bar, and, by bringing it back to "straight ahead," averts an overturn by a hair.

"Never had a horse shy like this," mutters the neophyte, as he takes the bar again.

All goes well for a time now. The machine is on two-thirds speed and acts very well. Two-thirds speed is not very slow, however, and before long the automobile arrives at a street where the electrics cross the boulevard. Still thinking of the horse, and wishing to keep the thing from stumbling on the car tracks, the new beginner slows up. Where, oh, where is that brake! After more or less shuffling, the foot finds it and, with a forward pressure, releases the catch that holds it in position on the comb. Gently as possible the thing stops. The track is crossed and no accident has happened. Then the brake is released and swung back into place, but still there seems to be no increase in speed. In fact the machine goes slower and slower and finally stops. The starting lever is certainly forward, where it was when indicating two-thirds speed.

Anxiously the volt-meter placed under the shadow of the

dasher is examined. That certainly indicates plenty of power left in the storage battery. Something must be wrong with the machinery. It is a relief to learn that there is nothing the matter. The machine is not balky nor injured. When the brake is set, it cuts off the power. The starting lever is pulled up in first position, then forward, and another start is made.

Somewhat rattled by previous mishaps, the first half mile is now done without much pleasure. One's whole mind is centred on the management of the machine. The surrounding scenery is enveloped in a sort of haze. Little by little, as ground is covered and nothing untoward happens, the new operator begins to notice other things. That was a handsome house that was passed, he thinks to himself. One by one objects begin to impress themselves on the senses. The mist clears, and with a keen sense of pleasure and exhilaration, the next half mile is passed.

Everything is going smoothly. The machine has been conquered, and the lever is pulled to the third notch. At a rattling pace the automobile now dashes on. Automobiles forever. Horrors! Is that nurse going to trundle that perambulator across the street? Will she never look this way? Down brakes, quick!

As the new driver painfully gathers himself together and sorts himself from the clinging gravel and mud that has stuck in artistic clusters on his clothes after he went flying over the dasher, his criticisms of the sport of automobiling are not fit to print. If he is not cured, the fever is in his blood and he will try again, each time with increasing pleasure.—*Boston Herald.*

War and Power Traction*

By the Right Hon. J. H. A. Macdonald, C.B., LL.D., F.R.SS. (L. and E.) (Commanding the Fourth Brigade).

At a time when war as a factor in national life has been brought home to this nation in a very sudden manner, all who are interested in power-traction will, I think, agree that the question of its applicability to the purposes of war should be studied. There are two aspects in which it presents itself—the combatant and the non-combatant. The first relates to the uses which can be made of power-traction to move weapons of war to and within the area of the actual fight, and to carry armed men into or out of that area, and, it may be, to give them practical aid and protection while fighting. The second, and in some aspects the more important, relates to those less stirring, but absolutely essential operations which take place outside and even sometimes inside the fighting zone, by which the necessary supplies of ammunition, food for man and beast, camp equipment, ovens, and many necessary stores that need not be particularized, as also engineering implements and explosives, pontoons, horse-shoeing forges, duplicate parts, repairing tools, ambulances and many other indispensable appliances and munitions can be carried along with the army, so that it may be kept efficient, and maintained in strength and health and equipment for the exertions it must undertake. As regards the feeding question, there is no truer saying than that which is often quoted—that "an army marches upon its belly," and if this were kept in view, we should not often hear the cry "Why doesn't General ———— get on? What's the good of his sitting doing nothing; he seems to be wasting time terribly."

It is plain that if means can be found by which the length of the transport train conveying a certain quantity of material may be reduced, the difficulties of transport and supply would be diminished in a corresponding degree. And further, if speed could be increased, still more advantage would be gained. At present, if a large force starts by one road, say, at 4 A. M., the last wagon may not move off for two or three or even four hours after that time, and will arrive at the end of the day's march correspondingly late. Therefore every reduction in the length of the column and increase in the speed of movement would be a

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great gain. Again, if the haulage be done by animals, delays for feeding are a necessity, and difficulties of watering may be serious and even in some cases make the use of a particular road impossible, or affect injuriously the laying off of marches, as halts cannot be made where water is not within reach. Add to all this, that in the case of animal traction, if the weather is very wet or very dry, the road will, under the shoe-pressure of such a multitude of traction animals, dependent upon foothold for their efficiency, have its surface completely destroyed, and thus made to cause greater wear and tear to animals and vehicles following, and possibly, if the road becomes badly rutted, to cause a serious breakdown of rolling stock, and impose much wearing fatigue on troops requiring to march by the road after some of the wheel traffic has passed. In short, war brings into exaggerated relief every disadvantage which appertains to animal traction. Notwithstanding its many disadvantages, animal traction has been till very lately the only mode of haulage in use by armies in the field, whenever any freedom of movement, either strategic or tactical, was sought for. A railway, of course, will bring forward supplies very rapidly, and as long as an army can accomplish what it has to do while clinging to a railway, no transport could be more efficient. But if an army is tied to rails, and has to limit its operations by the necessity of keeping close touch with an iron road, its commander loses all freedom of manœuvring, and his opponent is able to forecast his every move and foresee how far he can carry it. The present war has illustrated this very forcibly. As long as the commanders in the west and east of the seat of war were compelled to hold on to the railways as their means of conveying bulk supplies, the Boers could make up almost impregnable positions to bar their progress. But where, with road transport, our generals were able to move out from the railways and round the entrenched positions without losing the power to bring food and supply munitions of war to their forces, the whole scene changed as by magic, and our opponents had to abandon their carefully prepared positions in haste, and even to suffer disaster.

The use of the road being thus an essential of successful military operations, does this not open out a promising prospect for those who are engaged in developing power traction? To this there can be but one answer from all who are familiar with the progress in mechanical haulage which has been already made. Even the now old-fashioned traction engine is not a power to be despised for army transport. At the risk of the imputation of egotism, I will say here that the volunteer brigade under my com-

mand was, as I believe, the first military unit to employ power traction in this country for this purpose. Five years ago, having arranged that the brigade was to march to camp as an exercise, the distance being a full day's march according to the military standard, I authorized the supply and transport department of the brigade to make a contract for the whole equipment and stores for 1,500 men to be conveyed by two traction engines. The military authorities at headquarters shook their heads over the proposal, prophesying that we should find our tents in the ditch when they should have been pitched, and our men waiting in vain for their evening meal when it should have been ready. But it was not so; our train came in in good time. There was, indeed, an accident to machinery, by which for the last mile or two one of our engines was not sufficient, but the other, with its reserve of power, took on all the wagons, and triumphantly brought them in. On our return march, the whole was accomplished without a hitch. Since then the War Office has become alive to the value of this mode of haulage, and a number of traction engines have been doing excellent work in Natal. I am informed also that an efficient traction engine transport was organized in India many years ago by Lieutenant-Colonel Crompton, who is at present engaged in obtaining additional steam transport for South Africa.

But such engines, drawing trains of wagons, are not the most suitable for military transport work. It is rather in the single self-driven wagon of moderate size, dragging one other wagon behind it, and having a capacity for speed considerably more than —say double—that of the ordinary traction engine, and with its machinery so placed as to add little to the length of the vehicle, that the most practical application of power traction for war supply is to be expected, for this would reduce the space occupied by a supply train on the road very considerably. In the first place, as the exigencies of military wagon transport make teams of four horses in many cases a necessity, a power train of double wagons would not take up so much as half the length of road occupied by an animal-drawn train, even if the wagons carried no greater load than at present. This, both from a convenient supply point of view and also from a military point of view, would be a much-to-be-desired improvement. For, of course, if a train is reduced to half its length, the necessary guard will only employ half the number of fighting men, and the exposure to risk of raids on the line of communications is diminished proportionately to the shortening of the line of vehicles. But the diminution would be more than one-half, for as a train of 1,000 wagons will require

probably 2,500 horses at least, in many cases the team occupies more road than the wagon. And where so many horses are employed, a considerable proportion of the train must be taken up with the necessary supplies for feeding and the appliances for tending, nursing, shoeing, clothing and picketing the animals, and repairing and renewing harness. Also, as one man can only take care of two horses, the equipment and supplies for many additional men must be conveyed as compared with a system in which one man would take charge of each traction unit. Against all this there would be nothing to set except the weight of fuel and provision for repairs on machinery. Further still, a horse-drawn military wagon can seldom be loaded up to the extent of more than two tons, even if drawn by four horses, and therefore there would be a still greater reduction in the length of train, if each power vehicle could carry, say, four tons of load. Thus, if the horses were eliminated and the number of wagons reduced, it is not saying too much to assert that a convoy might be brought down to one-third of the present length, or even less.

Road difficulties would also be diminished in a marked degree. The surface of the road would not be cut up as it is at present, making it in dry weather a sea of dust, destroying foothold and causing wheels to run heavy, and rising in clouds to parch the throats, clog the nostrils, and close the pores of man and beast, while in wet weather it becomes a quagmire, hiding ruts and hollows produced by the excessive traffic, rendering marching a distressing exercise and traction an excessive strain on animal endurance. Also the power train, one-third of the length of the animal train, could be moved at six or even eight miles an hour, a speed twice as great as is now possible. Thus, while at present it may take some hours before the last wagon of a train can move off after the first starts, and accordingly it must come in the same number of hours late at the end of the march, an efficient power system would reduce the time to one-fifth of what it is at present. The capacity of the road for movement of troops and stores would therefore be greatly increased, and the fatigues and risks of the road sensibly diminished, as well as the delay at the close of the march by bringing up camp equipment and providing refreshment for the weary troops. Indeed, in any cases where an advance guard reported that the country in front was clear of the enemy, the supply officers could make use of their superior speed, could take with them a fatigue party and the cooks belonging to their column, and make progress in providing a meal while the troops were still on the march. And no one who has not experienced it can realize the difference it makes to the soldier, if after a long

day he can at once, or at least without a tantalizing delay, obtain his cooked meal. A wait of two or three hours in an exhausted condition in the evening may lower his capabilities for marching or work the next day, and his entire *morale* for more than one day, and in a very considerable degree. It is safe to predict that efficient power traction would do much to prevent risk of the soldier being exposed to such trials of endurance and the consequent loss in strength and addition to cost.

Add to all this, that the mechanically driven vehicle is not like a hauling animal in one particular vital to the question—it does not require periodical stoppages of considerable duration in order to gather physical strength that has been exhausted. An animal can only do a certain amount of work in a day. The power vehicle is not limited to what is called a day's work, and compelled to rest when extra work has been done. It is as fit for work the day following a forced march of, say, forty or fifty miles as when it has been standing idle for a day. The commander has no questions of exhausted transport animals to consider, a matter which may often be most serious, hindering his freedom for advance and greatly increasing his difficulties in retreat.

All these considerations tend to one conclusion—that successful enterprise in the construction of transport vehicles for war purposes will be of incalculable service to an army in the field.

Turning now for a short time to the combatant side of the question, it will be seen at once that the possibilities of substituting power traction for animal haulage are much more limited than in the case of transport. As regards all cases where the road is to be left for the open country, the only traction which requires to be seriously considered is that of guns and machine guns. And it is evident that as these must often be forced over broken and even obstructed ground, power traction, as far as it has been developed up to the present time, is not practicable. Any one who has seen the way in which even field batteries are made to fly over ditches, low fences, and boulder-strewn ground, and up heavy gradients, can have no doubt on this matter. Until lately there has been no development of traction at all within the fighting zone for any other purpose than the handling of artillery, ammunition supply carts and water carts. But we have in the armored train the first beginnings of the use of power traction for combatant purposes. Both in Egypt and in South Africa such trains have done useful service, although their capacity for good work is necessarily limited by their being confined to a fixed line of railroad, which is easily destroyed, and if in any degree broken

up may reduce an armored train to nonentity, and expose it to capture. National defence is the primary consideration in the development of fighting resources, and if roads can be effectively used for fighting by aid of power-traction there is no country better equipped for doing so than our own. I think it will be found that there is great scope for development in this direction. High-speed motor-vehicles, with bullet-proof sides, would be of great value in the advance-guard and rear-guard work of an army. Such vehicles, capable of a speed of 15 or 20 miles an hour, could be moved out in front for long distances, each carrying ten or a dozen men and followed by cyclists who could search the country between their own road and the next on their flank, sure of assistance from a pivot machine gun on the wagon in covering their retreat if driven in, and confident that they could run the gauntlet and get back under its protection if they were outflanked or outnumbered, the cyclists using the armored car as cover by riding in front or at the side of it during retirement, according to the direction of the enemy's fire.

But still further, there may be good ground for believing that the introduction of power-traction may prove the solution of the difficulty which to some extent hampers the efficiency of the fighting cyclist. But if cyclists were accompanied by a fast moving armored power-vehicle, they would have much greater freedom. Ingenuity would provide a locking bar arrangement by which the cycles could be made up in groups, so as to run upright freely when hauled by the wagon. Thus they could be taken forward or back as required. The rifleman having been brought rapidly forward by his bicycle, would be able to do his field duty without troubling himself about the safety of his machine, which would be moved about and defended by those working the small moving fort, with its Maxim gun, and both could thus do their duty for the general end in view, the rejoining of cycle and man being for the time a secondary question.

Such small mobile forts as have been spoken of would certainly be useful in many ways. They might be invaluable in protecting a flank of an advance in battle, and nothing could be better in a retirement for enabling a rear-guard to hold on for some time, and so check a pursuing enemy. Their high speed would also make it possible to move them by crossroads to any point of a line of battle where they might be of service, and, of course, wherever there was fairly even surfaced grass land they could be taken off the road and run over the open country. Like the old *testudo* of the Romans, they would, in moving, carry their own cover against the missiles of the enemy, but with the

advantage of traveling at a speed in proportion to the increased range of modern armament, and being able to disperse for fighting, with their *testudo* to aid them, and on which they could fall back, they would combine some of the mobility of the hare with the hardness and shell of the tortoise. Where it was necessary to defend, or to assault a bridge or a defile, or to repel an assault, such vehicles would be invaluable to race forward and cover an attack, or to hold on as a tortoise fort in defence until reinforcements could arrive. In a day when cover from musketry fire must be sought by both attacker and defender in the field, such movable armor would often be most useful as an aid to success in fighting.

I will ask you to consider two more points. The first is whether in such an accident as happened to our guns and convoy three weeks ago, to the east of Bloemfontein, the presence of a few military armored wagons with pivot machine guns and haulage power, might not have made all the difference in saving of guns and the protection of the convoy. In these days when a successful ambush is a veritable death-trap, and when it is not bravery but foolhardiness to ignore cover, are there not great probabilities before us in mobile cover obtained by mechanical traction? The second is, whether there is not great gain in possessing a haulage power which has no nerves and no vice, which has no tendency to stampede, and never sulks or jibs, is unaffected by tetse fly, and never takes the bit between its teeth.

Allow me now for a few minutes to sketch what might be the traction equipment of an army in the field in the next great war, which, let us pray, may find us neutral. Out in the front, on every road, armored high-speed vehicles mounted with pivot machine guns, such as I have described, to co-operate with the mounted troops and cyclists in covering the advance, feeling for the enemy, and capturing and holding bridges and fords and places of vantage, and at another time aiding in the converse duties in covering a retreat, and also in general engagements giving support at points as required, and protecting flanks; in the transport, power vehicles, with a maximum speed of, say, 8 to 10 miles an hour, every tenth or twelfth being a service vehicle, armored, and of extra speed and horse-power, carrying a pivot machine gun, the driving engine so fitted that its power can be used for working purposes, each being supplied with, say, 20 or 30 fathoms of steel ropes. These service vehicles would also carry certain appliances; for example, one would carry a small forge or smith's tools; another, wheelwright's plant; another, spare parts for the driving machinery; another, screw jacks,

anchor pulleys and block and tackle for heavy warping work; another small arms repairing plant; another spare bullet resisting plates; another search-light appliances; another an entrenching plow, to be hauled by steel cable, and all would carry some entrenching tools. These vehicles would be the centres of defence of the convoy, and a power traction transport would have many advantages for its own defence. In the case of horse traction drivers must stay by their horses and manage them, but with power traction all drivers can concentrate with the escort at the armored vehicles, thus making the defence stronger. These vehicles being mobile could be moved as the exigencies of the resistance to attack might make necessary, and being armored they could offer a much more effective defence. Again, where steep hills are encountered these service wagons having extra horse-power could assist the ordinary wagons. In case of necessity they could be used with their steel ropes to work the wagons up gradients, either by warping over an anchored pulley at the top of the hill, or by simply first ascending the hill and towing till the towed wagon reaches the top and then returning to tow the next. One can imagine how much time would be saved in such a case. One can also see that where, as is the case in the present war, it is necessary to move heavy guns up very steep slopes, such service-power wagons could be anchored and used to haul by wire ropes over anchored pulleys, and with block and tackle where necessary, instead of using teams of eighteen or twenty oxen, and in some cases hundreds of men. These are but some of the prospective advantages of mechanical traction. Many others will present themselves as experience widens. Lastly, these service wagons having extra power and only carrying a light load, could be attached to and haul any transport wagons whose traction power might be disabled from any cause.

It only remains in this outline of the subject to consider what is the best class of motor to be employed. It would appear that there are at present only three possible sources of power which would be suitable for the class of work which is likely to be required in war—steam, heavy oil, or light oil. The other sources of power sometimes used in traction—compressed air and electricity—are evidently out of the question. Kerosene, petrol or benzoline, although they have proved themselves highly efficient for ordinary road traction, present serious difficulties when it is proposed to apply them to war transport. They are ill adapted for use in hot climates, and might be a source of considerable danger if carried in bulk in a military wagon which may be struck by heavy shells, and the volatile spirit scattered over the

wagons near and set on fire. Heavy oil does not present the same difficulties, and it may be found that the progress of invention will develop this mode of traction to a high practical efficiency for wagon haulage. Steam raised by oil fuel or by a combination of solid fuel and oil fuel presents only two difficulties; the one is its dependence upon a water supply sufficient in quantity and of a quality not tending to incrustation. Such a supply may not always be available, and without it steam traction must break down. The other difficulty is that any escape of steam would betray the presence of the convoy to the enemy at very great distances. Everyone knows how easily condensed steam can be seen over many miles of country. Upon the whole, although one must express any opinion with diffidence, it seems likely that explosion engines worked with heavy oil give the greatest promise of success for war transport.

It is certainly matter for congratulation that while on the Continent and in America attention in motor-traction circles seems to be mainly concentrated on fast passenger vehicles, much progress is being made in this country in the development of heavy van and wagon power traffic. Those who are engaged in the study of this important branch of a new industry may rest assured that there is a great field open for design of vehicles suited for war purposes. The present war has led to Her Majesty's Government announcing many changes in the military organization of our forces in time of peace. And one of the most important of these is that the volunteer force is to be supplied with transport, the purpose being that there may always be a large number of standard military vehicles ready for use on an emergency. It will lie with the manufacturers of mechanically-driven wagons to convince the War Office authorities that they can turn out efficient vehicles for transport purposes. If so, it is difficult to believe that they will not be adopted, and orders given for their supply to our home defence forces, for nothing can be more certain than that such vehicles, if found practical, will be most suitable for the purpose. In time of peace transport carriages must necessarily stand idle for considerable portions of the year, particularly if employed for volunteer corps. Intermittent horsing is always expensive, and as a preparation for active service most unsatisfactory. But the motor part of a power wagon can be always ready for use, and will cost nothing for up-keep beyond the price of proper preservative grease when it is laid up unused for a time. At any moment it can be turned out efficient, and the training for its management under proper skilled inspection is not difficult. And as the wagons can be constructed for heavy

loads, and can cover at least twice the number of miles that can be covered by animal traction, in any given time, a much smaller number would be necessary, thus compensating for any extra initial cost per wagon.

May the British citizen, from motives of humanity as well as of patriotism, give attention to the question of war traction, and if he does so, the members of this club cannot doubt that mechanical power will prove itself efficient above all other modes of road haulage. But the designer and the builder must not wait until a government department seeks them out and asks for their aid. The war authority is too busy at present, making the best use it can of the means now at its command, to take any initiative in the adoption of new appliances. But the departmental powers of other nations, and notably of Germany, having no war on their hands, are working at the problem, and we are told that the Emperor has offered a large premium for the most suitable motor-vehicle for war purposes. Our designers must not be behind the world, nor must they wait for offers of premiums. They must put trust in their own exertions and in nothing else. Let them put before the country, as we know they can, specimens of their thought, their experience, and their inventive power—vehicles which will not break down under trial, but will be as efficient for the road as the locomotive engine has so long been for the rail.

Trend of Progress of the Automobile

By R. H. Thurston

Third Paper

ON the other hand, cheap mineral oil or other petroleum product or the by-product of manufacture, condenses nearly double the amount of energy within a stated weight that can be had with coal of average good quality, is free from ash, can be readily insured against the production of smoke, need not give offense by odors and is easily arranged for automatic supply and regulation to the momentary requirements of the motor. It is also easier, with this fuel, than with solid combustibles, to secure thorough combination, complete combustion and perfect distribution of the hot gases over the boiler heating surfaces. Costs of operation, even though the fuel have a high price in the market, may probably, in the end, be made satisfactory by these practical advantages in the use of this class of fuel. Automatic supply is essential to complete success in the use of fuel. Success has been so far attained in the use of the petroleums as fuel that they are adopted by the makers of steam-automobiles generally, and the fact of their successful use to-day may be taken as indicating a probability that they will prove the ideal fuels of the coming years with the automobile.

Assuming 10,000 *B. T. U.* obtainable for storage in the boiler from a pound of fairly good coal, it would represent 7,780,000 foot-pounds of work. If all transformed into work in one minute, it would produce 232.7 horse-power; if distributed over an hour, it would measure nearly 4 horse-power. If distributed over a day's work of ten hours, of which four-tenths was occupied in active work, the remainder in awaiting the completion of the work of loading by other power, as is not unusual in working horses, the equivalent of precisely one horse-power for the day would be secured. In fact, however, the average power of the horse is less than the engineer's horse-power of 33,000 foot-pounds per minute, 1,980,000 per hour, and a single pound of coal is fairly equivalent, in stored energy, to more than the average day's work of the average horse.

The 10,000 *B. T. U.* of the pound of coal, as stored in the boiler, will under favorable, but very usual, conditions of steam-making, produce about ten pounds of steam, and thus each pound of steam stored is the equivalent of about one-quarter of a horse-power, and, if perfectly utilized in an engine capable of entirely converting it into work, an engine of efficiency unity, about 2½ pounds of such steam per hour would represent the storage of the equivalent of one horse-power; as would about one-fourth of a pound of coal of the assumed quality, utilized to the extent assumed. In fact, the best coals store 15,000 *B. T. U.* and the equivalent of 11,670,000 foot-pounds and of nearly 6 horse-power-hours, per pound. About forty times such amount is stored in a cubic foot; for the pound of coal only occupies about 43 cubic inches, a pint and a half, a volume no greater than a large man's fist, as Col. Meier has put it. Thus a cubic foot of coal stores from 400,000 to 600,000 *B. T. U.* of heat-energy, *available,* or actually potential in the best varieties according to quality, and the equivalent of about 160, or 240, horse-power-hours, minimum and maximum, respectively. The stored energy of a pound of best coal would raise a ton about 5 miles, or its own weight 10,000 miles.

Utilized heat-energy, unfortunately, never amounts to more than a small fraction of the stored energy of the fuel. The largest and best steam-engines convert only about one-fifth of the heat brought to them by the steam into work and thus avail themselves of but, at most, about 3,000 *B. T. U.* per pound of coal, requiring at least one pound of fuel and 12½ pounds of steam per horse-power-hour. Mr. Corliss' best practice with the simple condensing engine of his time, exhibited an efficiency of 12 per cent. and demanded 20 pounds of steam and about 2 pounds of coal per horse-power-hour, and, non-condensing, 30 pounds of steam and 3 pounds of best coal, with largest engines. Small engines of fairly good construction now require about 50 pounds of steam and 5 to 6 pounds of fuel, having an efficiency of not far from five per cent.—wasting ninety-five per cent. of the potential and stored energy of the coal. Thus the energy available diminishes from a small fraction, at most, with the best of our engines, to this insignificant quantity in common practice. But our smallest engines are even worse, and the direct-acting steam-boiler feed-pump, for example, consumes, often, 100 and sometimes 200 pounds of steam, 10 to 20 or more pounds of fuel, per horse-power-hour, and the steam-automobile probably rarely uses less than the lower of the two figures. The pound of fuel thus represents available energy in amounts, small at best, enor-

mously variable with the character of the engine employed and its size, and thus stores but from one-tenth to one-twentieth horse-power-hour in small engines and not above one horse-power-hour in the best of modern constructions, even on a large scale, the equivalent of from three-quarters of a kilo-watt to 15 kilo-watts; the lower being the figure found usually for the small engines of all sorts, including the automobile.

With oil-fuel and the petroleums, generally, storing about 20,000 *B. T. U.* per pound, weighing 45 to 55 pounds per cubic foot, storing over 15,000,000 foot-pounds per pound, averaging not far from 750,000,000 foot-pounds per cubic foot, 7½ horse-power-hours per pound, 375 horse-power-hours per cubic foot, about 5½ and about 270 kilo-watts—the case is somewhat better as regards storage, but not at all improved in the matter of utilization of the heat stored in the fuel.

The Steam Automobile has very obvious disadvantages, despite its evident success on the railway and with the traction-engine, and notwithstanding the facts that it was successful in a remarkable degree in the early half of the nineteenth century and that builders are perfectly familiar with proper proportions and methods of construction for every one of its unnumbered earlier applications. Its steadiness and reliability, when properly employed, its handiness in starting, stopping, reversing and for forward and backward movement, its convenience of adjustment to any desired change of speed, and in all emergencies, and its moderate cost of operation have made it one of the principal, if not the leading, competitor in a great struggle for a mighty prize. The necessity of carrying the usually undesirable steam-boiler under the vehicle or behind it, close to the occupants in any event, the requirement of a skilled operative, the discrimination against it through long-standing legislation, and its complication, and especially, perhaps, its liability to give trouble from the presence of sediment or incrustation in the boiler and from corrosion of the latter, have been, on the whole, a serious handicap. In commercial work, the automobilist may perfectly well be a skilled mechanic and engine-driver; but for the common type of light and speedy automobile, for long routes at high speed and for passenger or pleasure traffic, these objections become important.

A very light, yet substantial, engine, built of the best of material and in well-chosen proportions, with, perhaps most important of all, a system of automatic lubrication of absolute reliability, presumably by some method of flooding all journals continuously, a simple and durable apparatus, easy of manipulation, is the desideratum in this direction.

The boiler must be light, yet extensive of heating surface, and with every square-inch of that surface effective in heat-absorption. It must be made with a high " factor-of-safety " and not only comparatively safe against accident, but so constructed that, if accident occurs, it shall not endanger the occupants of the vehicle. Safety against incrustation or sediment is a primary requirement and this means, usually at least, only the use of a pure water, and this, in turn, compels the adoption of some system of condensation in limestone countries and wherever rainwater cannot be had, if this risk of injury to the boiler is to be quite eliminated. A large extent of very small-sized tubes seems the only construction by which boiler-power can be concentrated and some form of water-tube would seem to be the ideal. The early automobilists, Gurney and Hancock and others, employed such constructions, but the boilers of our later steam-carriages have commonly been of the " shell " type, with fire-tubes.

With steam-carriages, the load of fuel and of water may prove objectionable on long routes; yet they have a fine record, beginning in the " early thirties," for long-distance as well as short-line operation. Copper shells and tubes are used, with advantage, probably, to some extent, in promoting rapid transmission of heat; but copper is a treacherous material, must be used very cautiously. Oil is now generally used as fuel.

The power-transmission between steam-engine and carriage-axle is most usually a simple chain and sprockets, with a differential gear on the axle. Automobiles of this class have been built in considerable numbers, and have done some admirable work. In some, the running parts of the engine and the carriage and their journals and sliding surfaces are not as perfectly protected from dust as they should be. The engine, particularly, should be enclosed in an air-tight and dust-proof compartment. Durability must not be sacrificed, as has actually been very often done, to lightness, if the vehicle is to come into general use for other purposes than those of a simple racing machine—for such purposes as, only, can yield continuous and profitable returns on a steady and permanent business.

It is perfectly possible that the cost of operation of the " locomobile " may be, by proper designing, construction and operation, made very moderate. I have under my hand, in fact, a report upon a large " locomobile " of which a trial was made abroad, twenty years ago, as reported in the *Bulletin de la Société de Mulhouse,* January, 1880 (" locomobile," in French, meaning a traction-engine), in which the consumption of fuel was but one kilogram of combustible per effective horse-power-hour. It was,

however, a large machine and developed about 80 indicated, 70 effective, horse-power. It consumed 7.3 and 8.5 kilos (16.6 and 18.7 pounds) of dry steam per horse-power-hour; which is a fine performance, even for a first-class stationary engine of similar power. In Great Britain, some of the best records have been made by "agricultural steam-engines" of 10 to 20 horse-power. Professor Alden has done wonderful work with his little compound engine. We need not despair, therefore, of securing economy in the steam-engine employed with automobiles. Chief Engineer Croker and Commissioner Scannell, we are told, report most satisfactory efficiency and good economy as the result of their experience with the steam-automobile.

For commercial transportation, the steam-wagon has been found, according to Herschmann, to possess essential advantages, thus:

"(1) It has the greatest load and mileage capacity and radius of action.

"(2) Its operation is independent of charging stations and supplies necessary for the operation of the wagon can be easily procured and taken aboard quickly."

The variation of the expense of operation with size which finally become prohibitive in the electrically driven wagon reverses with steam. The danger, and the injury to fine classes of goods transported, from the odors and vapors of the internal combustion engine are absent with the steam-carriage, and the limit of daily delivery is greatly extended by its employment on a large scale and with a fairly high rate of speed.*

The Light-weight Steam-Engine finds its most extraordinary development, to date, in the department of aëronautics. In 1868, at the Aëronautical Exhibition at the Crystal Palace, London, Mr. F. J. Stringfellow took the prize for such an engine and boiler with a machine rated at from 3 to 4 horse-power, but actually developing, probably, between 1 and 2, and weighing but 13 pounds. This machine, lately bought by Dr. Langley, is now to be seen at the National Museum of the Smithsonian Institution, Washington. The boiler is water-tube and the engine direct-acting. Giffard, in 1852, built a balloon-engine weighing 110 pounds per horse-power.

French dirigeable balloons by Dupuy de Lome, Tissandier, and Renard & Krebs, years ago, developed power, the first muscular at the rate of 1,800 pounds per horse-power, the second and third by storage batteries—"*accumulateurs*"—at 300 for two and a half hours, and at 70 pounds per horse-power for two

* Trans. Am. Soc. M. E.; May, 1900; No. 853.

hours only, and yet attained what, in their time, was thought a marvellous success. Gas-engines were used by Hanlein at Brunn, in December, 1872, both reciprocating and rotary, and the weights reported were about 200 pounds per horse-power. Professor Langley has brought down the weight of the steam-engine for such work to less than 3 pounds per horse-power, apart from the boiler, for a single horse-power, and presumably to lower weights for higher powers. Mr. Hargrave has produced engines weighing 10 pounds and Hiram Maxim's famous engine, with boiler and accessories, weighs about 8 pounds, per horse-power, and develops about 300 horse-power, maximum. Aviators have stated their belief that 15 pounds per horse-power is a practicable maximum. H. M. S. Viper produces 10,000 horse-power on only 12 pounds weight of engine per unit, for engine alone. The indications seem to be that the birds often weigh considerably more than this, if not as high, in some cases, as 25 pounds per horse-power. It is supposed that military balloons, built by the army officers of European establishments, have attained speeds of 20 and 25 and possibly 30 miles an hour, in still air, with both steam and electric propulsion.

Fuel must be reckoned with, however, in all forms of artificial as well as natural propulsion. The steam-engine usually demands, in these small sizes, not less than 10 pounds of coal or 6 or 7 of oil per horse-power-hour. The bird stores a day's provision or less in a single meal, on long flights, using reserves of fat. Mr. Maxim has actually, as he tells us, reduced the weight of fuel for his engine to one pound of naphtha per horse-power-hour and that is most encouraging. He thinks internal-combustion engines should ultimately reduce weights considerably below those of steam-engine and boiler.

After Boulton & Imray's proposed gas-engine for aëronautic purposes, in 1868, and that of Hanlein in 1872, Selden devised a machine of that class in 1874 or thereabouts and continued his experiments and investigations for a long time, if not to date. The first of all gas-engines, in fact, Brown's of 1823, was designed for the propulsion of automobiles, as the inventor tells us, and it is said was actually thus employed.

The limit of weight, in the case of the steam-engine, has thus been most nearly approximated in the construction of the steam-machinery of the torpedo-boat and of the aërodrome. The former amounts, in good practice, usually, to about 100 pounds of displacement—boat and contents—per horse-power of machinery. Maxim's steam-engine, of 300 horse-power, apart from its boiler,

weighs 300 pounds very nearly, or a pound per horse-power. Langley has certainly improved on this considerably and may perhaps be able to bring down the weight by, of course, enormously costly construction and material, to perhaps a half-pound. In marine work, Mosher has reached as little as 4½ pounds, and the "Turbinia" is stated to have a weight of engines of but about 3 pounds. Boilers at a minimum weigh about 10 pounds per horse-power of attached engine, in this class of work, and often rise to 20 or more. Torpedo-boats generally range between 40 and 50 pounds per *I. H. P.*, total, of which about two-thirds is boiler and one-third engine. Mosher's radical practice, by peculiar and ingenious methods of design and construction, brings the total down to about 15 pounds, working at powers ranging from 1,000 horse-power upward. The automobilist's steam-engine should approximate the weight of that of the aëronaut and aviator and his boiler should be the lightest of "sectional" or "safety" types, and with moderate use of fuel and water.

We may perhaps reasonably hope for engines of the multiple-cylinder type weighing less than 5 pounds per delivered horse-power, boilers not exceeding 10 pounds for the same unit of power, and a fuel-storage not exceeding 2 pounds per horse-power-hour of operation on the road in the future.

Weight of boiler, other things equal, is determined by the area of the heating surface, and the required area of heating surface is determined, in turn, by its effectiveness. Double the effectiveness of average heat-absorptive power for the boiler and its weight is at once halved. Many stationary boilers require, or are thought by their builders to require, not less than 15 feet to the conventional horse-power; others are allowed but 7½; while, in marine practice, boilers actually furnish, frequently, a horse-power from 2 square feet of heating surface. All depends upon the efficiency of the unit of area, and this depends upon its form, disposition relatively to the boiler itself, and position relatively to the impinging gas-currents and, possibly considerably in many cases, on the direction, as well as velocity, of the impinging currents, both of gas and water. A closely subdivided heating surface, with the hot-gas currents searching every inch of its area and the circulation within it finding access to and steady flow over every point of its interior, gives maximum results in condensation of volume and weight, with highest economy for a given size. Fire-tube boilers must probably ultimately retire definitely from this field and give place to the water-

tube variety as, only, meeting the requirements, at once, of safety, lightness and power, combined with economy.

"Dry boilers," flashing the water into steam, charge by charge as demanded for use in the engine, the "*vaporisation instantanée*" of the French engineers, has been the obvious limit of reduction of the quantity of water present in the generator in the endeavor to secure power, lightness and adaptability to momentary requirements of the motor. The "safety-boilers" of Barlow, Trevithick, Voight and John Stevens and their successors have all been devices more or less approximating this limit and the demands of the automobile have accentuated the requirements of the marine engine and locomotive and steam-carriage builders of the early half of the nineteenth century. The work of Brayton and of Babcock, still earlier, and of the pioneer, Robert L. Thurston, in 1825 or thereabouts, and of the French inventors, Boutigny and Buisson and others, vaporizing water drop by drop and charge by charge, as required by the engine, has been carried to its limit, in our time, by Serpollet, who regulates the speed and power of his engine by the feed-water supply and makes an empty hot boiler his energy-storage system, when his engine is stopped.*

By compressing a tube of circular section until it becomes completely flattened and its interior a space of capillary thickness, he secures a very peculiar and yet, as is testified, effective method of vaporization. In this space, one-tenth of a millimetre in thickness, heated to about 300° C. (572° F.), the pump forces water at a rate determined by the operator and the vapor produced is capable of developing a quantity of work in the engine proportional to its own quantity and thus to transfer energy by thermodynamic transformation from fuel to engine-shaft, as needed; regulation being performed by adjusting the volume of water thus supplied. Solid matter in the water is reported to be driven through the capillary space in minute subdivision and the material of the tube is not either incrusted or corroded and it actually serves, according to the statement of M. Lesourd, as a solid lubricant at the engine.

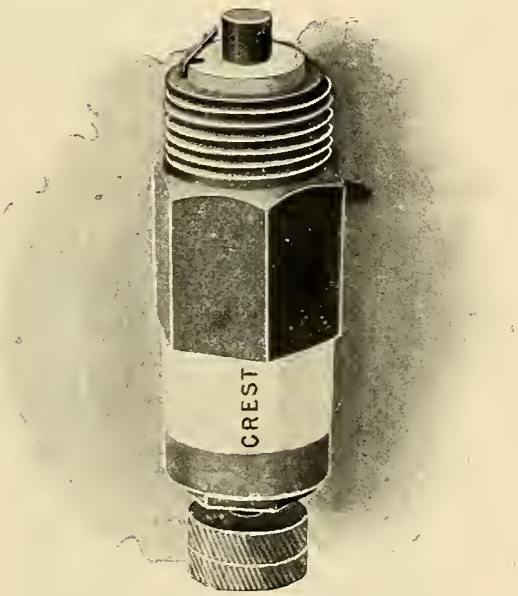
* Le Genie Civil; 1889, p. 283.

(*Fourth paper next issue*)

Crest Indestructible Sparking Plug

THE Crest Manufacturing Company, of Cambridgeport, Mass., manufacturers of Crest Motors for automobiles, are putting on the market a radically new design of sparking plug that is not affected by heat and expansion, and is unbreakable.

After a considerable expense in experimenting with the best porcelains of foreign manufacture they have, through the assistance of a well-known chemist, discovered a new material that is unbreakable by heat or expansion. They have had these sparking plugs in use for a long time on their motors without any reports of failures, and have decided to introduce them to other manufacturers and users of other makes of motors.



It is well known that the sparking plug is a delicate piece of mechanism and gives considerable trouble, and the failures of motors can, as a rule, be traced to the failure of the sparking plugs, and for this reason all automobilists are compelled to carry one or two spare sparking plugs in their kit.

Although the jump spark method is the most largely used to-day on account of the simplicity, it would be universally used in preference to the contact and wipe spark methods if it was not for the troubles of the sparking plug with its liability to crack with the intense heat of the motor, short circuiting the secondary circuit.

The material used in this plug is a perfect electrical non-conductor, and does not expand under intense heat. It is a tough material, not being brittle like porcelain.

The sparking plug, as shown in the cut, consists of a shell of steel having a thread at one end to screw in the orifice of the chamber of the motor.

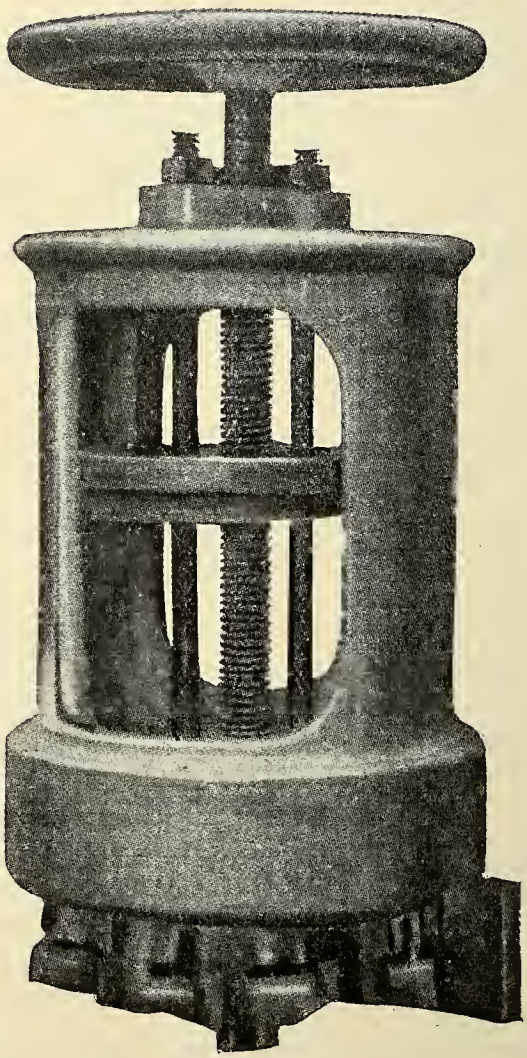
The sparking plug proper consists of a slight cone of this new material, which is inserted in the steel plug. This cone fits

tight in the shell, making a gas-tight joint, without packing, unlike all other forms of sparking plugs, as they use packed joints which, in the hands of unskilled persons, are apt to cause failure in the working of the motor. Through this cone a wire is passed terminating at the bottom of the plug with an enlarged head. A platinum wire is inserted in the body of the steel shell, the spark jumping across between the two points.

The plugs are sold singly or in lots of 25 to 100 to the trade. Directions go with each plug.

The Eldin Lubricator

THE inconveniences attending the use of separate oil-cups for the bearings of automobiles have induced some manufacturers to arrange the cups in a series and to conduct the oil to the desired points by copper tubes.

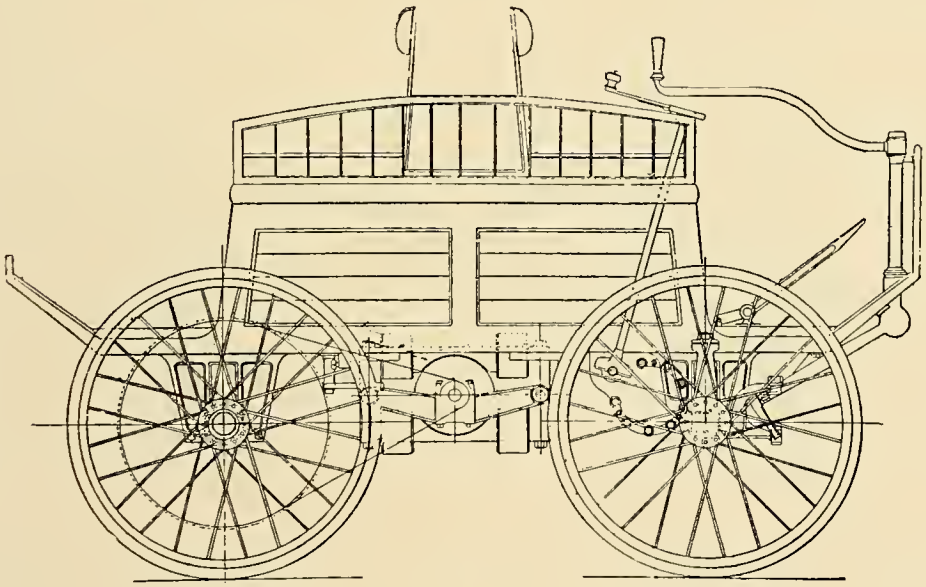


A French inventor, M. Eldin, has devised a very simple improvement upon this method, which consists in employing a single lubricator having the capacity of eight cups. Eight feed tubes are provided to conduct the coil to the bearings. The lubricator is made of aluminium and is especially designed for use on the Peugeot carriages; it is also applicable to all other automobiles.

The plunger within the lubricator is forced down by turning the hand wheel shown in the engraving. The new lubricator evidently possesses the advantage of simplicity over the system hitherto used.

The First Electromobile

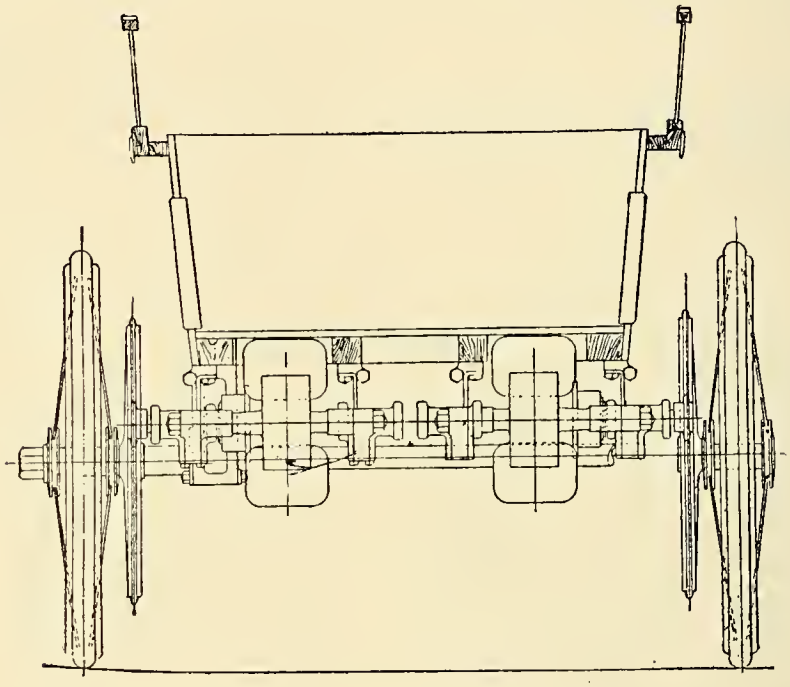
IN 1882 Mr. T. Partey exhibited at the Coalbrookdale Institute a number of Siemens-Edison incandescent lamps fed by a storage-battery current, according to a system which he had devised. In the same year he discovered that nitric acid assisted the "forming" of the battery-plates, and took out a patent for the use of the acid for that purpose. By a remarkable coincidence it happened that the same improvement was claimed in patents granted to H. Parker and Gaston Planté. At almost the same period Paul Bedford Elwell of Wolverhampton entered into partnership with Parker and formed the firm of Elwell and Parker, for the manufacture of accumulators and the installation of electric plants. Soon after Faure and Sellon invented the



paste battery, which soon superseded the Parker-Planté accumulator. The firm of Elwell and Parker transferred its business to the Electric Storage Power Company. Since that time little improvement has been made in the construction of accumulators, although, within the past three years, inventors have endeavored to lessen the weight of the storage-battery and at the same time increase its motive force. In 1884 Elwell invented and built an electric carriage, built on the general lines of the four-wheeled hansom, with the exception that the driver's seat was located in and not behind the vehicle. The springs were elliptical in form;

the wheels were of wood, iron-tired; the brake was operated, as in an ordinary vehicle, by means of a pedal; and at the rear axle an auxiliary hand-brake was arranged.

This axle resembled that of a tricycle and had a differential gear. In the centre, mounted in a metal-casing, was a series of small motors provided with rectangular magnets. The normal speed of these motors was 1,500 revolutions per minute; and the power developed was transmitted directly by means of worm gear and a flexible coupling, both at that time new inventions. The worm-gear comprised a coarse tooth-ribbon, and the worm-wheel, a number of pins, each provided with a small roller, so arranged as to correspond with the divisions of the worm. The movable



connection permitted every possible movement between the motor and the gearing on the axle.

The battery-cells were twenty-four in number, weighed about 660 pounds, and were disposed in the rear of the carriage-body. The cells were arranged in series, and resistances were employed whereby the driver could vary the speed of the vehicle.

At that time English laws were almost Draconian in their severity upon mechanical vehicles. Automobiles were looked upon as road locomotives and their speed limited accordingly. It was therefore impossible on the first trial of the carriage to attain a speed of more than 5 miles per hour. The vehicle ran smoothly enough until a heavy grade was encountered; the

worm-gear would not stand the strain; and the vehicle came to a standstill. The difficulty was, however, soon overcome, and the carriage fully realized the hopes of its inventor.

The electromobile was afterwards improved and kept at Elwell's residence in the country. It was finally brought to London, to be shipped to Paris. But the vessel sank and with it the electric carriage. The ship was afterwards floated and the vehicle recovered. The motor and gearing were sent back to Wolverhampton to serve other purposes. Thus ended the career of the first English electromobile.

Soon after Mr. Ward endeavored to build motor-omnibuses, and in 1890 ordered a vehicle of this class from the Elwell-Parker Company. This first omnibus, although quite respectable in appearance, was very cumbrous, like most of Ward's contrivances. It is said to have weighed, fully loaded, as much as 40,000 pounds! After a series of trials, the London Electric Omnibus Company was founded, with Mr. Ward as its technical advisor. Large sums were spent; but the undertaking did not prove successful. Nevertheless, Mr. Ward deserves the credit of having built the first electric omnibus.

In 1896 the new street railway law was passed; it was followed by various improvements in motor-vehicles. Mr. Bersey was the first man to receive a police license for an electric cab.

The Daimler Freight-Wagons and Coaches

THE exhibit of the Daimler Motor Company, of Cannstatt, at the International Automobile Exposition, held at Berlin during the month of September, 1899, embraced a wagon for the carriage of beer barrels, belonging to the Bohemian Brewery, and one of the Company's motor coaches.

The Daimler freight-wagons are provided with motors of from 4 to 16 horse-power, the latter of which have four cylinders.

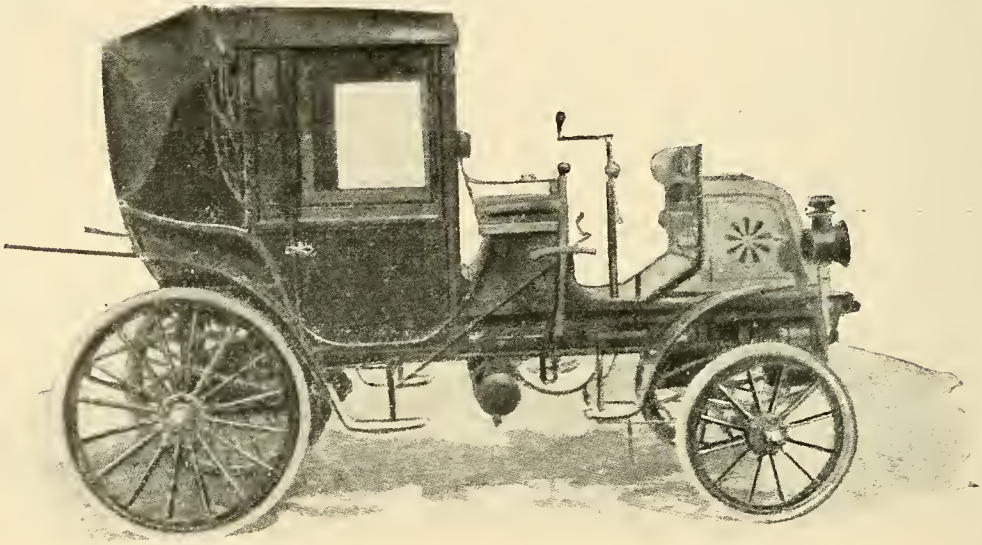


Fig. 1. The Daimler Motor Co. Coach

The consumption of gasoline in the motors is regulated automatically and according to requirements. The gasoline reservoir, which is placed in a protected position, has a capacity sufficient for a run of ten hours without refilling. The cooling of the motor is effected with water, of which only a few quarts a day have to be renewed.

In the coach there is a heating arrangement which serves for keeping the feet warm in cold weather. Power is transmitted to the driving wheels through the intermedium of the Company's patent impulsion gearing. The vehicles can be driven at four different speeds, which, in the freight wagons, reaches 6 miles, and in the coaches may be changed from 3 to 15 miles an hour. To this effect, the vehicles are provided with a quadruple speed-changing gear, which is operated by the simple manipulation

of a hand lever. The arrangement adopted is such that the changes of speed are effected while running, and that one speed must first be completed before another can be entered upon. The steering is done through a hand lever and steering rod that acts upon the fore-carriage.

The vehicles are provided with a hand and a foot brake, the latter of which, the more effective of the two, serves for braking the vehicle or bringing it to a standstill; while the former is used only for reinforcing the operation of instantaneous stoppage at the end of a trip.

The freight wagons are capable of climbing gradients of 12% and the coaches those of as high as 15%.

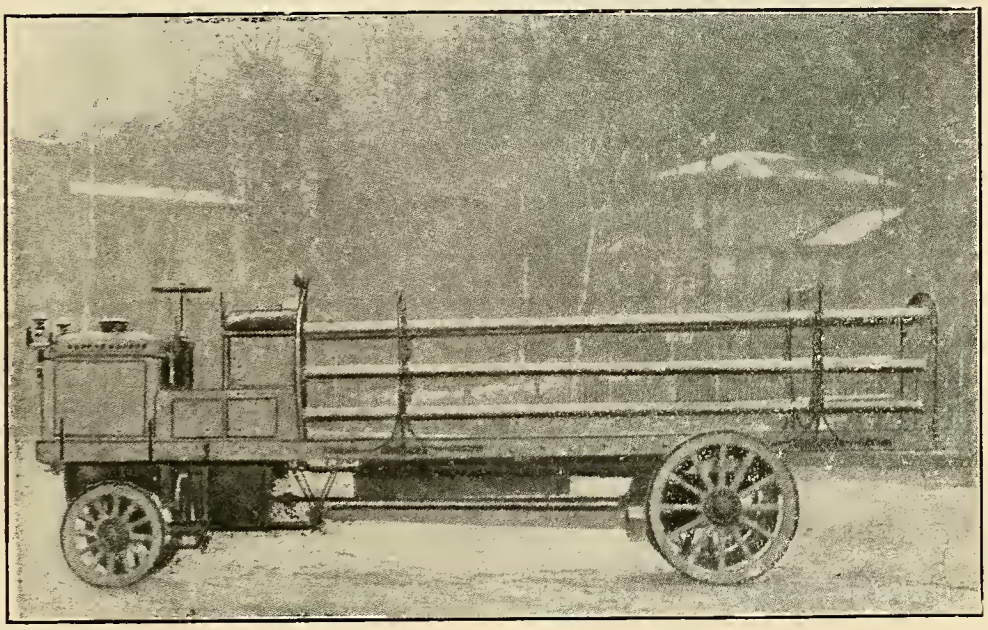
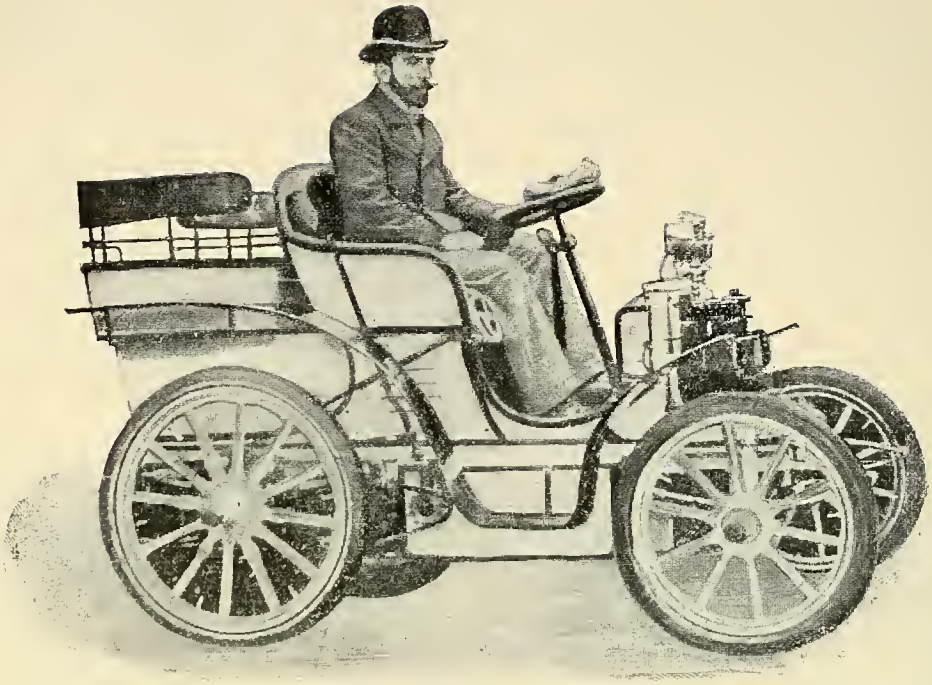


Fig. 2. A Daimler Motor Co. Beer-wagon



The Bardon Carriage

THE subject of the accompanying illustration, reproduced from a photograph, is one of the small types of the Bardon carriage, manufactured by the Société d'Automobiles et de Traction. The mechanism includes a 4 H. P. motor cooled by a circulation of water and provided with a single cylinder in which move simultaneously and in contrary directions two pistons actuated by the explosion that takes place in the single combustion chamber.

The economical benefit of such an arrangement, in which but a small quantity of gasoline is used and the total number of valves is limited to two, will be immediately seen.

The motion of the two pistons is transmitted through bevel wheels to a single shaft arranged parallel with the cylinder.

The shaft is provided with a friction cone that permits of putting it in connection at will with the shaft that carries the differential gear and actuates the hind wheels through the intermedium of chains.

What is particularly interesting is the ingenious arrangement of the friction cone, which is double, and against which bear two pieces that transmit their motion to the shaft of the differential through the intermedium of a socket and the change

of speed gearing. Owing to such an arrangement, all lateral thrusts are prevented. This is one of the reasons why high speeds are obtained in the Bardon carriages with a minimum output of gasoline.

The carriage under consideration is provided with three speeds; and the reversal of its motion is obtained by means of a spur gearing, which, when the vehicle is running forward, is thrown wholly out of engagement.

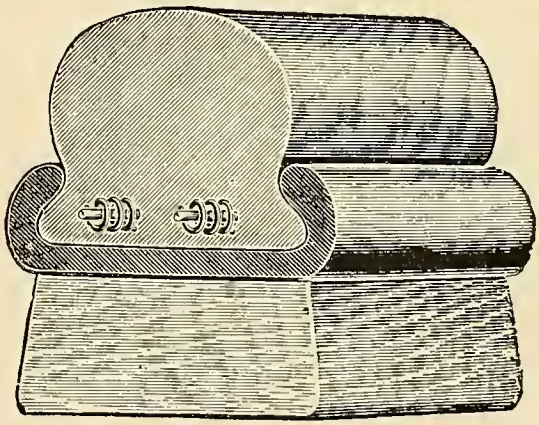
The igniting is done electrically. The steering is effected through the intermedium of an inclined hand-wheel, alongside of which are arranged the levers for changing the speed and regulating the ignition.

The brakes, which are very powerful and three in number, are placed, one of them upon the differential gear and the two others upon the hind wheels.

The type of carriage which we have just described, and which weighs but 1,430 pounds, has already covered more than three thousand miles, and has easily climbed all varieties of up-grades with four passengers.

The S. & T. Tire

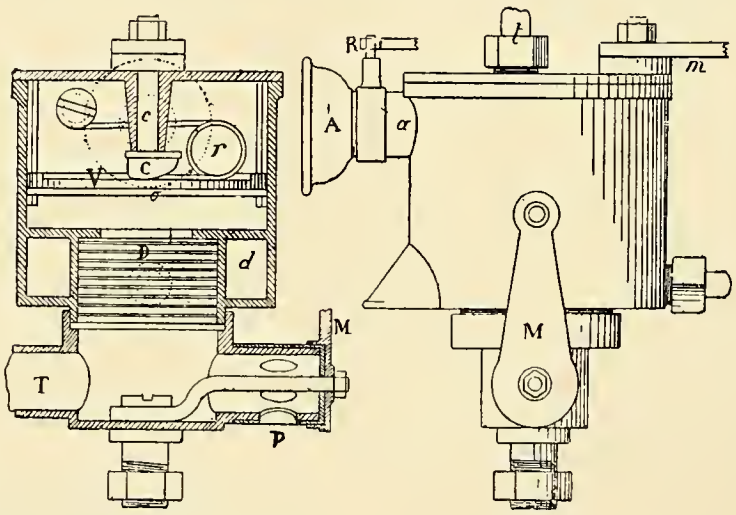
The accompanying cut shows the form to which the Shrewsbury and Talbot Cab and Noiseless Tire Company have brought their rubber tire. The main wires are surrounded by spiral wires which prevent the former from cutting the rubber. The section of the rim, in conjunction with the form of wiring, show that the firm are fully alive to the importance of taking all precautions to prevent the tire from slipping off. A further device, which they are about to make use of, will have the effect of preventing the tire from slipping round the rim when the wheel is braked, and will at the same time help to hold it on. The attempt to fit omnibus wheels with two tires each, abreast, proved a failure, but the Shrewsbury and Talbot Company are making heavy single tires for this purpose.



The Raymond Carbureter

THE accompanying illustrations show a new form of carbureter which has lately been put on the market by M. A. Raymond aîné, of 128 Rue du Bois, Levallois-Perret (Seine), and which is claimed to be the smallest device of the kind so far introduced. It is being made in several sizes, Figs. 1 and 2 showing a carbureter for small motors of from 1 to 2 horse-power. The main feature of the apparatus is a kind of balanced valve *V*, which moves around an axis *O*. This valve carries a pointer which engages with the lower end of the petrol admission pipe *t* (Fig. 2).

The pointer is not seen in Fig. 1, it being hidden behind the spindle *c* of the handle *m*. A helicoidal cam *C*, of which the shaft *c* is maneuvered externally by means of the lever *m*, removes

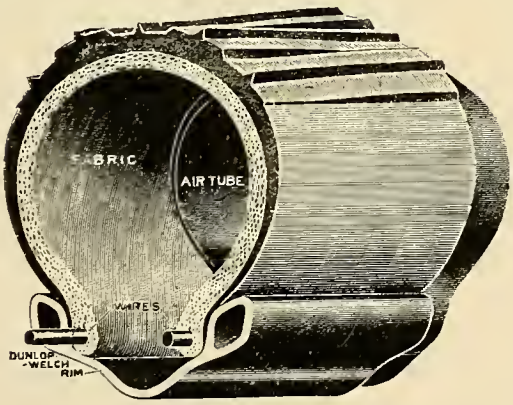


the valve *V* and its axis *O* more or less from the spirit inlet pipe, with the result that the degree of engagement of the pointer with the latter is varied. Under the effect of the suction stroke of the motor the valve turns on its axis, and the pointer falls, allowing a predetermined quantity of petrol to pass into the carbureter. As soon as the suction is ended the valve is brought back to position by the spring *r*, the pointer consequently closing the inlet pipe. During the suction stroke air is also drawn in through the pipe *a*, the mouth, *A*, of which is provided with wire gauze to prevent the admission of any dirt or dust. The quantity of air admitted is regulated by the valve *R*. The petrol, as soon as the valve *V* moves, falls thereon and meets with the air, a thor-

ough mixture being formed on the passage through the series of wire-gauze discs *D*. To assist in the carburation, a part of the exhaust gases from the motor are made to circulate in the annular space *d*. The necessary additional cool air, to form a good mixture, is drawn in through the openings *P*, regulated by the handle *M*, the explosive mixture then passing to the motor along the pipe *T*. To start the motor, the valve *R* is closed and the handle *m* moved over about a third of its movement, the electrical ignition being retarded. The motor once in operation, the quality of the mixture is regulated as desired by the levers *R*, *M*, and *m*. It is claimed for the device that it is regular in operation, notwithstanding the jolting caused by uneven roads, and that the regulators are instantaneous in their action.

Dunlop Non-Slipping Tread

The wretched greasy condition of the roads which has lately been the order of the day has tended to confirm the opinion that motor cycle tires, like ordinary cycle tires, are none the worse for being provided with a non-slipping tread. Up to the present the only tire firm we know of that has recognized the importance of this point is the Dunlop Company, whose tires for motor cycles can be had with either smooth covers or non-slipping covers, as preferred. The non-slipping pattern which we illustrate is a modification of the Welch type, which is familiar to every cyclist. In addition to the basket-work design there are small longitudinal ridges which help to prevent any side movement. It is possible that these small ridges may in time get worn off, but even in that case the deeper basket pattern would still remain. Only the other day we heard of a nasty mishap with a motor tricycle, due to side-slip, which might not improbably have been avoided had non-slipping tires been used.



New Accumulators for Automobiles

The Cruto Battery

IN the Cruto battery, the support of the positive plate is formed of a solid cast plate provided in the direction of its width with projections of rectangular cross-section, which are flush with a frame surrounding the entire plate. These projections are partially beaten down so as to produce hooks. The space between two successive series of projections forms a kind of trough 2 mm. wide and 2 mm. deep; closed at each end by the vertical posts of the frame. There are on each face of the plate 49 partitions each provided with 42 hooks. The frame which surrounds the plate has a width of 4 mm. and a thickness equal to that of the plate, *i. e.*, 6 mm. The upper horizontal bar of the frame projects beyond each of the vertical side posts to a distance of 12 mm. The connecting-bar is distant about 3 cm. from one of the vertical edges.

The support of the negative plate is even more intricate than that of the positive. It is composed of a cast grid, the openings of which have a square section about 5 by 5 mm. and the separating members a rhomboidal or lozenge-shaped section, two edges being flushed with the frame surrounding the plate and the two other edges constituting the borders of the grid openings. In each plate there are 399 of these openings. The thickness of the frame as well as of the plate is 5 mm.; its width is 5 mm. for the horizontal members of the frame, and 4 mm. for the two vertical posts. At each corner of an opening, the edges of the lozenge-shaped separating-bars are bent up to form four small hooks. The connecting-bar for the two elements of the battery is located as in the positive plate; and the upper horizontal bar of the inclosing frame projects in like manner.

The paste completely covers the hooks of the positive plates, so that only the outer frame is exposed. The paste of the negative plate likewise covers the grid; and the hooks are embedded so as to be flush with the inclosing frame.

Plates of like polarity are soldered to a bar carrying at its middle a rod constituting one of the poles of the element.

The plates are separated by perforated and waved ebonite partitions, held in the center of the 6 mm. space between adjacent

plates by means of small blocks on the vertical edges of the partitions and by means of lugs distributed over the rest of the surface, so as to permit the ready circulation of the electrolyte.

The cells are made of ebonite and are 5 mm. in thickness. At a height of about 7 cm. from the upper edge, two of the opposide walls are bent out so as to form a shoulder on which the lateral prolongation of the plate-frames rest.

An interesting method is employed for supporting the cells in groups. The shoulders of the cells are supported on rubber blocks; while similar blocks are arranged between the walls of the cells and of the entire battery-box and between the various cells constituting the battery.

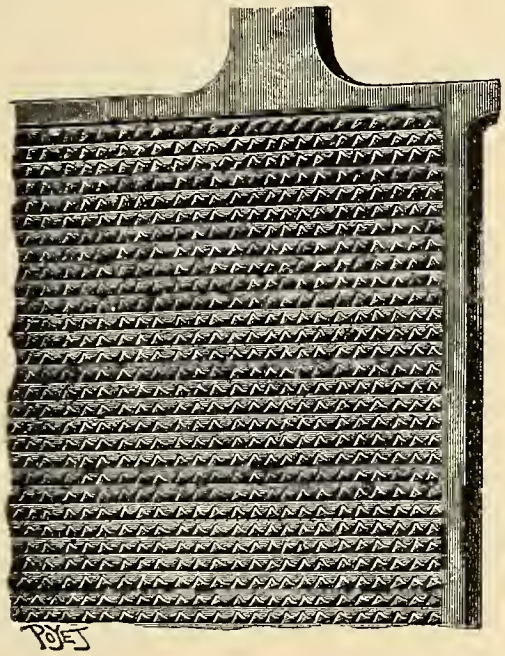


Fig. 1. Positive Plate

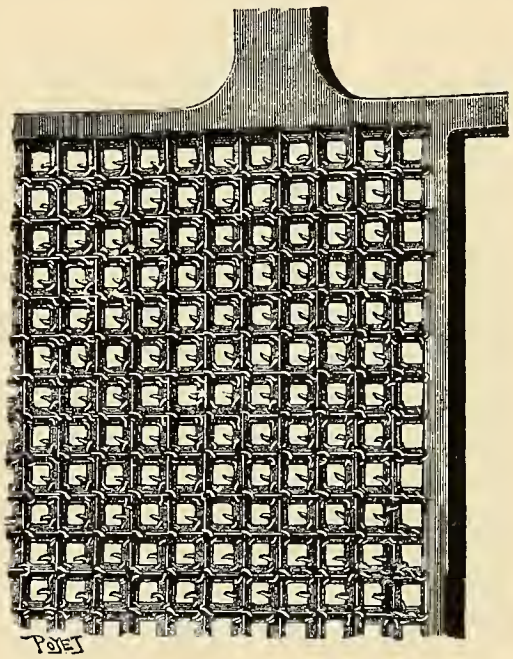


Fig. 2. Negative Plate

Positive Plates

Number	7
Dimensions in centimetres:	
Height	15.8
Width	14.2
Thickness	0.6
Weight in kilograms	0.96
Weight of the frame in kilograms	0.7
Weight of the active material in kilograms	0.26
Section of the frame in square millimetres	27.00
Section of the connecting-bar in square millimetres	84.00

Negative Plates

Number	8
Dimensions in centimetres:	
Height	15.8
Width	14.2
Thickness	0.55
Weight in kilograms	0.9
Weight of the frame in kilograms	0.64
Weight of the active material in kilograms	0.26
Section of the frame in square millimetres	25.00
Section of the connecting-bar in square millimetres	84.9
Space between plates in millimetres	6.00

Cells and Appurtenances

Dimensions in centimetres:	
Height	25.5
Length	20.5 and 16.5
Width	18.5
Weight of the cell in kilograms	2.0
Weight of the insulating separating members of the plats in kilograms	0.28

Electrolyte

Weight in kilograms	4.0
Volume in cubic decimetres	3.3
Density:	
End of charging	1.25
End of discharge	1.21
Total weight of the complete element in kilograms	21.20

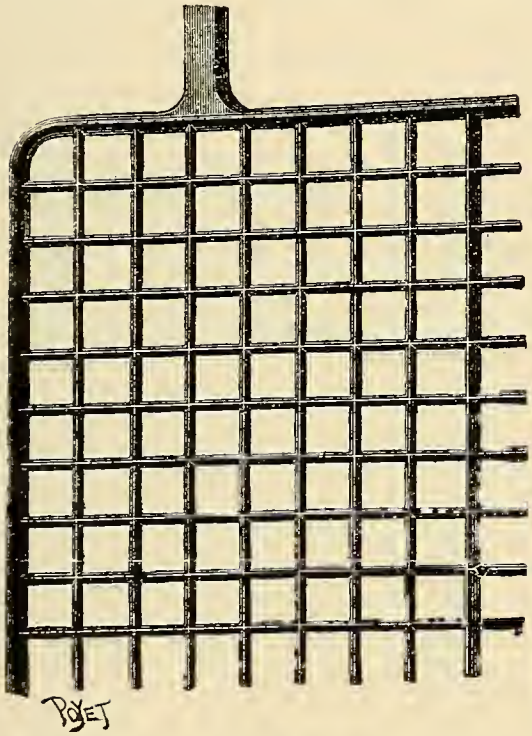
The Lagarde Battery

The Lagarde accumulator is of the pasted type in which a leaden grid is employed.

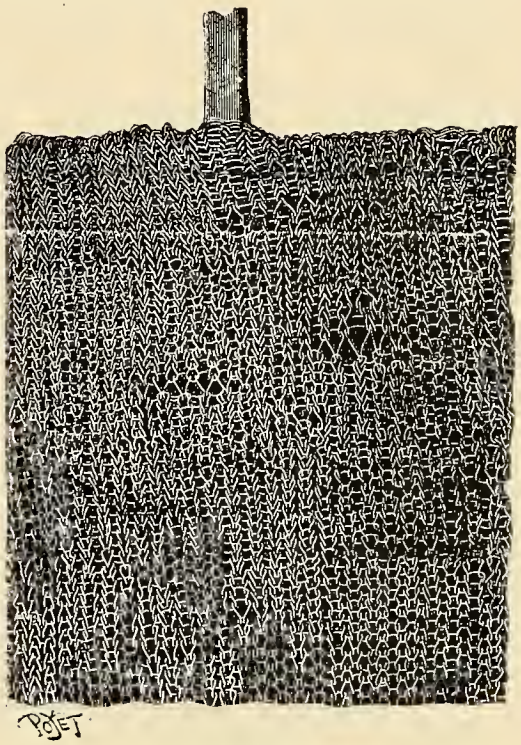
The support of the positive and negative plates is formed of a frame reinforced by two arms at right angles to each other and serving to maintain the rigidity of the frame. These arms divide the plate into four panels each subdivided into 88 square cellules 8 by 8 mm. in area. The partitions forming the cellules are completely covered by the paste. The bar connecting the two plates

is cast in one piece with the frame and is located about 3 cm. from the end. The cross-section of the cellule partitions is lozenge shaped, the edges serving to retain the pellets of active material. The paste is formed with no hole to facilitate the circulation of the electrolyte.

The plates are connected by means of a leaden bar. This connecting-bar is provided with a rod which projects through the cell. In order to prevent the peeling-off of the active material, the positive plates are wrapped in a sheet of parchment paper and then covered with a rubber bag which serves the dual purpose of preventing the peeling of the active material and of insulating



Support of the Negative and Positive Plates



Positive Plate

the plates from one another. The negative plates are uncovered. The positive and negative plates are pressed against one another so as to reduce the intermediate space to a minimum.

The quantity of electrolyte which is contained in the cell is less than the weight theoretically necessary. The weight of the sulphuric acid used is 360 g. at a density of 1.274 at the end of the charging.

The inventor has lavished the utmost care upon rendering the retaining vessel water-tight. The cell is closed by a cover which is adapted to rest on a shoulder formed within the walls of the cell. This cover is formed with a notch which receives a band

of rubber pressed against the cover and the wall of the cell by a frame which is held in place by insulated pins.

The connecting-rods extend through the cover, for which purpose threaded holes are provided in which a piece of ebonite is screwed, carrying a rubber tip at its lower end. These ebonite pieces are laterally recessed to receive a small brass bar which serves as a current feeder. The bar passes through a hole in the connecting-rod. Ingenious as the method of rendering the cell water-tight may be, it cannot be denied that the separation of the parts is thereby rendered extremely difficult.

Positive Plates

Number	6
Dimensions in centimetres:	
Height	20.
Width	15.5
Thickness	0.6
Weight in kilograms	1.08
Weight of the support in kilograms	0.22
Weight of the active material in kilograms	0.86

Negative Plates

Number	7
Dimensions in centimetres:	
Height	20.
Width	15.5
Thickness	0.5
Thickness of the extreme plates	0.4
Weight in kilograms	0.950
Weight of the support in kilograms	0.185
Weight of the active material in kilograms	0.765

Cell

Dimensions in centimetres:	
Height	28.
Length	16.
Width	11.
Weight in kilograms	1.4

Electrolyte

Weight in kilograms	1.4
Approximate volume in dm.^{3}	1.12

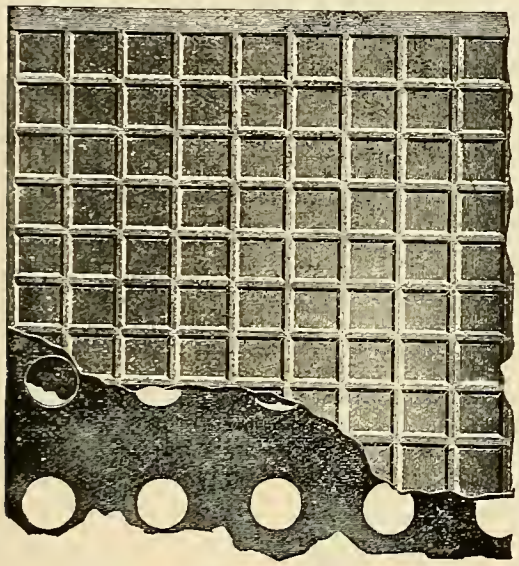
New Accumulators for Automobiles

Density:

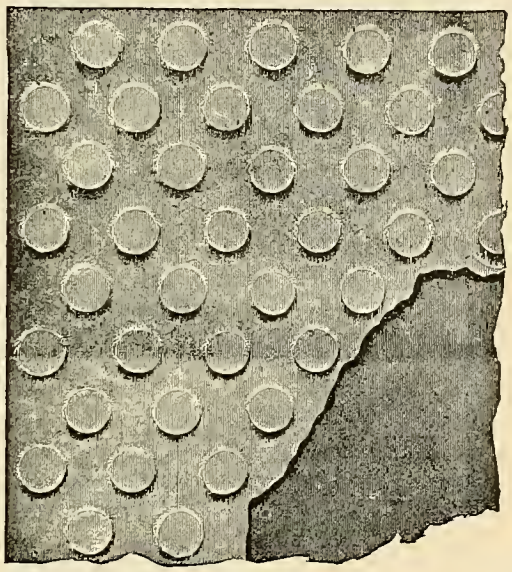
End of charging	1.274
End of discharge	1.190
Total weight of the complete element in kilograms	16.00

The Hathaway Battery

In the Hathaway battery, the active material instead of being placed in a frame or grid in the usual manner, is formed in large pellets of the same size as the plate. The positive plate is composed of two similar pellets, between which a metallic conductor is arranged which serves to lead off the current. The parts are held in position by two porous partitions each composed of four



Positive Plate



Negative Plate

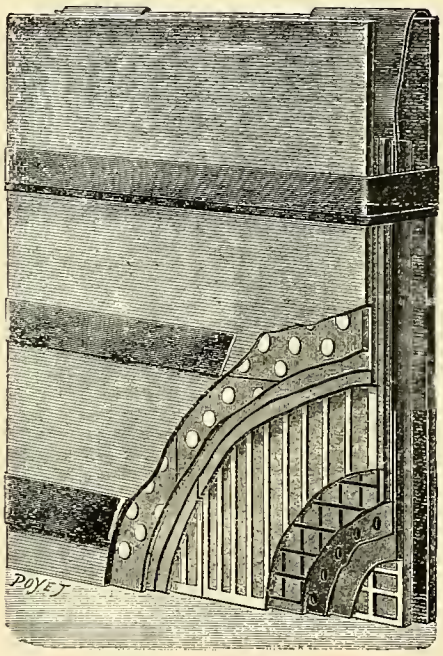
small burnt-clay or terra cotta plates, producing a checkered appearance on the outer face. A series of grooves is formed on the other face, running in the direction of the height. The central conductor is a thin perforated sheet of lead, the perforation, however, not being intended to receive active material. The negative plate has no exterior support; or rather the support which serves to hold the active material is formed of substances which disintegrate under the action of the acid. Generally a perforated wooden plate is employed for this purpose.

The surface of the pellets of active material is composed of disk-like projections, formed by the material which fills the holes of the support in which the plate was held during the process of forming.

The cell is composed of ebonite and has two lateral openings or notches from which the connecting-bars emerge. A small vent hole is provided for the escape of the gases.

Positive Plates

Number	5
Dimensions in centimetres:	
Height	21.5
Width	15.0
Thickness	0.5
Weight in kilograms	1.39
Active surface in dm.^{2}	40.00



Setting of the Plates

Visible surface in dm.^{2}	6.50
Proportion of active to visible surface	6.

Negative Plates

Number	6
Dimensions in centimetres:	
Height	21.5
Width	15.0
Thickness	0.5
Weight in kilograms	1.1

Approximate weight of frame	0.3
Approximate weight of the active material (kilogr.)	0.8
Section of the frame in square millimetres:	
Height	17.
Base and sides	12.
Distance between plates	0.55

CELL

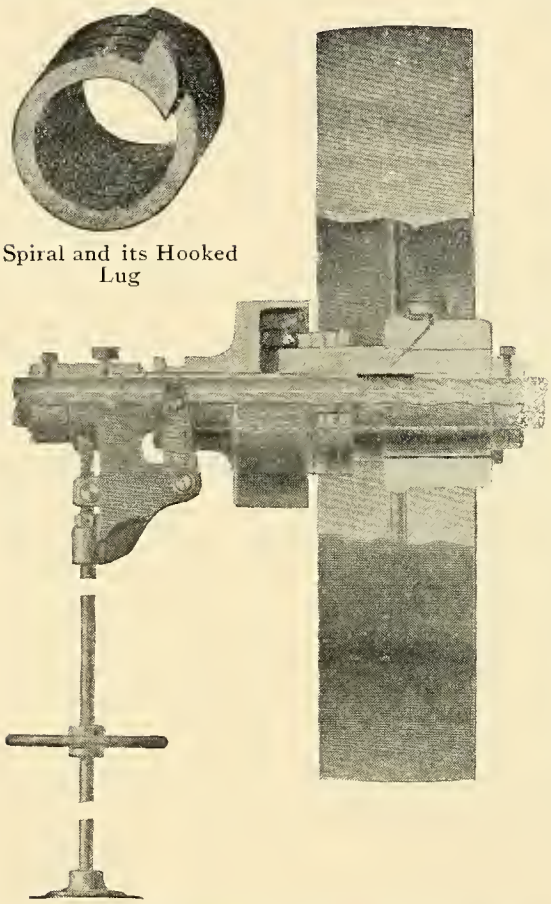
Exterior dimensions in centimetres:	
Height	30.
Length	16.
Width	12.
Weight in kilograms	1.22

ELECTROLYTE

Weight in kilograms	3.
Approximate volume in dm.^{3}	2.5
Density:	
End of charging	1.2
End of discharge	1.18
Total weight of the complete element in kilograms	17.00

The Lindsay Spiral Clutch

THE well-known Lindsay spiral clutches, which are widely used for coupling shafts of all sizes, are beginning to be applied to the automobile. The results obtained are said to be very gratifying. The fact that, unlike most similar devices, these clutches can be made to run in oil and can be completely protected from dust, renders them particularly well adapted to the motor-carriage.



Spiral and its Hooked Lug

Fig. 1. Application of spiral of constant cross-section to pulley and shaft

There are two general types of Lindsay clutches, differing slightly in principle.

One form consists of a spiral of constant section, coiled in the form of an elastic cone, mounted on a cast cone. The clutch operates at all speeds, even when the shafts are running at several thousand turns per minute.

The second form of clutch is built on the principle of the rope-brake. It comprises a soft steel spiral of diminishing cross-section, coiled about a cast sleeve, keyed on the shaft. The reinforced end of this spiral engages the part to which power is to be transmitted, while the other end is submitted to a progressive tension in order to bind the parts firmly together. The second type is more suitable to the automobile and to machinery which, though running at a low speed, transmits great power.

The Spiral of Constant Section.

Fig. 1 of the accompanying illustrations represents a spiral clutch of constant cross-section applied to a pulley.

The spiral is loosely coiled about a cast, hardened cone, to

which the pulley is keyed. The spiral is formed at its end with a hook in contact with a transverse rib or flange of a movable plate which can be shifted along the shaft.

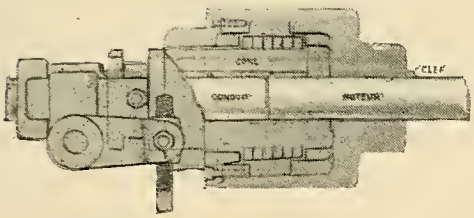


Fig. 2. Two shafts together

The plate is provided with two lugs in contact with the spiral, and two bolts, carrying at their end two members in contact with the spiral. The cone and the spiral should always be well lubricated. When the parts are out of gear, the solid cone turns freely within the elastic cone formed by the spiral. In order to throw the parts into gear, the elastic cone is gently moved on the solid cone. When the elastic cone has reached the end of its travel, it transmits the maximum power which it is calculated to withstand; and the shaft and pulley are bound as firmly together as if they were made of one piece. There is no reaction on the shaft. The clutch can be used on shafts running at any speed and operates without any shock or jar.

If, instead of moving the elastic cone to the limit of its motion, it be maintained in an intermediate position, it will transmit less power, without any relative movement between the two cones, and hence without wear. (The cones, it must not be forgotten, are always well lubricated.) The amount of power to be transmitted can therefore be regulated. If the power exceed that for which the clutch is built, or if the resistance of the driven part exceed the power to be transmitted, the elastic cone will slide on the solid cone, until the resistance has returned to the normal.

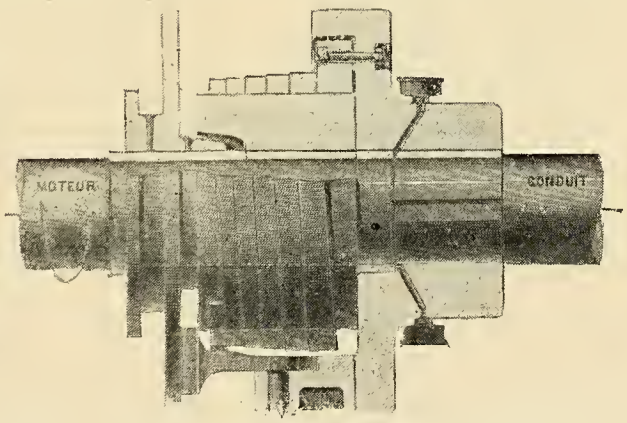


Fig. 3. Spiral of decreasing section applied to two shafts

The driving parts are thrown out of gear by moving the clutch members in a direction opposite that of throwing them into gear. The disengagement is effected gradually and with little effort.

Fig. 2 shows the clutch used in coupling two shafts—an arrangement which will be generally adopted for automobiles. The elastic cone is inclosed in a casing filled with oil, and in this case is fixed, the solid cone being the movable member. The

sleeve is keyed on the driving shaft. By means of flanges the sleeve engages the spiral.. The cone within the spiral, when forced into operative position, turns and drives the power-receiving shaft on which it is secured. Adjustable stops limit the movement of the cone and enable the power transmitted to be regulated. It will be observed that the end of the driving-shaft rotates in a bushing within the solid cone, whereby its position is maintained.

The Spiral of Diminishing Section.

Fig. 3 shows the second type of clutch in partial side elevation and longitudinal section. On the driving-shaft is secured a polished sleeve about which the spiral is coiled. The large end of the spiral is bolted to a second sleeve on the shaft to be driven.

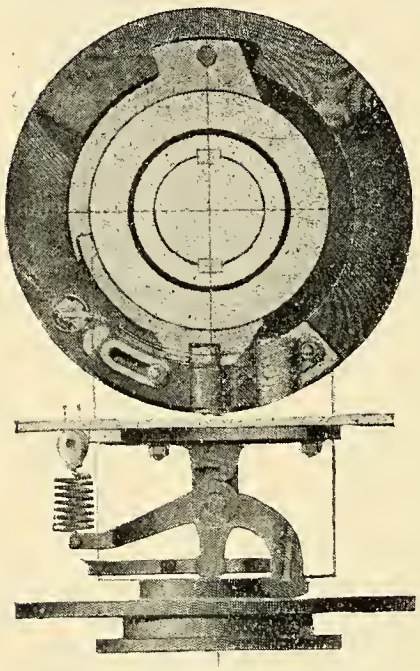


Fig. 4. Transverse and longitudinal sections of clutch with spiral of decreasing cross-section

In inoperative position, the sleeve on the driving-shaft turns freely within the spiral. On the driving-shaft there is also mounted a clutch-plate, secured by long keys, so that it can be shifted by means of a fork.

The operation of the clutch is well shown in Fig. 4. When the plate is shifted, it comes into contact with a three-armed lever, the pivot of which is integral with the sleeve on the shaft to be driven. The small arm of the lever engages the hook on the free end of the spiral and tightens it. The spiral is compressed on the sleeve of the driving-shaft and thus causes the shaft to be driven to rotate.

The parts are thrown into gear progressively, owing to the pressure of the plate on the lever, but are thrown out instantaneously, because the lever is forced back by a retractile spring, whereby the small arm is caused suddenly to release the spiral. A stop limits the motion of the spring and prevents the lever from following the plate too far.

The plate is always in rotation, the lever turns only when engaged by the plate. By means of slides the position of the levers relatively to the hook of the spiral can be regulated.

Henri Vernier.

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Editorial Comment

The Products of Combustion

SPECIALISTS are at times inclined to laugh at the general public for its ignorance in regard to technical matters and the consequently erroneous conceptions held by many people. There are, however, not a few experts who have sins of their own to answer for in this respect. The fund of human knowledge is so vast that no one person can be expected to have more than a very general sort of information concerning anything outside of the particular province wherein it has been his business to inform himself. Beyond this he may have a knowledge of general principles, but in every special field the knowledge of the details is held in trust for the world by certain "keepers of the keys," so to speak. And in every realm of science each province is thus divided and subdivided. There are, therefore, few experts who can speak with authority concerning anything outside of the division where they are at home.

This fact finds illustration in the field of automobilism. New as it is, there is no man who can speak with confidence concerning the entire field. There are many different problems involved: traction, transmission, vehicular construction, different forms of motive power. Each of these departments has its respective

specialists, and while a well-grounded knowledge in the principles of physical and mechanical science will enable a level-headed person to exercise sound judgment concerning the various problems involved, there are few men who can go beyond this. An expert, therefore, must be exceedingly careful to speak only tentatively, and with due reserve, concerning anything outside of his own domain of knowledge, even though it be closely associated therewith.

A case in point is that of a highly interesting, and in many ways instructive, address concerning the automobile, lately given in London by Sir David Salomons, Bart. Sir David has a high reputation as an authority on the automobile. Discussing the problem of motive-power he very properly said that in the present stage of development it could not well be predicted what would be the best form of power. Yet, concerning the explosion-motor as represented by the forms now in use, Sir David hazarded the curiously extraordinary statement to the effect that should animal-traction in our streets be entirely superseded by petroleum-driven vehicles the inhabitants of our cities would all be poisoned! This is jumping at conclusions with a vengeance, and the assertion betrays a most rudimentary knowledge of the process of combustion.

With automobiles as at present constructed it would undoubtedly be extremely unpleasant and a chronic annoyance for the public to be afflicted with the odor that proceeds from the products of slightly imperfect combustion, for the smell of petroleum-gases is one of the most disagreeable known to human nostrils. But of poisoning there can be no serious talk whatever. Combustion in the average explosion-motor is now remarkably complete. The apprehensions of Sir David were based upon the quantity of carbonic dioxide emitted. This, however, is a mere trifle, and is at once taken care of by atmospheric processes. In the generation of steam the average process of heat-production for the purpose results in combustion very much more defective than in the case of the explosion-motor. In the combustion of coal, for instance, a considerable quantity of carbonic dioxide is set free, yet little trouble is caused thereby, even in the greatest manufacturing towns. The main product of combustion in petroleum-motors is aqueous vapor, formed by the union of atmospheric oxygen with the hydrogen contained in whatever form of petroleum is used—whether gasoline, naphtha or ordinary kerosene. Without this mixture of oxygen and hydrogen, combustion—and consequent explosion or sudden expansion—could not take place. The aqueous vapor thus formed is, of course,

absolutely harmless and at once enters into the atmosphere, contributing to its humidity and returning sooner or later to the earth in the form of rain, snow or dew.

In the explosion-motor the petroleum is actually burnt, just as much as under a boiler for the generation of steam, and therefore serves as fuel in a more direct way. The difference is that its efficiency in the former case is enormously greater, a given amount of fuel producing a far greater equivalent in power. Since petroleum represents one of the most concentrated forms of energy we may expect to see the explosion-type of engine ever increasingly used. The main drawbacks at present to its employment in automobile work are the greater complication of parts than in the steam-engine and the consequent difficulty in handling, and also the limited supply of gasoline available. Inventive progress is rapidly overcoming the former objection and we may expect at no distant day to see the explosion-motor handled by the amateur as easily as the steam-engine. Were the utilization of the explosion-type of engine limited to gasoline and the other volatile grades of petroleum known as "petroleum spirit," the second drawback mentioned would be for the future as increasingly serious a problem as that of complication in construction is a diminishing one. These lighter forms of petroleum constitute a very small percentage of the crude oil, and since the demand has increased enormously and the supply is but little more than stationary the price has lately advanced very considerably. In explosion-motors, however, it is still a sufficiently cheap form of fuel, but where used as a substitute for steam in engines of the expansion type—as in naphtha vapor-launches, where much of it is consumed as "flame-fuel" after its expansion, to produce the continuous-expansion process—the increase in price has become well nigh prohibitory. A gradual increase in price appears to be inevitable, and automobile interests may as well face this fact.

Fortunately, however, the remedy partly lies in the substitution of the heavier grades of oil. With these there is likely to be more trouble from offensive odor, on account of the greater difficulty in securing perfect combustion. Successful kerosene motors, however, are said to have been constructed and it looks as if this problem would be completely solved in the near future. Indeed, an admirable type of explosion engine for the use of kerosene oil has been in existence for some years—so long ago, in fact, that the patents have probably expired by this time. The vagaries of the inventor were responsible for its lack of commercial success and the engines are no longer made. Not a few

continue in use, however, and give excellent satisfaction, being highly efficient, while they have the great additional merit of being controlled, with power and speed perfectly regulated, as simply as a steam-engine or electric motor. In all probability this form of engine would serve admirably in automobile work. The automobile industry may be confident, therefore, that its development will not be retarded by the threatened scarcity of the lighter grades of petroleum. The utilization of the heavier oils will serve as a check upon increase in gasoline prices. The supply of gasoline is sufficient for all present needs; and all existing motors, as well as those to be constructed in the near future, may continue to rely upon the form of fuel for which they were built.

With the utilization of kerosene, however, the factor of safety will be greatly enhanced, for in the use of the volatile grades there is a certain element of danger, though comparatively small. It is likely, furthermore, that the combustion of solid fuel will be adapted to the explosion-engine. Promising experiments are reported in the way of introducing minutely powdered carbon, from either coal or coke, into the explosion cylinder of such an engine, to be consumed with each charge.

Road-Racing

Long-distance road-racing in this country on anything like the French basis is, of course, impracticable. There are no continuous stretches of good road to permit it. In various parts of the country there are relatively short sections of excellent road, much of which would compare favorably with even the French highways. On these, if anywhere, whatever road-racing we have must take place. But here public sentiment steps in and is likely to forbid it, as happened in the Boston suburb of Newton the other day. At Harvard University the automobile has this year been a growing factor in sport, and trials of speed have been pretty common among the possessors of vehicles. The other day a more formal contest was arranged for, to take place on the Newton boulevard, which offered exceptionally favorable conditions for the purpose. The contestants had been given to understand that, although under the ban of the law, such a race would not be interfered with if it took place very early in the morning. Neither would it have been had not some influential citizens got wind of it and made complaint accordingly. The police authorities therefore could do nothing but stop it; the considerable crowd that had gathered before five o'clock saw nothing more than the exciting start of the participating motocycles and

locomobiles. They had not gone many hundred feet before the sight of a man in the road waving a red flag brought the vehicles to a halt, and a squad of blue-coats pouring out of a neighboring barn did the rest. Since the offenders had supposed that the race would be permitted they were let off with light fines. But this ends road-racing in Newton. Possibly there may be surreptitious races here and there on bits of road elsewhere, and brushes when the road is clear may be looked for on occasion. But should these ever get too common, legislative enactments making high speed impossible through requirements as to gearing would certainly be the next thing in order. Possibly special permits for road-racing might be obtained from the authorities should the occasion be deemed sufficient to warrant it. But since these permits are no longer granted for bicycle road-races, now that well equipped bicycle-tracks have become common, it is unlikely that the rule will be violated in behalf of the automobile wherever bicycle road-racing is forbidden. Automobile-racing has its proper place in sports, but that place is on enclosed courses, under conditions similar to those required for horse-racing. When French manufacturers complain that road-racing is essential to the encouragement of the industry they may be reminded that the exclusion of horses from open-road racing has not discouraged the breeding of swift horses, but the contrary.

It is interesting to note the way in which the International race became permitted in France. The government was firm in withholding its permission until the sentiment of the villages along the route began to assert itself in favor of such races, which bring crowds from the country all around to see the automobiles dash past and incidentally to spend money in the place. In the present state of the law the central government permits a road-race under certain conditions, but the local municipal councils along the route have the right to forbid the race from passing their way. This might give encouragement to local politicians to act an obstructive part until they had been properly "seen," and it was reported in some places that money had to be freely used before this race could be assured.

"The Moto"

Mr. Nathan Haskell Dole should be credited with scoring one in his suggestion of a popular name for the automobile. He recommended the adoption of the word "moto" as a terse and effective designation. Now, in the very cradle of the automo-

bile, where the word itself originated, a strong rival of the powerful Automobile Club de France has been organized and the name selected is the "Moto Club de France." So the new designation, applied under auspices specifically popular and democratic, promises to find vogue in France; and therefore, like the word "automobile," to become current in other parts of the world. "Moto" is a much better word than "auto," "mobe," or anything else that has been suggested, and since we must have a short name for popular use it will probably fill the bill better than anything else that has been suggested.

The Automobile as a Friend in Need

The automobile may have uses other than locomotory, as was shown recently in the little English village of Leatherhead, where an entertainment was given for the benefit of the wounded in the South African War. A feature was to be an exhibition of the cinemetograph. But the storage-battery that had been ordered from a neighboring city to supply the needed electric current of 25 amperes at 60 volts failed to appear, and it looked as if this part of the programme would have to be abandoned. But it happened that a gentleman living in the neighborhood owned an electric automobile and he offered the use of it for the purpose. So the vehicle made its own way into the hall, connections were effected with its accumulator and the cinemetograph was operated with thorough success.

Any automobile might be utilized to furnish power in case of emergency simply by jacking it up a little and attaching a belt to the motor. In certain instances it might be economy to utilize it regularly for such purposes when not in regular use. A farmer, for instance, might thus make it saw his wood, do his threshing, etc., and even run a dynamo at night to supply electric light.

A Rail-Track Course

It seems worth considering whether it would not be worth while, in connection with a race-course for automobiles, to include a railway course whereon might be tried not only steam locomotives, but electric and other forms of motors designed for railway use. By locating such a track near a railroad all sorts of locomotives might easily be brought to the place for trial. Such a feature would be a great novelty and sufficiently exciting to become a great attraction. A powerful locomotive "running

wild" is a very different thing from the same machine dragging a heavy train, and under these conditions an enormous speed might be attained.

The Automobile at Pleasure-Resorts

The automobile makes its appearance at White Mountain resorts this summer for the first time as a vehicle for public use. Mr. F. O. Stanley was at the mountains with his locomobile last summer and ascended Mount Washington, demonstrating the practicability of the automobile for mountain work. There is enough of fairly good road in the White Mountains to make the automobile really serviceable there even under present conditions. The introduction of mechanical traction will, moreover, be a powerful incentive for the construction of good roads, both as to grade and road-bed. Under existing circumstances an excellent automobile excursion can be made from Plymouth to Bethlehem, returning by way of the Intervale. A writer in the Boston *Herald* says:

"The hotel men generally feel that the automobiles would be a great improvement over the former method of touring, and they are planning on inaugurating the service. The first expense is, of course, a great drawback, but once in service, the machines would be cheaper to maintain than horses. One of the great problems of the mountain stables is as to the keep of the horses when not wanted for conveying summer visitors. A large number is required by each of the hotels, but when the season is over there is little use for them. The farmers want them at the same time the hotel visitors do, so that the horses cannot be let out, and accordingly they are a drug in the mountain market during the late fall, winter and early spring. To supply the demand the big hotel men have to keep on hand at all times a large supply and the problem is a difficult and expensive one. With automobiles it is different. They can be used in the cities almost any time, and even if not transferred are not eating their heads off when not in use, as the hotel men have found to their cost is the case with horses."

It may be added that, instead of transferring the vehicles to the cities, a still better field offers in transferring them to the winter resorts of the South, utilizing them in the autumn and the spring, say in Virginia and North Carolina, and such places as Lakewood, in New Jersey, while in the mid-winter season they would be in full demand in Florida, in Georgia, in Cali-

fornia, and even in island resorts like Bermuda, famous for its perfect roads. We shall probably, before many seasons pass, see this migratory idea in full operation.

The Question of Speed

"Road-races are suppressed, the true automobilism is going to begin," writes the French engineer, J. Ravel, in *La France Automobile*. "Everything has been sacrificed to that idea: the augmentation of speed without ceasing," he continues. "Think on how many lines of railway at present do they attain a speed of 80 kilometres, although the wheels of the locomotives and the cars are guided by the rails over a perfect way—and they strive to reach that speed on poor ways with no other guidance than the address or the *sang froid* of a driver!" M. Ravel says that the constructors, instead of devoting themselves to perfecting their motors and their transmitting mechanism, confine themselves to one problem—and what a problem! The augmentation of power in the motor, talking of nothing but maintaining 12, 16, 24 and 30 horse-power; and while augmenting their power they neglect to augment correspondingly the strength of active and supporting parts. He holds that even a speed of 25 kilometres (over 16½ miles) an hour is altogether too high for ordinary purposes. A speed of 25 kilometres is equivalent to a speed of about 7 metres a second. And in passing along a road a distraction, or a cramp that means but a second of pain, is sufficient to throw the persons in the vehicle into the ditch to the right or the left. Returning to road-racing, M. Ravel asserts that it is absolutely useless; it always has been, and it is, of more harm than good to the cause of automobilism. Already, in 1896, he advocated in *La France Automobile* the suppression of road-racing and the interdiction of high speed. At that time M. G. Pierron, the Vice-President of the Touring-Club of France, agreed that road-races were demoralizing the public, and particularly the amateurs. And the Count de Dion then held that a maximum of 22 to 23 kilometres was more than sufficient for the public. But the latter advocated road-racing as necessary to the proper development of the automobile. As to this, M. Ravel holds just the contrary to be true; that road-racing has impeded progress by hypnotizing manufacturers with speed.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Accumulators—

Competitive Tests of Accumulators. An account of the competitive tests made by the Automobile Club of France, from June 3 to December 2, 1899, with a table showing results. "Elektrochem Zeitschr," May, 1900.

A technical article regarding the methods employed for the transport of acetylene in reduced volume (from "Echo des Mines"). "The Horseless Age," New York, June 20, 1900.

Acetylene and its Adaptability as a Motive Power for Vehicles—

A technical article by E. C. Oliver. "The Horseless Age," New York, June 20, 1900.

Acetylene Generators for Motor Vehicles—

A detailed technical article by W. F. Cooper. "The Horseless Age," New York, June 20, 1900.

Acetylene Motors—

A technical article regarding the question of the employment of acetylene for motive power. The author, Henri Cuinat, states that the development of all the applications of acetylene—to lighting, to heating and to motors—is arrested by the cost of the carbide. When the electrochemists furnish the industry with carbide at 250 to 300 francs, the days of coal gas will be numbered (from "Journal de l'Electrolyse"). "The Horseless Age," New York, June 20, 1900.

Automobiles—

A description of an electric vehicle of recent European introduction. "The Motor Vehicle Review," Cleveland, July 3, 1900.

A description of the new four-seat Blake gasoline carriage. With one illustration. "The Motor Car Journal," London, June 30, 1900.

A description of a new six horse-power wagonette of recent European introduction. "The Motor-Car Journal," London, June 30, 1900.

A detailed technical description of a new carriage of European manufacture. With eight illustrations. "Cyle and Automobile Industriels," Paris, July 1, 1900.

The automobile wagon for heavy duty. By Arthur Herschmann. Describing the conditions which make these vehicles most desirable, considering the construction, propulsion, etc. Illustrated. American Society of Mechanical Engineers, May, 1900.

Automobile Fire-engine—

A brief account of an auto-cycle chemical fire-engine of American manufacture. With one illustration. "Cycle and Automobile Trade Journal," Philadelphia, July 1, 1900.

Automobile Gun Carriage—

A brief description of a motor-tricycle and gun carriage manufactured in Europe for the Norwegian Government. With one illustration. "The Motor-Car Journal," London, June 23, 1900.

Bicycle Motors—

A technical description of the Holley motor. With one illustration. "The Automobile Review," Chicago, June, 1900.

A technical description of an improved four-cycle gasoline motor of American manufacture. With one illustration. "The Motor Vehicle Review," Cleveland, July, 1900.

Carbureter—

A brief technical account of a new auto-carbureter of American manufacture, which is said to be affected neither by the varying degrees of temperature nor the dampness of the atmosphere. With one illustration. "The Motor Age," Chicago, July 5, 1900.

Combination Systems—

Combination systems. Description, with two illustrations, of these systems, with remarks on their advantages and disadvantages. "Horseless Age," New York, May 9, 1900.

Cylinder Head—

A description of a new water-cooled cylinder head designed for a well-known automobile motor. With two illustrations. "The Autocar," Coventry, June 30, 1900.

Economical Laws of the Progress of Automobilism—

A popular article exploiting the possibilities of the new industry. "Automobile," Berlin, May 26, 1900.

Electric Carriage—

A technical description of the new Kühlstein electric carriage, possessing some novel features. With four illustrations. "The Autocar," London, June 23, 1900.

Electric Automobile—

A brief account of the new Century Electric Automobile. With one illustration. "The Automobile Review," Chicago, June, 1900.

Employment of Aluminium in the Construction of Automobiles—

A technical article (from "Journal de l'Electrolyse"). "The Horseless Age," New York, June 13, 1900.

Engine—

A description of the Simms vertical water-cooled engine. With one illustration. "The Autocar," Coventry, June 30, 1900.

Friction Clutch—

A technical description of a new simple and practical friction clutch of American manufacture. With two illustrations. "The Horseless Age," New York, June 13, 1900.

Gasoline Motor Cycles—

A detailed technical description of the Comiot-Eadie Motocycles and Cycles, by I. Lainé. With three illustrations. "Cycle et Automobile Industriels," Paris, June 17, 1900.

Horse-power Tests of Automobiles—

A detailed technical article on the subject. With four illustrations. "The Motor-Car Journal," London, June 9, 1900.

Hydro-Carbon Automobiles—

The Georges Richard Voiture. Illustrated description of the latest type. Condensed from "La France Automobile." "Horseless Age," New York, May 16, 1900.

A technical description of the new Tourand carriage. With nine illustrations. "La Locomotion Automobile," Paris, June 7, 1900.

A technical description of the "L. Linon" Motor cars, by José Md. Monmany. With one illustration. "El Automovilismo Ilustrado," Barcelona, June 15, 1900.

A brief account of the imperial gasoline carriage. With one illustration. "The Automobile Review," Chicago, June, 1900.

A description of the Packard gasoline carriage. Illustrated. "The Horseless Age," New York, May 16, 1900.

Hydro-Carbon Motors—

A brief technical description of the new Lukas-Villian motor. With three illustrations. "Automobile," Berlin, June 10, 1900.

A detailed technical description of the Keystone gasoline motors for vehicles and launches of the four-cycle, inclosed crank-case type. With one illustration. "The Motor Vehicle Review," Cleveland, O., June 19, 1900.

Ignition—

From the Batteries to the Sparking Points. An article by Reginald P. Wales. "The Automobile Review," Chicago, June, 1900.

The Automobile Index

Illumination—

A brief description of a new searchlight of American manufacture, by the light of which it is claimed a watch can be read at the distance of a quarter of a mile. With one illustration. "The Motor Age," Chicago, July 5, 1900.

Liquid Fuel Motors—

Liquid fuel motors for vehicles. By Hugo Güldner. A fully illustrated account of many types of liquid fuel motors. Serial. 1st part. "Zeitschr d Ver Deutscher Ingenieur," Berlin, April 28, 1900.

Lubrication—

The lubrication of motor vehicles and cycles. Information from a pamphlet written by J. Veitch Wilson. "Automotor Journal" London, May 17, 1900.

Some valuable and concise remarks on the question of lubricating. By J. W. Wilson, London. "The Automobile Review," Chicago, June, 1900.

Lubrication of Motor Tricycles—

Advices and rules to prospective purchasers. By Arthur Goodwin. "The Motor-Car World," London, June, 1900.

Mechanical Propulsion—

Road locomotion. By H. S. Hele-Shaw, with appendices by experts. Discusses the general principles of the engineering features of the question; the behavior of the wheel upon the road, steering and turning, motive power and transmission, etc. Illustrated. "Institute of Mechanical Engineers."

Mixture and Carburation—

A technical article. "Cycle et Automobile Industriels," Paris, June 10, 1900.

Model Automobile Barn—

A detailed description of a recently completed "Automobile Stable" in Cleveland, O., with charging stations, gasoline tanks, pumps, repair tools and other accessories. With one illustration. "The Motor Age," Chicago, July 5, 1900.

Motor Cycle Mysteries—

A number of facts regarding unexpected accidents to cycle motors. By A. J. Wilson. "The Autocar," London, June 9, 1900.

Motor—

A technical description of the Mounier-May motor. With two illustrations. "La Locomotion Automobile," Paris, June 21, 1900.

Motor Bicycles—

A technical description of the Werner motor bicycle. With two illustrations. "The Motor Vehicle Review," Cleveland, June 12, 1900.

A detailed technical description of the new motobicycle, "la Constantin." With four illustrations. "L'Industrie Velocipédique and Automobile," Paris, June 25, 1900.

A brief account of a new motocycle of European manufacture. A motor supported directly over the rear wheel. With one illustration. "The Autocar," London, June 16, 1900.

New System of Setting up Spokes of Tension Wheels—

Technical description of the new King system. With five illustrations. "La Locomotion Automobile," Paris, May 24, 1900.

Opposing Automobile Racing—

An article by T. Ravel, for the suppression of races. The author declares that Automobilism is being developed on false lines, as at present it tends simply toward increase of speed. "La France Automobile," Paris, April 29, 1900.

Pneumatic Tires—

The manufacture of a pneumatic tire. From "La Nature." Illustrated detailed description with related information. "Scientific American" Supplement, New York, May 12, 1900.

Racing Machines—

A technical description of an Austrian racing machine which won first prize in the Turbil (mountain) race, attaining speed of ninety-two kilometres on the level and twenty-five

kilometres on twelve per cent. grade. With two illustrations. "The Motor-Car Journal," London, June 16, 1900.

A brief description of the new Benz racing car. With one illustration. "The Autocar," London, June 16, 1900.

Safety Valve—

A brief description of a new device of American manufacture designed for gasoline motors. With one illustration. "The Motor Age," Chicago, June 14, 1900.

Some French Experiments with Acetylene and Alcohol as Motor Fuels—

A technical article by P. M. Heldt, comparing the prices of gasoline, calcium carbide and alcohol in the United States. "The Horseless Age," New York, June 20, 1900.

Some Properties of Acetylene—

A detailed technical article by Herbert L. Towle. "The Horseless Age," New York, June 20, 1900.

Speed Change—

A detailed technical account of a new speed-changing system, said to present many novel features. With two illustrations. "La Locomotion Automobile," Paris, June 28, 1900.

Spur Gear Differential—

A technical article by T. B. Chamberlain. With one illustration. "The Automobile Review," Chicago, June, 1900.

Steering—

The pivot steering gear in practice. P. M. Heldt. Illustrated description. "Horseless Age," New York, May 2, 1900.

Storage Batteries—

The selection of a storage battery for an automobile. Giving a method for determining the speed and radius of the vehicle, illustrating by working out the problem for a given vehicle. "American Electrician," New York, June, 1900.

Testing—

Formulæ for designing and testing automobiles. By Dr. Walter Kummer. Theoretical discussion of the determination of the efficiency of self-propelling vehicles. "Elektrotech Zeitschr," May 3, 1900.

The Automobile for Heavy Duty—

Extracts from a paper read before the American Society of Mechanical Engineers, Cincinnati, May, 1900. "The Horseless Age," New York, June 13, 1900.

The Automobile in War—

Some interesting points on the subject brought out by a paper read before the Automobile Club of Great Britain, by the Rt. Hon. J. H. A. Macdonald, who states that anything which tends to increase the speed of an army from place to place and enables it to withdraw from the railroad is destined to be of the highest value, and this is where the modern automobile should come in and take the place of animal traction and the traction engine, which has been used to some extent already. "The Automobile Review," Chicago, June, 1900.

The Motor-Vehicle for Heavy Duty—

Extracts from a paper read at the Cincinnati meeting (May, 1900) of the American Society of Mechanical Engineers, by Arthur Herschmann. "The Motor Age," New York, June 21, 1900.

The New Mors Racing Car—

A brief account regarding the new Mors racing car. With one illustration. "The Motor-Car Journal," London, June 9, 1900.

The 1,000-Mile Trial in England—

Its lessons and knowledge derived therefrom. A technical article. "The Motor-Car Journal," London, June, 1900.

The Trend of Progress of the Automobile—

Second paper of a serial. By R. H. Thurston. "The Automobile Magazine, New York, July, 1900.

Wheels—

"Construction and Function of Motor-car Wheels." A technical article by A. J. Wallis-Tayler, C. E. With illustrations. "The Motor-Car World," London, March, 1900.

The Esty motor vehicle wheel described and illustrated. "The Horseless Age," March 14, 1900.

Dished wheels. By H. E. Wimperis. Considering their advantages and disadvantages when applied to automobiles. "The Automotor Journal," London, February, 1900.

Will Acetylene be the Coming Power for Motor Vehicles?—

An article by D. N. Long. "The Horseless Age," New York, June 20, 1900.

The Start of the Second Run of the Buffalo Automobile Club, July, 1900

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Trend of Progress of the Automobile

By R. H. Thurston

Fourth Paper

DRY steam must be had, not only because the engines, if properly constructed, will have small " dead spaces " and cannot safely work water in any appreciable amount, but also as an element of economy. Moderate superheating, in fact, is most desirable if obtainable without too great sacrifice of lightness and compactness of boiler. A gain of very considerable amount should follow superheating, through reduction of internal wastes in the engine, and it would compensate, by its reduction of the fuel carried and expended, a correspondingly considerable enlargement of the boiler with increase of weight and size. The opportunity thus to secure a gain in the average automobile engine is not improbably in excess of fifty per cent. of its present expenditure of heat, steam and fuel.

With steam-wagons for commercial work, the problem of the engineer assumes very different form in some respects. He may find it wise to adopt the shell-boiler if he finds difficulty in choosing or designing a " safety " boiler and he can employ a larger area of heating surface and a heavier steam-generator altogether than with the high-speed pleasure carriage. He may adopt large sizes and high powers and will need but a comparatively low speed and that speed will be better maintained. The conditions, on the whole, are decidedly more favorable to economical and low-cost operation. Rubber tires are not demanded and

details may be designed with reference purely to the main purpose of transportation and without much regard to prejudice or to the comfort of the rider or driver. Width of tire can be adapted to the work and an inch of width, if desired, to the ton of load may be secured, and half that width is probably likely to be found desirable for heavy work. Solid fuel may be here used and it has usually been found that anthracite coal or coke is preferable, all things considered, to liquid fuel. Frost, however, is a real danger with this construction.

Serpollet, in the principle introduced by him with his singular and, for general purposes, apparently, not remarkably promising boiler, seems to have brought us a clue that should be followed with the most thoughtful and persistent care on the part of the steam-automobile designer. This principle may be enunciated as that of employing, where the presence of water is a load and a source of annoyance if not of danger, a comparatively large mass of metal; thus securing the regulating action of water together with that safety which comes of its absence and of the immense strengthening of the chambers containing steam which is consequent upon the use of very heavy tubes. The iron stores heat when the machine is not in action and gives it out as the demand for energy and the supply of heat from the fuel fluctuate in opposite directions and the desirable accumulator effect is thus obtained. This system has been in use, with the automobile, particularly, for now many years and it seems to many engineers both sound and promising. But whatever may prove to be the outcome of that particular device, its principle is one to be kept carefully in view in all automobile construction in which steam is the motor. It would be difficult to find a safer system of construction than that embodying this idea, and perhaps otherwise quite impossible without large weights of water in the boiler, to secure the needed regulating action of stored heat-energy. A boiler without water capable of carrying hundreds of atmospheres pressure, economical and compact, is aimed at.

Mechanical, chemical and thermal storage and regulating action should all be carefully studied from this point of view and the comparison of the energies of fuel, of compressed air, of electricity and of heated water and metal offers an enticing field of research for the automobilist. It is not enough to find that either one or another affords an opportunity to secure a better commercial result than can be obtained with the horse-drawn vehicle; the real question for the engineer, the builder and the automobilist is: Which gives the best and cheapest and most safe and reliable commercial result?

Trend of Progress of the Automobile

The Internal Combustion Engine adapts itself to the automobile in a remarkably satisfactory manner, although still subject to its own special faults—as have been found to be all motors. It has been built in large numbers and has taken part in the evolution of the automobile in a most extensive and promising manner. It has been the winner of many long-distance races and is finding place in every line of automobile work. European engineers and constructors have hitherto accomplished more with this motor than have those of the United States; but the indications are that it is on the verge of extensive evolution in this country and it has already performed admirable work in the hands of a few builders and users. It is anticipated that the proverbial American inventive genius, combined with the intelligent and well-informed mind of the American mechanic, will soon produce marked improvements in this machine and may develop an automobile that, for long routes over country roads, particularly, will find extensive employment and prove satisfactory both in performance and in costs.

Those forms of engine of this class now in use are almost all of the standard type of stationary machine with single cylinders, water-jacketed, and comparatively heavy. It is probable that they may be made much lighter without sacrifice of strength, durability or efficiency, and doing away with the water-jacket, become quite independent of a water-supply. In small sizes, it is perfectly possible to secure cooling by simple conduction and radiation from the exterior and devices long employed in steam-boiler work for increasing the rate of heat-absorption are here available for insuring satisfactory rates of heat-dispersion. For the larger powers, this may also involve the multiplication of working cylinders and the use of separated compression pumps; but the gain is so great that it may be found that even somewhat expensive systems of construction may pay well. Cooling by external flanges has been known in this country for many years to be effective, and such engines were designed by Mr. George B. Selden, of Rochester, N. Y., and for this special purpose, some years ago, for sizes up to about 4 horse-power. The cycle adopted is usually that of Beau de Rochas, commonly denominated the Otto cycle, and the methods of ignition are, as a rule, electric, either the spark or the hot tube and spark together for greater certainty of action. Transmission of motion is best made as direct as possible and the belting and bevel-gearing, loading up foreign constructions so seriously and involving so much risk of trouble, are not favored with us; nor is the system com-

pelling the throwing into gear of a rigid clutch or setting gears into side-mesh in changing speeds.

The principal difficulties with the oil-vapor or gasoline engine and other types of internal-combustion machine, at the moment, seem to be that of starting from rest and that of reversal when in motion, and also some trouble in varying speed without loss of efficiency of engine or even extinction of the combustion. Once *en route* and at full speed, the machine behaves admirably, and, so long as steady speed and constant loads are maintained, power, economy, lightness, convenience and, in fact, substantially all the requirements of a successful motor are illustrated. Starting, reversing or changing speed, however, are very apt, with many of these machines, to reveal serious difficulties. These difficulties, however, we may be sure, will ere long be completely removed by the American inventor and the scientifically trained designer. Some system of storage of energy will supply the reserve power needed for application in starting up and some system of automatic adjustment of the elements of the charge to the speed and load, and a way of starting in either direction as well as of reversing with certainty, will be discovered and introduced. This type of machine seems, in some respects, at least, the most promising of all the heat-motors, and it may find extensive application throughout the whole range of use of the automobile. An internal-combustion engine that can satisfactorily operate with varying speeds, loads and road-gradients, and especially one capable of starting from rest on a heavy grade with the brake on, is still needed.

The gas-engine varies in efficiency with load and with size, much as does the steam-engine. Thus: a gas-engine rated at a maximum as of 12 developed horse-power and which consumed 48 cubic feet of a stated gas per horse-power-hour when delivering one horse-power, demanded at higher powers up to the limit of its rating about $V = 48 \sqrt{P}$; where P is the number of horse-power delivered at the shaft.

The total efficiency of the gas-engine, measured between fuel and shaft, is often about double that of the steam-engine of similar power, and averages not far from 12 in the latter and 20 to 25 in the former. Where gas-producers are employed, they cost about as much per horse-power to be delivered from the engines as do steam-boilers per delivered horse-power. The "stand-by" losses are comparatively small with the gas-engine. In automobile work, the working fluid is always the vapor of some volatile hydro-carbon. It is stored in large quantity in small space and weight, is convenient to handle, need not be dangerous and

requires no delay awaiting the heating up of the apparatus before starting. Its use in the gas-engine brings with it special difficulties for the automobilist. It is difficult to operate the engine at a varying speed as it results in uncertain action of the explosive charge and introduces waste of the combustible and annoyance of the operator. The gas and vapor engines using internal-combustion systems are peculiarly subject to loss with low powers and with variable speeds.

The "working fluid" of the internal-combustion engine as employed for automobile work, must necessarily be such as will be transportable conveniently, *i. e.,* must be, in its initial condition of little volume and weight for the unit of work performed by it. This means, evidently, that it must be carried in the liquid or solid form; but the latter is impracticable while the former is entirely practicable in the case of the light petroleums and other volatile combustible liquids. The internal-combustion engine of the automobile therefore commonly consists of a system involving provision for the volatization and explosive combustion of the petroleums, as benzine, gasoline and other trade products of suitable character. The values of these substances as working fluids are not very different if equally well burned in the engine. The heavier petroleums give more difficulty than those of low density in their ignition and combustion while having the special and important advantage of freedom from danger of accidental ignition and explosion outside the engine. The use of ordinary kerosene, such as is employed in illumination, will perhaps be ultimately generally adopted as the best compromise between availability and safety and as being that material which can be most certainly depended upon in making long journeys and outside the cities.

In France and especially, at this time, in Germany, the cost of alcohol is comparatively low and it is an entirely practicable working fluid for these engines. In the alcohol we have about one-half of the carbon of the petroleum exchanged for oxygen and it requires twice as much by weight of the former to supply the same quantity of heat of combustion. Alcohol has also been employed carbureted and with good results thermodynamically; although costs have hitherto proved prohibitory. In Germany, where alcohol is exceptionally cheap, the costs are not so different as to absolutely preclude its use.

Heat-storage in Water and in Steam are forms of energy-storage which have been sometimes proposed in the endeavor to avoid the difficulties, annoyances and accidents which are liable to be met with where fire and an explosive material are used in

transportation. By heating confined water to high temperatures it is possible to thus store considerable amounts of energy; yet it will be found, on computation, that this scheme involves the use of heavy storage-tanks and involves risks of explosion. The non-use of fire and the absence of the risks due to the exposure of the metal to intense heat of furnace gases, to the action of corrosion by heat and moisture and to the injuries resulting from excessive strain coming of varying temperatures in different portions of the structure, are advantages, however, of real importance. This system has been tried in various forms and on various occasions, and the latest and best examples, where street-railways have been thus experimentally operated, have, it is said, proved quite successful in these respects; but the fact that, even then, the storage was reinforced, ultimately, by a fire shows that storage in fuel is, after all, the most satisfactory method of potential energy-condensation yet discovered. The system still remains one of promise rather than of performance. It stores about 15,000 available foot-pounds per pound of water; coal stores ten millions. If made successful from the standpoint of the automobilist and the promoters of the street-railway, it would give an ideal system in respect to freedom from smoke, fire, sparks and noise. It would be operated much as the compressed-air systems are managed. A fair comparison of the costs and relative advantages and disadvantages of these systems would be interesting. It has been many years since it was introduced by Dr. Lamm; it seems surprising that its place has not been already definitely settled. The accompanying tables of available storage of energy in steam and water are in this connection very instructive:*

* Manual of Steam Boilers; R. H. Thurston; N. Y. and Lond.; Z. Wiley & Sons and Chapman & Hall.

I.—Total Stored Energy of Steam Boilers.*

Type.	Area of		Pressure. Lbs. per Sq. In.	Rated Power. H. P.	Weight of			Stored Energy in (Available).			Energy per lb. of		Maximum Height of Projection.		Initial Velocity.	
	G. S.	H. S.			Boiler.	Water.	Steam.	Water.	Steam.	Total.	Boiler.	Total W't.	Boiler.	Total.	Boiler.	Total.
	Sq. ft.	Sq. ft.			Lbs.	Lbs.	Lbs.	Foot lbs.	Foot lbs.	Foot lbs.	Ft. lbs.	Ft. lbs	Feet.	Feet.	Ft. per sec.	
1 Plain Cylinder.....	15	120	100	10	2,500	5,764	11.325	46,605,200	676,698	47,281,898	18,913	5,714	18,913	5,714	1,103	606
2 Cornish.....	36	730	30	60	16,950	27,471	31.45	57,570,750	709,310	58,260,060	3,431	1,314	3,431	1,314	471	290
3 Two Flue Cylinder.	20	400	150	35	6,775	6,840	37.04	80,572,050	2,377,357	82,949,407	12,243	6,076	12,243	6,076	888	625
4 Plain Tubular.....	30	851.97	75	60	9,500	8,255	20.84	50,008,790	1,022,731	51,031,521	5,372	2,871	5,372	2,871	588	430
5 Locomotive.....	22	1,070	125	525	19,400	5,260	21.67	52,561,075	1,483,896	54,044,971	2,786	2,189	2,786	2,189	423	375
6 "	30	1,350	125	650	25,000	6,920	31.19	69,148,790	2,135,802	71,284,592	2,851	2,231	2,851	2,231	428	379
7 "	20	1,200	125	600	20,565	6,450	25.65	64,452,270	1,766,447	66,218,717	3,219	2,448	3,219	2,448	455	397
8 "	15	875	125	425	14,020	6,330	19.02	64,253,160	1,302,431	65,555,591	4,677	3,213	4,677	3,213	549	455
9 Scotch Marine.....	32	768	75	300	27,045	11,765	29.8	71,272,370	1,462,430	72,734,800	2,689	1,873	2,689	1,873	416	348
10 "	50.5	1,119.5	75	350	37,972	17,730	47.2	107,408,340	2,316,392	109,724,732	2,889	1,968	2,889	1,968	431	356
11 Flue and Return Tubular.....	72.5	2,324	30	200	56,000	42,845	69.81	90,531,490	1,570,517	92,101,987	1,644	931	1,644	931	325	245
12 Flue and Return Tubular.....	72	1,755	30	180	56,000	48,570	73.07	102,628,410	1,643,854	104,272,264	1,862	996	1,862	996	346	253
13 Water Tube.....	70	2,806	100	250	34,450	21,325	35.31	172,455,270	2,108,110	174,563,380	5,067	3,073	5,067	3,073	571	445
14 "	100	3,000	100	250	45,000	28,115	58.5	227,366,000	3,513,830	230,879,830	5,130	3,155	5,130	3,155	575	450
15 "	100	3,000	100	250	54,000	13,410	23.64	108,346,670	1,311,377	109,624,283	2,030	1,626	2,030	1,626	361	323

* This "stored" energy is less than that available in the non-condensing engine by the amount of the latent heat of external work $(p_1 - p_2)\,v$.

II.—Stored Energy in the Steam Space of Boilers.

Type.	Energy, Total.	Stored in Steam (ft. lbs.) per lb. of Boiler.	Height of Projection.	Initial Velocity per sec.
1. Plain cylinder	676,693	271	271 ft.	132 ft.
2. Cornish	709,310	42	42 "	32 "
3. Two-flue cylinder	2,377,357	351	351 "	150 "
4. Plain tubular	1,022,731	108	108 "	83 "
5. Locomotive	1,483,896	76	76 "	69 "
6. "	2,135,802	85	85 "	74 "
7. "	1,766,447	86	86 "	74 "
8. "	1,302,431	107	107 "	83 "
9. Scotch Marine	1,462,430	54	54 "	59 "
10. "	2,316,392	61	61 "	62 "
11. Flue and return tube	1,570,517	28	28 "	42 "
12. "	1,643,854	29	29 "	43 "
13. Water-tube	2,108,110	61	61 "	59 "
14. "	3,513,830	79	79 "	71 "
15. "	1,311,377	24	24 "	39 "

The study of this table is exceedingly interesting, if made with comparison of the figures already given, and with the facts stated above. It is seen that the height of projection, by the action of steam alone, under the most favorable circumstances, is not only small, insignificant indeed, in comparison with the height due the total stored energy of the boiler, but is entirely too small to account for the terrific results of explosions frequently taking place. The figures of Table II. are those for the stored energy of steam alone in the working boiler; they may be doubled, or even trebled, for cases of low water; they still remain, however, comparatively insignificant. The enormous potential, stored, energy of the steam-boiler, in its usual form, is that of the enclosed mass of hot water.*

Compressed Air, stored in tanks and carried under the vehicle has been often and extensively used for propulsion of automobiles and, in mines and in tunnels, where the exhausted air replaces the smoke and gas and dust of the coal-fired locomotive, it has often been found to be an ideal arrangement. It has frequently been used, during a generation past, for the propulsion of street-cars, and with some measure of success, in competition with horses, but not with steam or the internal-combustion engine. At even so high a pressure as a ton to the square inch, the weight of the tanks amounts to somewhere near a hundred pounds, if safe, per cubic foot capacity, and including but about ten or eleven pounds of air, yielding in work but about a quarter or a

* Steam Boilers as Magazines of Explosive Energy; Trans. R. S. M. E., 1884.

third of a horse-power-hour, according to efficiency of machinery. The storage battery gives two or three, if not four, times this yield in good work. Compressed air thus does not seem likely to serve the automobilist satisfactorily at present, at least, except as an auxiliary when starting under load the internal-combustion engine. Here it may yet find a useful place.

Carbonic Acid gives no more promise, practically, so far as can be now seen, than compressed air, and its cost is to be added to that of the air in the uncompressed state. Nearly all such expedients in the substitution of other fluids as the thermodynamic substance of the heat-engine are urged on the ground of comparatively small latent heat of vaporization or expansion; but there is nothing at all in the argument and, in fact, the best substance is that containing the largest store of this form of potential energy and this is the more important as the substance is the more costly, the measure of the capacity for storage being increased by the value of the latent heat.

"*Liquid Air,*" of late strongly urged as a source of power for the automobile, probably has much less of promise than its promoters believe, or at least assert. It stores comparatively little energy, is enormously costly, especially as a competitor in energy-storage with fluids of little or no cost, requires very large quantities per horse-power delivered, and no known way exists for its storage for any considerable or satisfactory period without immense waste. According to Linde, perhaps its most successful and experienced and reliable producer, it requires a hundred horse-power at the compressor to produce as many pounds per hour, and it can develop but a fraction, probably a small fraction, of that amount of power in regasifying. It loses by simple vaporization, even in large vessels, ten gallons and upward, about four per cent., under the most favorable conditions for its preservation, each hour. Its efficiency in the motor is found to be about four per cent.; that of the steam-engine is from seven to twenty and more, and that of the gas-engine ranges to still higher figures. In the perfect heat-engine, the quantity of air required to do the same work within the same range of temperature of operation is about sixteen times as much as of steam; while steam costs nothing as a crude material and liquid air costs no one knows precisely what—probably not less than three or four times, perhaps ten or fifteen times, as much as the fuel used with the steam-engine or the gas-engine. The wild claims of the promoter of the stock-company, now in the market for speculative purposes, are probably based on but little better reason than those of Keely or of other mountebanks, often self-deluded, who

continually crop up on the "street" in New York, Boston and Philadelphia. Taking its cost in the engine at the advertised minimum, about $8 per ton, and that of steam in the engine at about $0.00025 a pound, about 50 cents a ton, and $4 for coal, the relation is sixteen to one in favor of steam, per pound, and many times this per horse-power developed. A first-class steamship of 10,000 horse-power would probably pay $100,000 for the air alone, to operate the proposed system of machinery in a single voyage across the Atlantic. We are, however, still awaiting exact data and the proposing investor in this field will meantime do well *first* to ascertain the exact character and records of the men with whom he must deal, their intellectual as well as moral reliability and their standing as scientific men, as well as mechanics and mechanical engineers; *next* to secure by personal observation and measurements, or through a trustworthy and reputable expert in that specialty, precise figures of power expended, product secured and costs of power and of product, and, finally, its availability as shown, not through prophecy but by actual experimental and life-size work, for the particular purpose in view. It is always perfectly practicable to ascertain just what the business side of the proposition may be expected to prove to be worth through a careful and accurate investigation, by properly conducted experiments, by well-known and reliable methods familiar to every member of the engineering profession. The same remarks apply to the unknown facts of automobilism generally.*

The Electric Automobile consists of a storage battery and a motor. The former is heavy, at best, and very costly; the latter is a very satisfactory apparatus. The battery may be either of the two usual forms, the Faure system of chloride, "paste," battery and the older Planté arrangement of several makes. The fundamental patents on the latter are open,† those on the former

* The best evidence that the writer has thus far collected, indicates that the cost of even refrigeration, in ordinary cold-air work and transportation, as of fruits by train, must be several times as much with liquid air as with ice; the former, costing many times as much as the latter, pound for pound, is capable of far less refrigerating effect per pound. In no ordinary work can liquid air compete with ice or the refrigerating machine. European experiments indicate liquid air to be far less effective as an explosive, in any form yet devised, than the familiar and cheaper "high explosives." In production of power in a heat-engine it is necessary first to produce the air and at a cost about sixty-five times as great as that of an equal weight of ice, then to use it thermodynamically under the most unfavorable of working conditions. Its work, following Linde's data, may be about one horse-power-hour for eighty pounds, as against fifteen to thirty pounds steam in the engine, or two to four pounds of coal, at least twenty to one in weight and a hundred to one in cost. The use of this most interesting and widely heralded product will probable long, if not always, be confined to work in which costs are of little importance, as in surgery.

† The Planté battery or "accumulator" as it has often been denominated, was brought out by M. Gaston Planté about 1860, and his work continued in its development until 1879. The patents of Faure, the later inventor, were mainly on methods of mechanically applying the "paste," the active material of the storage battery, to the grids, a system apparently known to Planté, but not introduced by him to public use. Brush, the American inventor, however, anticipated Faure and his claim has been sustained by the courts, not only as anticipating Faure but also Metzger, whose patents were issued in 1879. The older method of putting the paste in place was by the tedious system of electrical deposition, as first employed by Planté. Leaden grids with lead-peroxide material as the active element are at present the only forms of storage battery composition found satisfactory commercially.

are strongly held. The Planté system appears to be giving good results, as now used, comparing well with anything produced. One very light French battery is finding tolerably extensive use as particularly adapted for the comparatively hard work of the automobile. The motor is commonly the series-motor, sometimes one and, for heay work, especially, sometimes two driving the carriage. One motor to each driving wheel is thought by many to be much preferable to a single motor driving both; the differential gear, ingenious and effective as it is, proving on the whole undesirable, if it can be avoided. Where it is used, it is, by preference, employed on the motor-shaft, as a rule. The batteries and controllers are so arranged that the several compartments of the battery may be used in multiple or in series as may be found at any moment best. Commonly three combinations, giving as many speeds on the level or at constant load, are adopted. The shunt or compound-wound motor, recharging the batteries when runing down hill, has been suggested frequently, but has not been yet made available.

The Storage Battery is still capable of immense improvement in reduction of weight and bulk and especially, perhaps, in costs, to adapt it to general purposes and still more to the use of the aëronaut and of the automobilist. When the battery weighs from five to ten, or even fifteen, times the theoretical weight and its cost is from five to ten times that of the material from which it is made, it is obvious that, if of any use at all for transportation purposes to-day, it should, in time, when these obstacles to its introduction are in some measure removed, find comparatively frequent and extensive employment. This constitutes the ground of a reasonable hope that the electric automobile—and perhaps even the electrically propelled aërodrome—may yet find general use. It is probable that a more intelligent and liberal policy on the part of the holders of the monopoly of their manufacture will lead to a reduction of price to one-third the present tariff and still afford good profit, while so enormously increasing their use as to give largely increased dividends to their makers. Weights can probably be, in time, reduced to a fraction of those now usual and costs should not be more than double those of the raw materials of their manufacture, perhaps ten or twelve cents per pound for the cells.

The lightest batteries, to-day, store about 30,000 foot-pounds per pound; coal stores 10,000,000—of which, however, but about ten per cent. is thermodynamically transformable—and heated water stores about 15,000 foot-pounds. The heavy storage batteries of the market, proportioned for durability, store but

about 20,000 foot-pounds per pound weight. From one-third to one-half the total weight of the storage battery outfit, as commonly constructed, is acid, tank and lining. Both cell and accessories are undoubtedly to be greatly lightened with later improvement. The real question of interest to us now is to what extent we may be able to profit by such improvement, in the early future.

Just now we must reckon on a weight of not far from 70 per cent., as a maximum, of lead to cell-weight and 60 to 70 pounds of cell per horse-power-hour, stored in a space measuring not far from one cubic foot, minimum, one and a half as a maximum, per horse-power-hour; although automobilists' demands have, in special cases, brought the space down to a half cubic foot, and still less is promised. For similar quantities of power and work, at the point of application to propulsion, the storage battery has a weight of fifty to a hundred times as much as coal and demands from ten to twenty-five times as much space. If the comparison is made with the petroleums, these figures may then be decreased thirty per cent. Motors weigh about as much still be increased fifty per cent. Motors weigh about as much as steam-engines of similar power and their accessories: not far from the weight of boiler, or about half the total steam equipment. The key of the situation is thus seen clearly, so far as the utilization of electric energy is concerned, to be found in reduction in weight of battery. The success of this system must ultimately depend upon the ingenuity, judgment and learning of the electrician and the electrical engineer and on the broadness of policy of the manufacturer who, to promote his own success, even, must be wise enough to work also in this direction, and then to seek a wider market by contenting himself with a small percentage of profit—resulting probably in maximum dividends, in the end. To-day, the usual proportion of battery for 20 horse-power, four-hour discharge, would weigh about seven or ten tons and the light automobile outfit about three tons as a minimum, and half these figures would suffice for a two-hour discharge. But to do an all-day's work, as with steam, without recharging, would mean at least five times the last figure. The storage battery and its machinery of propulsion must be reduced in weight to a fraction of its best figures of to-day to do the work which can be readily performed by the heat-motors.

Costs being compared, it will be found that, the best work of the electric and of the steam-motor being assumed, the cost of the whole heat-motor equipment, ready for action, is, at best, about the same as that of the machinery of the electromobile and that the cost of the battery must be added as an excess-charge. We

may fairly anticipate that steam and other heat-motors may, in time, be brought into the market at a cost not exceeding, we will say, $50 per horse-power. Similar power in the storage battery itself, assuming a five-hour discharge, would cost not far from $100, as a minimum, and perhaps $200 as a maximum, and half these figures for a half-time endurance. The additional cost of the motors may be taken as about the same as a steam equipment as a whole, engines and boilers, or of heat-motors of other forms. complete.

But, notwithstanding the fact that the storage battery will now furnish but about one-thirtieth, at best, of the energy at the shaft of the best coal, or one-fortieth to one-fiftieth that of the petroleums, in equal weights, and that costs are enormously in favor of the heat-motors, the convenience, neatness and cleanliness, quiet, safety and handiness of the electric system—its whole operation, in fact, so far as applicable—are so nearly ideal that we must all hope most earnestly that weights and costs may soon be reduced to practicable quantities, and that stations for energy-storage may be soon established on all highways, as well as in every city. Meantime, it is very possible that electric energy-storage may find new forms, and who knows but that the result of further discovery and scientific investigation may be the artificial production of the equivalent of "ball lightning" in controllable form?

For the present, we must content ourselves with seeing two pounds of coal consumed in originating this energy where one would suffice were the steam-power producing it directly applied to the work to be done. Where weight and cost are not absolutely controlling quantities, the electric carriage is greatly favored, and Mr. W. K. Vanderbilt and his $5,000 victoria probably at the moment lead the procession. The smoothness of the motion of the motor-dynamo with its continuous rotation, its steadiness at whatever speed and its lightness—capable, however, of further and great improvement—tell strongly in favor of the electric vehicle.

The storage battery is in enormously extensive use on a large scale in power and light development in Europe and is rapidly coming into use in this country; but it is a vastly different problem where the storage is demanded for accumulation of energy for transportation while in process of application and the necessity of reduction of weight to a minimum is in the latter case incomparably greater, in fact absolutely essential to success. With the battery weighing ten times as much as its ideal prototype, the opportunity of gain in this respect is apparently very

great, and we will both expect and demand it for the automobile. The reduction already made, however, proves to be, largely, a reduction by sacrifice of life, and at increased cost, of batteries, and precisely where the best compromise between gain of weight and loss of money comes is difficult to determine.

The high efficiency of the storage battery is one of its most encouraging features. Professor Callender has found the ampere-efficiency to be as high as 96 per cent. and the watt-efficiency 84, and others have claimed still better figures. Costs of maintenance vary greatly, but the manufacturer of the standard battery guarantees to keep it down to four or five per cent. per annum. In the special automobile battery, the figure must be, naturally, higher. Ways must yet be found to produce a battery capable of larger storage than those of to-day, on lighter weights and, where needed, with quicker discharge, and all this with immensely increased economy of first cost and of maintenance. Weights of hundreds of pounds per horse-power-hour must be reduced to tens. Guarantees must be exacted of the maker, and carefully worded and as carefully lived up to or exacted. This system it was which first caused the entrance of the steam-engine-builder and designer upon the path of improvement which has been so marvellously extended during the latter half of the nineteenth century. The fact that the unpatented Planté type is free to all gives at least some opportunity to lead off to every inventor and independent maker. A guaranteed efficiency of 75 per cent. should be expected to-day, eighty per cent. should come very promptly and ninety per cent. in the early future. Prices falling below $100 per kilowatt should be secured and, ere many years, we may perhaps look for figures much less, a fraction of those of to-day. Where, as is actually the fact with some makes of battery, the product is already many tons a day—a firm of German makers was shipping sixty to seventy tons a day, some time ago—improvement should proceed rapidly; for the makers have in such case ample capital and opportunity for experiment. Once this work is fairly begun, the costs will drop far below those of to-day, for even large installation and stationary work, and $25 per kilowatt-hour may be looked upon as an enormous price. The best reported figures for cost of power, perhaps about two-thirds of a cent per car-mile, will certainly be greatly reduced ere long.

At present, it remains a very important fact that the energy-store in coal and the fuel-oils, by nature, is very much more compact and vastly less costly than the artificial storage of energy, developed by the heat-engine, converted into electric energy, and then stored in the accumulator. A cubic foot of coal in the

bunker represents, in fact, about 20 horse-power-hours, in the ordinary storage battery about one, and in the lightest of automobile batteries of the time, about 1.6 horse-power-hours. The motor weighs about 30 pounds, possibly in some cases a little less, per horse-power, or about the same as current torpedo-boat engines and double the minimum of our day. Professor Durand finds that the weights of battery required in such marine practice would be from three to five or six times the displacement of the boat, for a four-hour discharge, and for the now moderate power often adopted, 2,000 horse-power, and for the moderate speed of 23 to 25 knots. A four-hour range of steaming, say 100 miles, would, however, be an absurd limit for such craft. The costs of the two outfits, at present prices, would also be in the proportion of three or four to one, in favor of steam.

The development of the Planté type of battery, especially for automobile work, seems to give much promise, not only indirectly, as stimulating through competition the best and cheapest work of the patented accumulators, but directly as a type finding very satisfactory application to this particular purpose. Reduction of cost and increase in power for a given volume and weight will prove the one main line of improvement and the extension of areas of active surfaces, reduction of depth of active material, and decrease of weight and volume of inactive and simply enclosing and accessory metal, with promotion of circulation of the fluid in the cells and over the composition employed, will promote as actively the reduction to useful and available form the automobile storage battery.

The best action and highest efficiency will always be found to be that which makes the cost of power supplied a minimum, as a total, when all costs, direct and indirect, first cost, maintenance, replacement, wasted time and lost business have been made a minimum per unit of useful and paying work. In the automobile the item of cost which includes value of space and weight appears as an important factor where it does not enter to any important extent in common use for stationary work. Prices as well as costs are so liable at any time to suddenly and extensively vary that no figures can be given of more than temporary value; but the principles involved are always applicable by the thoughtful and intelligent engineer.

The whole business of design is always a compromise. It is possible, if the batteries, for example, are made large enough, to reduce costs of maintenance to a very unimportant percentage; it is practicable to secure small size and weight by adopting high rates of discharge and depreciation of the batteries; somewhere,

as always, the engineer must seek and if possible identify and adopt the golden mean. Improvements looking to extended and satisfactory use must, to prove satisfactory in themselves, be such as reduce costs of manufacture and of operation and use.

The latest and most promising figures for the storage battery of to-day are perhaps these: 6 to 8 ampere-hours per pound of battery, where the theoretical output for the ideal case and maximum efficiency is 96 per pound of lead-peroxide, and an efficiency, as thus measured, of about one-third, where the cell gives 33 ampere-hours per pound of peroxide therein. These figures are better by nearly a half than those of the average battery of the market.* This means either a corresponding decrease in the weight carried as load, in form of battery, or, with the same load, a doubled working range of action or radius of limiting route.

Vollmer reports that, in automobile work, the Planté type permits high discharge-currents without serious loss of efficiency. Fifteen minutes suffice for charging a battery of 80 ampere-hours, but the objections, in weight, volume and small capacity are important. The Faure type he credits with less weight and volume and a greater capacity, but a restricted life, where rapidly discharged, which puts it at a disadvantage in competition with the Planté. He makes the relative weights about as two to three or as three to four in favor of the Faure, and credits the two batteries with, respectively, 2.8 and 3.6 ampere-hours per pound. Capacities per cubic inch are given as 21 and 35 ampere-hours, respectively, and the length of route may be thus 15 or 18 miles with the Planté and between 25 and 30 with the Faure. The life of the former is about 200 discharges under such conditions and 120 to 150 with the Faure; the first being most suitable for city use and the other for long trips across country, and where economy is not a controlling consideration.

In handling the electric vehicle, the storage battery of to-day compels peculiar care in manipulation if its life is to be prolonged and maximum efficiency is to be attained. The speed and power, the latter, particularly, as measuring the draught upon the battery, must be made as uniform, *en route,* as practicable; the current should be taken steadily and never, unless in an emergency, in "flashes" or rushes; the fewer starts and stops the better and the more steady and deliberate the changes of speed the longer the life of the battery and its period of satisfactory action in any one run. The less the brake is employed, also, the better. The ammeter should be constantly in view and made a guide at all times, to aid in insuring the maintenance of the conditions of

* *Electrical World and Engineer*, April 28, 1900.

best effect of battery and motors, and their maintenance. Efficiency is lost with either overload of battery or overload or underload of motors. Normal speed and power continuously and uniformly maintained gives the best result. Batteries should never be completely discharged, unless a very serious emergency should arise, and should never be left completely discharged under any circumstances.

Properly constructed and applied and operated, it is asserted by those who have looked into the matter with care, that the storage battery can do work on the street railway at about half the first cost and half the operating expense of the horse-drawn street-car and this should be approximately represent the relative costs of the two motors, one would suppose, on the highway as well. In street-car practice, the relative weights of car and battery have been about 3.5 to 1 and occasionally as low as 2.75 to 1, where the vehicle is exceptionally light. With sealed rubber jars for automobile work, the weight of the battery is usually lighter than for the street railway and about 3.5 watts is reported to be the output per pound for a three-hour discharge. Where steep grades are met or much stopping and starting is requisite this weight of storage battery is often fatal to success.

The storage battery, although still the weak point of the electro-mobile, has been enormously improved in adapting it to this special and exacting purpose. Great gains have been lately made in its concentration of power, its strength and endurance, its safety, its steady pressure, and its capacity for rapid charge and discharge. With the rapid growth of the electric light and power distribution of the country and even amidst the sparsely settled districts, far from the great cities, facilities for charging are coming to be comparatively common, and this essential improvement is apparently keeping pace with the progress of the automobile itself. With the possibility, if we may assume it, of 5,000 charges and discharges in the life of the battery, it only remains to find a way of making the apparatus lighter, approximating its theoretical weight, without loss of permanence of structure, to give us a machine capable of almost unlimited employment about our cities and even in moderately long-distance work. Already its capacity is reckoned as about four times that of an equal weight of compressed air-storage, and the opportunity for gain is still enormous. But such extension of application can only come when ways are found to reduce costs very greatly. With prices ranging from $300 a ton, in large batteries, to $500 and even $1,000 and upward a ton for small sizes, this system must be seriously retarded.

Just as long as it costs so much and we secure such small returns in energy, the electric apparatus will be tremendously handicapped for all but a very limited range of application in automobile construction. As long as the lightest of storage batteries store but about three per cent. of the energy of equal weights of coal—measured as delivered at the shaft, at that—its use for commercial purposes must remain enormously restricted on land and absolutely prohibited on the water.

The fact that the storage battery has been very extensively employed in railway traction and yet has been in every case displaced again by either one or another of the various competing motors, is not to be taken as proof that it may not prove, in time, the ideal and the commercially desirable motor for the automobile; although undoubtedly it does prove the disadvantage of the accumulator where it is practicable to apply motive power from the primary motor more directly. Apart from weights and volume and cost, its action is ideal; but, unfortunately, volume, weight and cost are the principal obstacles to its introduction and precisely as they constitute objections to every motor in transportation, whether on land or sea. Yet, the experience had on street-car lines has shown that the average life of the battery has been, commonly, about 12,000 miles at best and, at a hundred miles a day, this would mean the replacement of the battery about once in four months. The best work, however, is reported at about 60,000 car-miles for the plates, meantime several restorations of the paste being needed, and this would mean a very great advance in recent practice. Dr. Ball's comparison, some years ago, showed the costs to be about twice as great for a stated amount of work with the storage battery as with direct systems.

The battery should give at least 1.2 watts per pound weight, should weigh not more than 300 pounds per ton transported, and the discharge should be at least, if needed, 0.60 ampere per pound. The storage battery, through increased weight, compels the use of twenty or thirty per cent. more traction power than other systems.

Costs of Operation of the automobile vary greatly, not only with size and duty, but with class, construction and management. It is as yet difficult to state what may be anticipated as a reasonable figure for the standard machine, of the immediate future, even. Tests by the British Automobile Club at Richmond have shown that heavy steam automobiles capable of taking up a load of 3½ tons and transporting it at considerably more than ordinary horse-transportation speed, cost, for fuel, about one cent a mile and the usual upkeep, on *all* accounts, is reported to be

about $2,000 per annum, amounting to about 3 cents per ton-mile, as against the reported cost for equal work with horses and wagons of 15 to 20 cents or more per ton-mile. In Paris, according to reports made to the *Société des Ingenieurs civils,* the electric cab costs an average of about $1.25 a day, for the current and storage, and $4 for all costs of operation; exceeding the cost of the older horse-drawn cab by 10 cents per day. Mr. Maxim's century run of 7 hours and 45 minutes cost $1.25 for his 190 ampere-hours of current used; costing, however, but 41 cents at the dynamo.*

Costs compared by Messrs. Simpson and Bodman, recently, are taken as about $300 per annum for 300 ton-miles of carriage, 300 days in the year; of which work two-thirds is taken as useful, the balance as "tare." Similar work by steam-carriage or wagon is estimated as costing about $95. The ordinary size of two-seated carriage having a speed on the level of about 15 miles an hour and a radius of action of about 40 miles on good roads costs, in the average case with reasonable care, not far from $25 a month for "upkeep." The storage battery and its care and use cost much the largest part of this amount and probably three-quarters in most cases.

In the rivalry between the steam and gas engines on a larger scale, the latter seems to be constantly gaining and, in costs, to be in many cases far in the lead. Recent statistics show that gas-power plants, in Europe, have been found to cost from $0.006 to $0.014 per kilowatt-hour, for the year reported on, and steam plants, for the same period, cost from $0.013 to $0.0142. At Dusseldorf, the costs are reported, for a lighting plant, with gas, as a half cent per kilowatt-hour. The improvements now sought are better regulation of the mean speed, more efficient fly-wheel control and reduction of noise and vibration. Adams reports that gas-producers and gas-engines give an economy of forty per cent. under stated conditions over the steam-engine.† On the other hand, a number of English gas-plants have, of late, been altered over to steam. It would seem that, on the whole, automobiles have given a better comparative record for gas and the petroleums—which are, in fact, of the same class—than has been reported in other departments.

In what will probably ultimately prove the larger and more important, if more commonplace, field of automobile transportation, that of commercial traffic and of the delivery wagon, paying work has long been done by the steam automobile and the other motors are now coming into sharp competition with that pioneer. This field is ordinarily urban; but it is likely that it

* Automobile Magazine, January, 1900.
† *Engineering Magazine.*

will extend greatly in the coming years. Costs of horse-traction have been reckoned, under the usual conditions of operation in the metropolis, as about 17 cents per ton-mile, where the not unusual case is taken of one ton total weight and a mileage of 20 per day. This figure may be reduced to 10 cents by employing two horses to increase the mileage of the single wagon to 40 miles per day. With a small business, in which the vehicle cannot be constantly employed, the costs of work accomplished will increase in proportion to the wasted time. The more continuous the use of the apparatus, as a rule, in all form of transportation, the higher the efficiency and economy.

Electric automobiles competing in such service as the above have been found to demand about 120 watt-hours per ton-mile, equivalent to one-sixth of one horse-power; although, as in all transportation, a surplus power is to be provided for emergencies, as a matter of course. The cost is about one-half that of horse-power, even less, often; both figures including wages and incidentals. The cost per pound delivered by each is computed as 0.168 cents for the electric apparatus and 0.178 for the horse and wagon. The difference in the two methods of computation, per ton-mile and per pound delivered, is due to differences in weights of vehicle and motor. The horse costs 90 per cent. of the total in the one case and the electric motor but 60 per cent. in the other. Exclusive of wages, costs of operation become $1.43 per day for the horse and $1.19 for the electric service—a saving of 17 per cent. for the latter. How far these comparisons will be affected by depreciation is as yet uncertain; but the depreciation of the horse and the wagon is always a very large figure, and very extravagant allowances may be accorded to the automobile to equal them. It is probable that the above comparison may be found, ultimately, to be less favorable to the automobile than it should be.* There is no expectation of reducing costs of horse-service, but no one knows how far the gain may prove to be increased in the improvement of the automobile.

With storage batteries costing, even for light and power station work, $40 to $120 per kilo-watt-hour at low and at high discharge-rates, respectively, and with ten per cent. depreciation, as reckoned by the majority of those investigating the subject, the field offered for improvement in this direction is obviously very extensive and attractive.

Costs of operation in the recent French competitions of 1898 and 1899, as reported to the *Société des Ingénieurs civils de France,** are not far different with steam, vapor and electricity.

* Operating Costs of Horse and Electric Delivery Wagons in New York City. By Messrs. Fliess and Sever, Trans. Am. Inst. Electrical Engineers, 1899.

Electric cabs with the Fulmen accumulator consumed 150 to 250 kilo-watts per mile at an efficiency of battery of 75 per cent. They carried batteries rated at 8 to 12 kilo-watt-hours consumption daily. Their consumption per ton-mile was from 65 to 95 watt-hours for the delivery wagon at 6.5 to 14 miles an hour and from 105 to 160, for the cabs at from 6.2 to 15 miles an hour. Daily costs on all accounts ranged from $3.75 to $4, of which less than half, often much less, was for the power. There was little difference among the several motors in this respect.

Standardization must be effected in the handling of the storage battery, from designer to manufacturer and from manufacturer of vehicle to user. The total watt-hours to be guaranteed should in some way be absolutely determined for all and the rate of discharge equally exactly guaranteed for the specific use to which it is to be put; which use should be understood distinctly by all. When one-half the weight to be transported consists of the battery itself, its exact adaptation to its purpose and a maximum of power and endurance become obviously vital matters, and its precise definition and guarantee no less important. Probably the production of standard and tested sizes of jar and of groups in battery would do much to improve the condition of the market and the use of the accumulator. It will then be at once possible to determine just what proportions of discharge-rate to storage and what proportions and methods of use will give the automobilist the most for his money—and this is, in the end, the problem in every commercial or industrial operation—and will perhaps promptly lead to the reduction of weights far below the 12 watt-hours per pound of active elements in the battery, considered the minimum at the commencement of the year 1900.

The Design and Construction of the Body of the Vehicle and of its running parts, in this country, has been considered by purchasers, abroad as well as at home, to be superior to any foreign manufacture, and the light and graceful American automobile finds a market throughout the world. The almost or quite entire absence from view of the machinery of these carriages and wagons is not only a recommendation from an aesthetic point of view, but also from that of the mechanic; for it means, in addition to improved appearance, a reduced liability to injury by dust and dirt from road and carriage body. All the pretty and comfortable and convenient patterns of carriage and wagon evolved through past decades for equine transportation of passengers and of merchandise have found equally satisfactory representatives in our latest constructions of automobiles, with, in some cases, such improvements in grace of form, convenience of operation

and comfort in use as only could be made practicable after the removal of the horse from before the vehicle. This freedom of design, so obtained, has not yet been fully availed of; but it is very certain that, ere long, the designer will discover his freedom in this respect and we shall soon see some admirably original, beautiful and handy carriages, constructed on entirely different lines from the horse-drawn apparatus, and as unique in their adaptation to their special purposes in use as in their suitability to the performance of good work.

The wheels and their details are coming to be made very solid and strong for the heavy commercial automobile, light, stiff and yet strong for the express vehicles, and, for high speeds and racing carriages, the highest skill of the designer and of the builder is demanded and secured. Ball and roller bearings may here find place, and every device for reduction of weight, of friction and of loss of energy or wasted power, in every direct and indirect manner, will be studied with a view to the application of concentrated power in largest possible degree to propulsion of a carriage of minimum resistance.

Resistance being reduced to a minimum, as far as is practicable, by reduction of the weights of carriage and machinery, the use of large wheel-diameters and of a tire of least resistance are the final expedients for improving the performance of the automobile, and the improvement of our roads and pavements then becomes the most important matter of all. On an absolutely hard and smooth road or pavement, the best tire-material would be found to be the hardest and smoothest of metal. Where large obstructions are to be overcome, the same statement probably holds good; but, for the ordinary highway, paved or not, the resistance to motion of the automobile is mainly found in small irregularities, in the uneven surface of pavements and in the yielding of the roadbed or in the presence of pebbles of comparatively small size, and here the rubber-tire comes into play with great advantage. The minor obstacles imbed themselves into the tire and it rolls on at an undisturbed level and without that serious waste of power, due to the rise and fall without restoration of energy, which ordinarily produces such great waste and resistance to the wheel tired with an unimpressionable material. Experiments at Sibley College on bicycle-tires have shown clearly that, other things equal, the thinner the tire, the better it is expanded, the more permeable its surface and the more impermeable its body, the better the work on the ordinary road or elsewhere. For heavier vehicles, where considerable weight must be carried, and therefore a heavy tire necessarily employed, if

pneumatic, a compromise must be felt out for each line of automobiles, light and heavy, racing and other, between efficiency in this respect, the costs and the risks of puncture. With improvement of roads and street pavements the problem of the tire will probably, in time, completely solve itself and the vehicle will do good work with the more durable forms.

The Materials of the Coming Automobile must include, probably, new steels for strong and elastic parts, making axles and springs of indefinite life with lightness, strength and high elastic limit and with proportional moduli of elasticity and range of flexibility and ductility. For the wagon-body and accessory parts, woods, like East Indian teal and our own ash and white and yellow pines, combining lightness, strength and elasticity and large range of yield—the ideal yew-like material for archers' bows or a carriage-bar—will find place in the construction and will lead to corresponding improvement of every older form of carriage and railway vehicle. New alloys, very possibly—as, for example, the "alzinc," used so extensively in Sibley College work for such cases—may prove available for castings, giving admirable combinations of lightness and strength, and other kinds for "running parts," where the highest possible strength is demanded at whatever cost, are certain to find prompt adoption into this system.* All advancements in aëronautics and in marine, torpedo-boat, engineering will afford suggestions for the automobilist and help on his progress. Invention and discovery, science and all arts, the brain of the man of science, the hand of the mechanic, the genius of the inventor and that of the engineer, will alike conspire toward a common end—the improvement and the successful introduction, for all its many purposes, of The Coming Automobile.

To-day, cast-irons, made in the air-furnace, may be obtained with a tenacity of above 30,000 pounds per square inch; cast steels may be made of from two to five times that strength, according to proportions of hardening elements, and steel castings replacing those of iron may be purchased with resistances and ductilities enormously exceeding those of cast-irons. Wrought

* Alloys of possible value, especially for castings, have sometimes been discovered in the course of research in the Mechanical Laboratory of Sibley College. Thus: "Alzinc," as it has been generally termed, consists of two-thirds aluminium and one-third zinc. It has the general working quality of a very good cast-iron, but has only about four-tenths its weight (S. G. 2.9), works beautifully in the lathe and on the planer, and can be cast very fluid at a comparatively low temperature, making remarkably sound and even castings. Its tenacity is about 25,000 pounds on the square inch, and, when warm, it is ductile, but it is brittle at low temperatures. Its cost is about two-thirds that of aluminium. Another alloy, "alzinctin," contains 50 per cent. aluminium, 25 tin and 25 zinc. Its specific gravity is 3.17 and its cost is about 80 per cent. that of aluminium, a trifle higher than the preceding. It has a measured ductility, even when cold, about 5 per cent., and is a better material for smaller parts and where some ductility and elasticity are desirable. Its tenacity is about 20,000 pounds per square inch. Both alloys, at the boiling point of water, become very much tougher and more ductile. No copper can be employed in making these alloys, as it proves wholly deleterious.

irons in bars of good quality have tenacities of from 50,000, as in bridge-irons, to 60,000 and over with harder, and 70,000 with cold-rolled irons, and, in rods and wires, having increasing tenacities with decreasing sizes until 150,000 pounds and more may be had in the smallest sizes. In steel, these figures are much exceeded and wire of about 175,000 pounds tenacity has long been obtainable for bridge-construction and special qualities, like, for example, that going into the best of the fine and high-grade watch-springs, have been brought up, in these very small sections, to 300,000 and even, occasionally, to 400,000 pounds per square inch.

Lightness of Construction is usually a valuable property in our moving machinery and especially for that of transportation. The product of the inventor and mechanic, of the man of mind, has now come to enormously excel, in this respect, that of nature. The common draught-horse weighs about one ton per horse-power and probably rarely, if ever, works by the day at much less than that figure. Man, if strong and muscular in exceptional degree, may perform his day's work at a weight as little as 750 pounds per horse-power, probably oftener at double that rate. Stationary engines weigh 500 to 1,000 pounds per horse-power. The locomotive weighs from 100 to 150 pounds per horse-power; the marine engine rarely falls below that weight, except in the special cases of torpedo-boat and fast yacht construction, where the weights are brought down, often, to 60 pounds, sometimes to 40, and rarely to 20 or even 15, while the aëronaut halves even these figures on rare occasions. The birds are reported to practically duplicate them; notwithstanding the fact that the animal muscle seems to be subjected to a load of but a small fraction of that carried by the metal parts of mechanical motors.

For the purposes of automobile construction, as well as for aërostation, the true gauge of the value of a material for use in the structure is best shown by its capacity for carrying its own weight, rather than simply by its tenacity as usually reported. It is of no advantage that a substance should have double the tenacity or compressive resistance of another if it also weighs twice as much. The length of rod of uniform section that may be carried by any substance, when suspended from one end, is the real measure of constructive value for our proposed use, assuming that the material is of the desired class for our immediate purpose. Thus: good cast-iron will sustain over two miles, say 12,000 feet, if made in the air-furnace or the best ordnance iron. Common bronze carries a trifle more, perhaps 14,000 feet.

Good wrought iron, of 50,000 pounds tenancity, will thus support 15,000 feet, nearly three miles, and in small wire double that length. Steels of eighty, a hundred and a hundred and fifty pounds tenacity per square inch, will, respectively, support four, five and seven and a half miles of their own material in form of a prism suspended by one end. Aluminum supports about four miles and some of its alloys double that length. Fine watch-springs may be found equal to the load of fifteen miles of their own section. Aluminum and magnesium, the two promising new metals, seem likely to provide alloys capable of substitution with advantage for the now usual cast metals, but not probably to replace the steels in malleable work. There is here, however, a very important field for exploration. It may probably be asserted that any material incapable of sustaining at least two miles of its own section in the form of castings or four miles, forged, is not to be considered particularly desirable or promising as material for use in automobile construction, where the aim is the production of a machine combining minimum weight with strength and safety.

The Limiting Value of the Materials of Automobile Construction may thus be taken as not far from 10,000 feet, as above gauged, for castings and 20,000 for forged parts in metal. Otherwise stated, the quotient pounds on the square inch divided by weight per cubic foot should exceed sixty ($t/w > 60$) for strong castings and should be above 120 if not 150 for forgings. Gun-iron and tool-steel will come into use in the finer constructions and probably some of the new alloys, as nickel-steel and those of aluminium.

Hemp rope and similar fibres are comparatively weak and carry but about two miles of their own section. Good fishing cord carries, if of best linen, about eight miles and, in tension-parts, is thus superior to iron and the soft steels and to aluminium. Silk may sustain a length of nearly thirty miles and is, in turn, vastly superior to linen and, in fact, to all organic material available for similar purposes. Catgut sustains five to seven miles, rawhide about three and "sinew" about the same as silk. These strongest fibres are equivalent, in tension, to steel of about 100.000 pounds tenacity or something over. The woods of best class have values of $t/w = 250$ or more, as a rule. Ash gives $t/w = 350$ and hemlock may rise to $t/w = 450$; the range being equivalent to that of steels of from 125,000 to 200,000 pounds tenacity. Hickory stands about at the upper limit, with the strongest steels of ordinary character. Copper, tin and zinc, unalloyed, have no attractions for the engineer-automobilist.

Success in the improvement of the details of construction evidently depends largely upon discretion in the choice and use of the materials of construction, and one important path to further progress lies in the direction of further exploration of the field for new metals and especially of new alloys.*

Requisites—Positively certain and safe operation, automatic just as far as possible, is evidently one of the desiderata with the automobile. Its essential characteristics, if it is to be successful and permanent, may perhaps be thus summarized:

(1) The automobile must be safe, comfortable, convenient, handy and quiet, light and strong, easy of maneuvering in forward or backward motion, powerful at low speeds when ascending hills, capable of attaining comparatively high speeds on smooth, level roads without jar or vibration or excessive expenditure of fuel or energy, and must please the eye as well as the judgment, and a sense of fairness as to cost.

(2) Its action must be, in largest possible degree, automatic, and it must be capable of being handled safely and satisfactorily by the average user. It must be simple and not liable to become disabled within a reasonable period of working life, easy and inexpensive of repair in case of a breakdown, readily adjusted as to speed on any road or any incline, with a brake capable of, if necessary, skidding its wheels—but no more—and capable of going over rough country without danger to carriage, machinery or people, and with positive advantage to the roads.

(3) It should be odorless, as well as noiseless, prompt and certain in starting, easy, and as prompt as the emergency may require, in stopping. It should have a good surplus of both impelling and stopping power. It must be free from danger of fire, explosion or breakdown of the running parts of the carriage. The latter should have maximum factors of safety.

As to our position to-day—Probably no one familiar with the situation and with the construction and the use of the automobile as now supplied the market, and as used by the automobilists of the closing year of the nineteenth century, will hesitate to assert the full demonstration of the following points:

(1) Automobile operation may be safely effected and no greater dangers attend it than are accompaniments of horse-drawn vehicles.

(2) Speeds may be attained, and maintained, higher than can be either attained or maintained by horse-power—doubled speeds

* Notes on Materials of Aëronautic Engineering; Proceedings of the International Conference on Aërial Navigation; Chicago, 1893, R. H. Thurston.

Materials of Engineering; 3 vols., 8vo., R. H. Thurston; New York and London, J. Wiley & Sons and Chapman & Hall.

for short distances and trebled for long distances. Length of route may be unlimited.

(3) Heavy gradients may be surmounted and any road fit for horse-drawn vehicles may be traversed by the automobile.

(4) A good construction of automobile machinery in proper hands—not necessarily those of a skilled mechanic—is, on the whole, much less liable to serious disability than is the horse. The better and more expensive the automobile, the less this liability to invalidism; the more valuable the horse, the more is he liable to injury and illness.

(5) Costs of maintenance and operation are less with automobiles than with equine outfits. With heavy work, the difference is immensely in favor of the automobile.

(6) Commercially, the well-built horseless vehicle, of whatever class and in whatever line of work, is greatly to be preferred to the horse and vehicle and its accompaniments of stable, attendance, untidiness, unsanitary conditions and obtrusiveness.

(7) There are no serious objections to the general use of the automobile for either heavy or light, slow or speedy, traffic. There are fewer and less serious objections than were raised to the introduction of the street-railway; while there is open to them an enormously more extensive field.

(8) The tires of the automobile, if not pneumatic or of rubber, may be made of any desired width and, of whatever breadth, will aid in the improvement and permanent maintenance of the roads, while the hoofs of horses injure them.

(9) Weights of automobiles, for similar powers and loads, may be made less than the weights of horses with their vehicles.

We may probably hope to be able, ere long, to say that prices of automobiles of similar speeds and loads may be made less than those of the equine outfit.

Whichever of the now more or less successful among the existing systems of automobile be adopted for the specific work to be performed, the advantages of the automobile over the horse-drawn vehicle are unquestionable. These advantages are, in general:

(1) Reduced cost of transportation.
(2) Greater speed and better control of speed.
(3) Absolute docility.
(4) More perfect "handiness," as a naval man would say.
(5) Sanitary gains of very great importance.
(6) Less cost of maintenance of pavement and roads.
(7) Less trouble in crowded city streets from interruption of traffic, as a consequence of the less space occupied and better action of the automobile.

(8) Much greater quiet, especially in traversing paved streets covered with cobblestones or brick.
(9) Reduced space and cost in storage.
(10) Extinction of the nuisance and costs of the stable.
(11) Abolition of danger from "run-aways."
(12) Continuous decrease of costs, as against steady increase with horses.
(13) Resultant upon the introduction of the automobile, to the exclusion, largely, of the horse, will come such improvement of our city streets and country roads as has only been just begun by the bicycle and its friends, improvements particularly adapting them to the new vehicle.

The automobile is the coming feature of our modern life. The bicycle has had its period of rapid development and of popularization, and the automobile is its natural successor. The bicycle is coming to be the every day instrument of business and pleasure. The day of excitement and of hysterics has passed with it, and we are settling down to its sensible but limited use. The automobile is a vastly more important development and it has an immensely larger and more serious and extensive field before it. The "wheel" has taken its place among the common necessaries of every-day life and largely passed out of the field of the "fad," pure and simple. The automobile is coming in to take up a great work and one of much larger range and higher importance. It is bringing to the aid of transportation of all kinds, light and heavy, passenger and freight, work and pleasure, the aid of the inventor and of the motor-machine. It is adapting itself alike to the demands of the rider in the park and of the tradesman sending home the family dinner, to the needs of the delivery wagoner and of the postman, to the transportation of tons of ironwork and of ounces of lingerie, to the slow traverse of the ploughed field or the deliberate movement of the "auto-van" and as perfectly to the express-speed of the racing vehicle over the one-mile track or over the hundred or the thousand mile course. Pleasure, convenience, business and public advantage, and all industrial economies are about to be promoted by its evolution, as power, speed and safety and handiness are gained, and costs are reduced in construction and in operation.

The horse will be relegated to a narrower field of work, and our streets will, in time, become as perfect sanitarily as they are coming to be, in well-managed cities, in their construction. The run-away horse, the constant source of anxiety and frequently of actual danger in the city street and in the parks, will disappear,

and the lives of mothers and grandmothers will be rendered thus more serene. Ericsson's automobile fire-engine of 1860 will have many useful successors. Cross-country routes will gain in attractiveness while losing the risks of ordinary coaching, and the hamlets and farms off the line of the railways, among eastern hills and on western prairies, will become accessible and comfortable as homes and pleasure resorts for all seeking the quiet of nature and the pleasures of country life, as well as for their native workers and the small farmer or the retiring millionaire. Hauling lumber, transporting ore, carrying merchandise over the common highway, delivering the morning purchases in the city, driving in the country or through the park and going to the opera in the evning:—each use will find its best and most satisfactory form and type and special construction, and the civilized world will be transformed through another and hardly less wonderful evolution than that which, in the field of railway and steamboat transportation, has characterized the century just expired.

Inventors and inventions of the older sort, amateurs in science and art, and a spontaneous inspiration, are now nearly gone by. The invention of to-day is simply a design adapted to a precisely defined purpose by a trained designer, familiar with the principles and practice of his art, who proceeds, by direct and safe and certain routes, to his end, adapting a mechanism of as exactly defined plan and method of operation to the work. The educated and professionally-trained designer has succeeded the ignorant, but often marvellously skillful and ingenious, inventor, whose crude devices required months and years, often, of experiment, trial and error, to work into practically useful shape and profitable form. To-day one trusts no inventor, if he lacks that scientific knowledge which is essential to success as a designer. It is the expert in the field in view who, to-day, determines just what to do and in what manner to reach the desired end. Every successful professional is a specialist and each is compelled often to say—as did a distinguished surgeon when I once asked him a question requiring special knowledge for its answer—"I cannot tell you that—*but there is another man who can!*"

But the man who can say just what is to be the future of the automobile, what form of motor, if any, is to be the one exclusive motor, or what will be the ultimate distribution of work among the perhaps various permanent types of horseless vehicles has not yet appeared. Only this can be said with probable truth: The steam-engine is not likely to see any very great advance in the immediate future and is too near its practicable limit of perfec-

tion, probably, to have much chance of success if that success depends upon extensive improvement in construction and type or in thermodynamic perfection. The internal combustion engine has a wider range of possible improvement, and to this extent has larger promise, but with no certainty, that its defects will be removed at any early date. The storage battery and electric propulsion have a similar relation to the steam-motor and, like the gas-engine, await the genius who can reduce still serious infirmities and give a very reasonable degree of approximation to the ideal prototypes.

The Trend of Progress of the Automobile, in all directions, is toward perfectly well-understood and fully recognized ideals and limiting perfection and the educated, professionally well-informed and experienced engineer will undoubtedly find many ways of pruning away defects and of importing improvements until that limit of practicable and economic advance is reached for each of these interesting types of self-propelling vehicles. This is not the work of the amateur in any line and the day of the self-appointed promoter of great advances in the industrial arts has gone by, never to return.

The Automobile Girl

Another bright meteor flashes across
  The skies of this workaday world;
Of all the dazzlers she soon will be boss—
  All rivals from power will be hurled!
She's trim as a two-year-old running on grass,
  A picture from summit to heel,
That fearless, intrepid American lass,
  The girl on the automobile.

She handles the lever with delicate skill,
  Sits straight in her seat as a queen,
She skims the smooth levels and scales every hill
  With ease on her silent machine.
Her eyes are a-sparkle with jolly delight,
  Her song has a silvery peal,
As onward she speeds in enjoyable flight,
  The girl on the automobile.

The fellow she honors with place at her side
  To take a spin over the street,
Swells up like a toad on a log in his pride,
  As stiffly he sits on the seat.
He knows he is stared at by all of his crowd,
  Can picture the envy they feel
To see him enthroned by that maiden so proud,
  The girl on the automobile.

Ye sweet cycle fairies with skirt split in twain,
  Your It-ness is waning at last!
Ye maidens who drive tailless horses, your reign
  Will soon be a thing of the past!
You long have been held as the cream of your sex,
  But now in this new-fangled deal
You'll get the keen gaff in your beautiful necks
  From the girl on the automobile.

Social Aspects of the Automobile

By Sylvester Baxter

THE automobile has a unique social record among improved transit instrumentalities. At the very outset it leaped at once into high social regard. The horse, the source of chivalry and inseparable from the idea of knighthood, was at once suplanted in the favor of aristocracy by his mechanical rival. In France the Automobile Club straightway vied with the Jockey Club as a great social organization and as the gathering-place for *la haute société*, becoming not only a markedly aristocratic organization, but even a centre for the reactionary elements in the recent scheming and plotting against republican and democratic tendencies in the government.

It seems very strange that one of the most important instruments of modern progress should start out with such associations. But "motor-sport" is the rage of the day, and as the golden youth of centuries past used to put on their coats of mail, mount their steeds, and go forth to the tournament, so their successors of to-day don garments that give them the aspect of common mechanics, with overalls and oil-cloth jackets, and race over the highways on their motocycles, voiturettes, or automobiles at reckless speeds that rival the railway express. Like the sports of chivalry, the new pastime requires courageousness and coolness, but more than those, it demands a mental equipment and physical training in accord with the spirit of the age—an adequate knowledge of mechanical science, together with a technical experience in which the oil-can and the monkey-wrench have taken the place of the sword and the lance. It is, therefore, significant that in its pre-eminently aristocratic phase the automobile should exhibit a socially leveling trait; making the very attributes of the trained mechanic those which are most necessary to proficiency in its use.

Other instrumentalities of progress in transportation have both their aristocratic and their plebeian phases. The railway, for instance, has its private cars and first-class coaches, its immigrant trains, and its third-class accommodations. The bicycle had a gradual development; at first an athletic device and an instrument of popular sport, it suddenly sprang into the highest fashionable favor, and is now a universal convenience, its use an

accomplishment almost as indispensable as a knowledge of how to walk. The automobile will inevitably have its broad, utilitarian phases; the high social favor in which it now stands in the days of its beginning will undoubtedly continue, but it will be insignificant in comparison with its manifold services in many other ways. The reason for this remarkable social regard may easily be seen. It lies very largely in the great cost of motor-vehicles in their present stage of development. There is an enormous demand for them, and the supply is exceedingly limited. So only those who can afford to pay high prices can obtain them. They are at present a luxury. Their cleanliness, their ease, comfort, and rapidity of motion, make them particularly desirable, and at present their possession and use is a mark of social distinction.

In time, however, the social monopoly of the automobile must give way to the demand for its universal use. This demand will be met by the increasing facilities of production which will suit all tastes. As with the horse and carriage, the most luxurious forms will supply the requirements of the wealthy, while good vehicles will come within the means of the moderately circumstanced, including a large constituency for whom the keeping of a horse and carriage is too expensive a luxury. Therefore, notwithstanding its distinctively aristocratic advent, the automobile will become one of the most powerful of social levelers. But its effect will not be that of leveling down; it will level up, by building a strong course in the structure of modern civilization, with its diffusion of comfort, its abatement of the gigantic nuisances that proceed from animal traction, and the development of better and more convenient ways of life and superior means of intercourse in both city and country. Like all other advances in invention, its tendencies will be distinctively toward democracy.—New York *Home Journal.*

MODERN IMPROVEMENTS

WRITEM—Young Rimer is an up-to-date poet.

REEDEM—How's that?

WRITEM—He says his Pegasus is an automobile.—*Baltimore American.*

Mechanical Propulsion and Traction

By Prof. G. Forestier

Sixth Paper

LET us now pass to the four-wheeled carriage. This consists essentially of a frame or of a body resting upon a rear axle and a fore-carriage, and connected with the former in an invariable manner. The mode of attachment of the frame to the fore-carriage permits the latter to assume any posi-

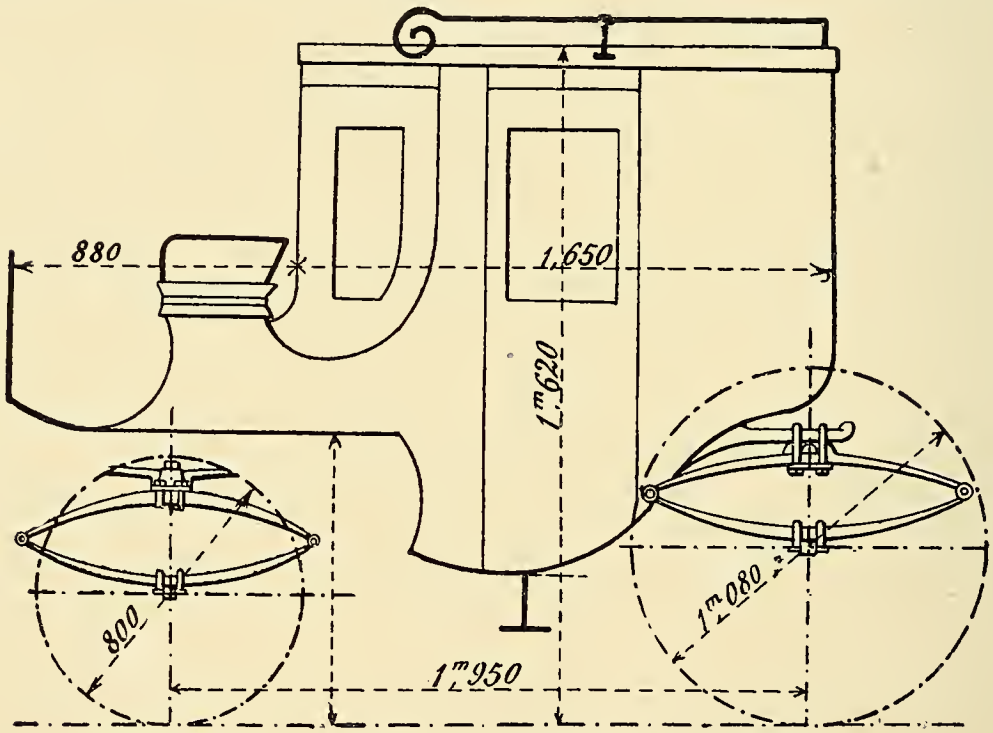


Fig. 23. Carriage for Passengers and Baggage

tion whatever with respect to the body. It is upon the fore-carriage that the motor acts.

The suspension of the fore-carriage and of what is interposed between the frame and the hind axle, we shall have to examine separately.

Concentrically with the king pin, the fore-carriage is provided with a "fifth wheel," consisting of two circle-irons, one connected with the frame and the other with the axle. It is evident that

these two irons must remain in one plane in order that their relative motions may take place without any difficulty; and such a condition must be assured by the suspension of the fore-carriage. Moreover, the suspension must, as in the two-wheeled vehicle, protect the living motor against the jerks that result from the shocks of the wheels against the projections of the roadway.

We represent herewith (Figs. 23 to 26), by way of example, a few vehicles that form part of the rolling stock of the Compagnie d'Orleans. The elliptic springs of Figs. 23 and 24 are adapted for light carriages only, since they are incapable of keep-

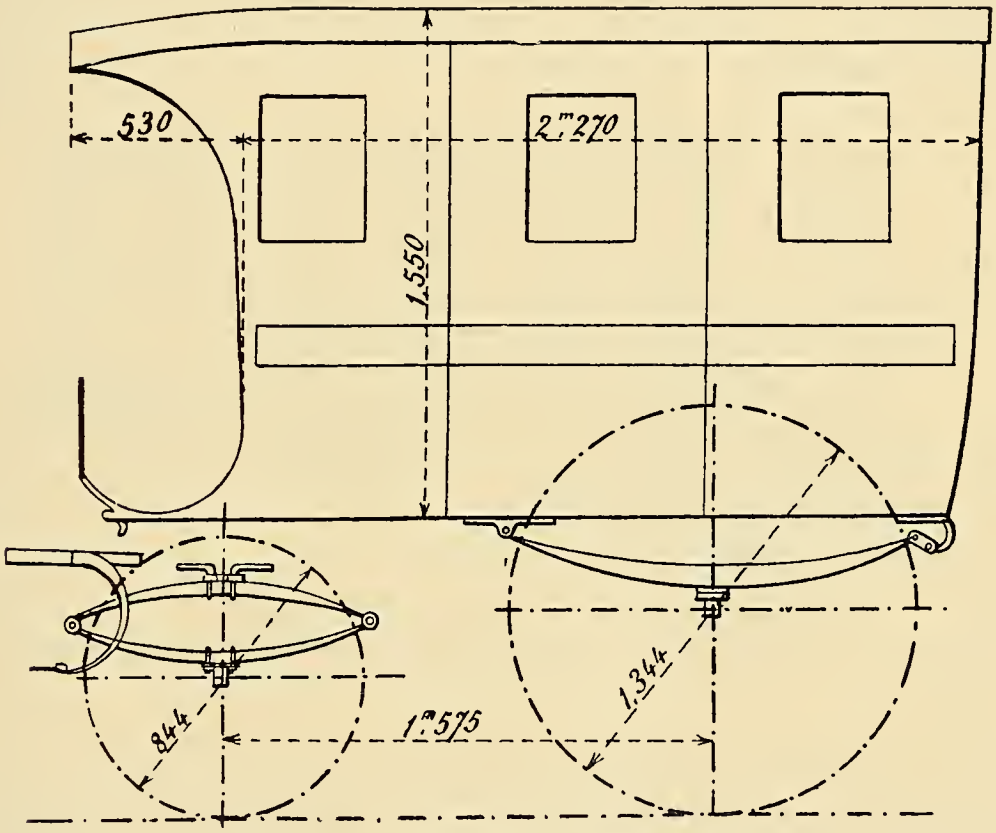


Fig. 24. One-horse Delivery Wagon

ing in a plane the plates of the fifth wheel, which is liable to buckle, owing to the fact that it is supported by two diametrically opposite points only. Moreover, they present here again the same drawbacks that we have pointed out in speaking of their use in two-wheeled vehicles.

The longitudinal springs of Figs. 25 and 26, fixed by their front extremities to the frame of the fore-carriage, and provided at their posterior extremities with a transverse spring, the centre of which supports the extremity of the said frame, completely assure the keeping of the fifth wheel in a plane, since there are

always three bearing points. Here, since the traction of the motor is exerted upon the anterior extremities of the longitudinal plates, such extremities must be assembled with the frame by a roller.

As regards the suspension to be interposed between the carriage and the rear axle, there are two cases to be considered—one in which the vehicle embraces a straight frame placed above the axles (trucks, delivery-wagons, omnibuses, etc.), and the other in which it is provided with a body of a more or less elegant form descending between the axles.

In the first case, for the suspension in the hind-carriage, we have merely to imitate that in the fore-carriage. Such suspension is shown in Figs. 25 and 26. Nevertheless, in trucks that

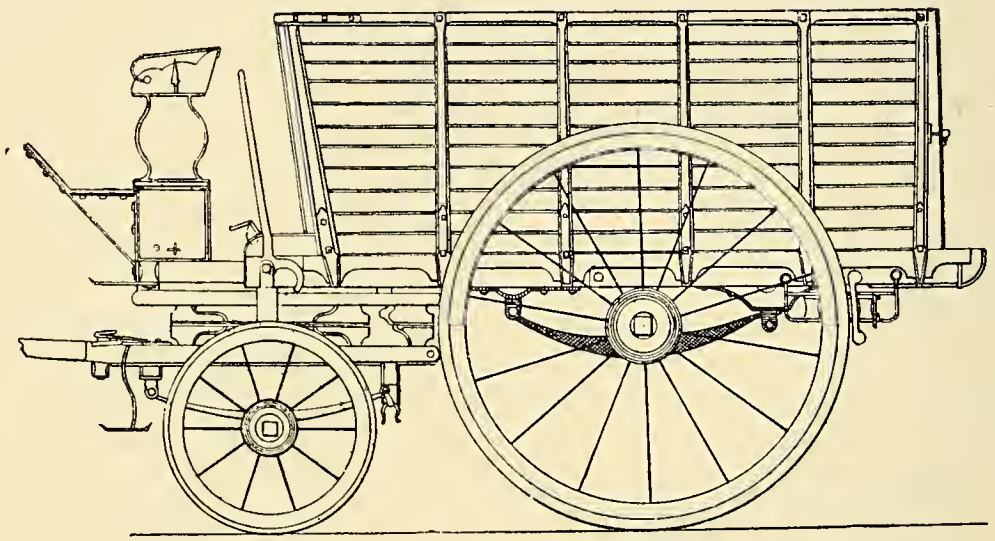


Fig. 27. Four Wheel Coal Wagon

are to carry heavy loads, no transverse spring is placed in the rear, and there is only a longitudinal spring attached to the frame through a roller at the front extremity, and through a link or some other movable device at the posterior extremity (Fig. 24).

In the second case, the usual custom is to transmit the traction to the hind-axle, either through elliptic springs (which have the special inconvenience of permitting of vertical oscillations only), or through bow-springs, which, contrary to the arrangement found in the preceding carriages, carry transverse spring-plates at the front extremity of the longitudinal plates. It is the posterior extremity that is fixed directly to the body and transmits the traction to the axle by compression.

In certain fancy carriages, the back spring-plates, instead of being connected by a roller, are joined through links. The

upper plate is then curved, and this increases its alterability of form (Figs. 29 to 32).

In a light carriage, upon a road in a perfect state, such an arrangement is acceptable; but an æsthetic arrangement of this kind for vehicles that carry heavy loads would be inadmissible.

In vehicles that carry heavy loads, such as coal wagons, for example, the posterior extremity of the spring-plate is free, as in the hand-carts already mentioned, and bears upon a metallic piece fixed to the frame and provided with cheeks to prevent a lateral motion of the spring (Figs. 27 and 28).

In former days, the old-style coaches, with their swan's-neck

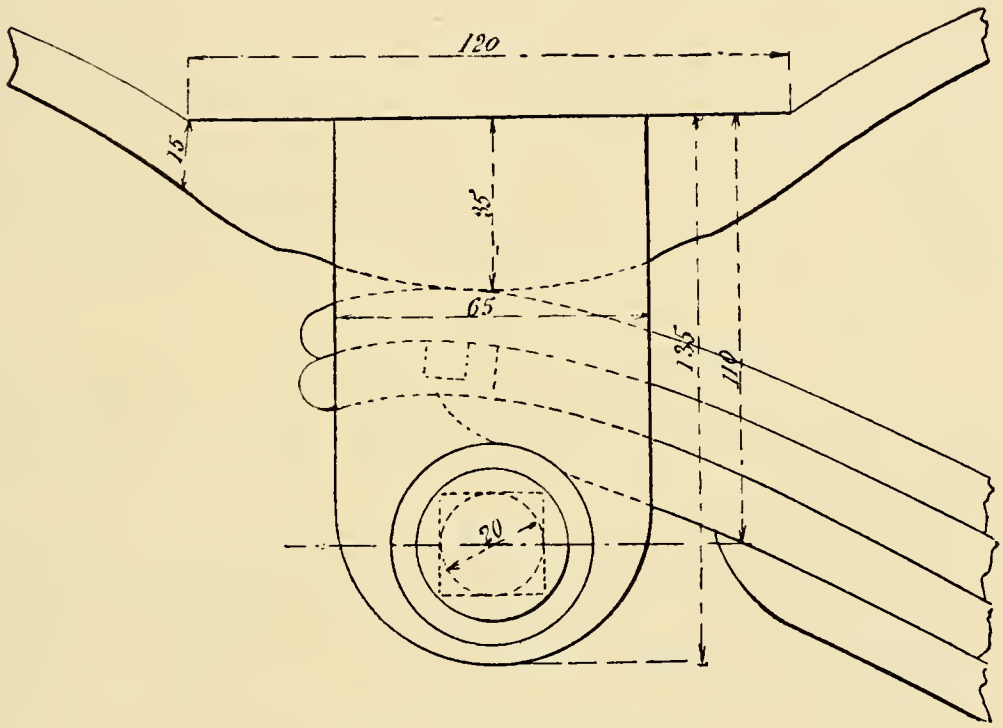


Fig. 28. Spring with Slide

springs, from which the body was suspended by straps, completely satisfied the object of suspension; but then, in order to assure the transmission of the traction of the team to the hind axle, the two axles were rendered interdependent through a rigid frame. This frame, the axle and the wheels constituted a very heavy combination of which the inertia was unfavorable to the draught. Such an inconvenience is still presented in mail-coaches, which have an analogous mode of suspension.

By adopting a properly jointed system for the frame, some manufacturers have got rid of the inconvenience of the interdependence of the four wheels, and at the same time have preserved all the advantages of the sensible mode of suspension, viz.,

transverse springs in front and swan's-neck springs behind (Figs. 30 and 31).

In automobile carriages in which the transmission is effected through chains, the transverse oscillations must not be too much facilitated for fear that the chain may be too easily thrown off the sprockets, especially in changes of direction at a high speed. To prevent such accidents, however, the gearings might be provided with cheeks to form a guard.

In a study of the suspension of automobiles, the position of the driving-wheels must not be lost sight of. If they are in front, everything that we have said concerning the horse-drawn four-wheeled carriage is applicable to the suspension. If they are in the rear, in order that the spring-plates may transmit the propulsion to the body and then to the front axle, in working by extension, it will be necessary, through rollers, to attach to the frame the back plate of the spring fixed to the driving-axle, and, on the contrary, the front plate of the spring fixed to the fore axle. The links should, in the same way, be placed at the front extremity of the hind spring and to the posterior extremity of the front spring.

When we come to speak of driving-wheels with movable axle-journals, we shall be led to ask whether manufacturers are not too much the slaves of a predilection contracted for animal traction. We are led to propound the same question here apropos of suspension and axles.

It is expedient, moreover, to distinguish two cases: one in which the carriages are light enough to be provided with elastic tires, and the other in which the vehicles are heavy and have to be provided with iron ones. As regards the latter, the experiments of Dupuit permit of no doubt as to the propriety of continuing to interpose springs between the axles and the frame, so as to diminish the non-suspended mass. On the contrary, as concerns the former, especially those of which the wheels are provided with pneumatic tires, that is to say, the weight of which does not exceed one ton per axle, would not the logical consequence of the use of pneumatic tires be the doing away with axles, the fixing of the journals directly to the frame, and the interposition, between the latter and the body, of the transverse springs necessary for the comfort of the passengers?

We should thus peculiarly facilitate the transmission between the motor and the wheels, which would form an invariable whole.

The transmission of motive force to the axle hauled or propelled would then be no longer effected except through the intermedium of the springs; and it might be easily possible to adopt

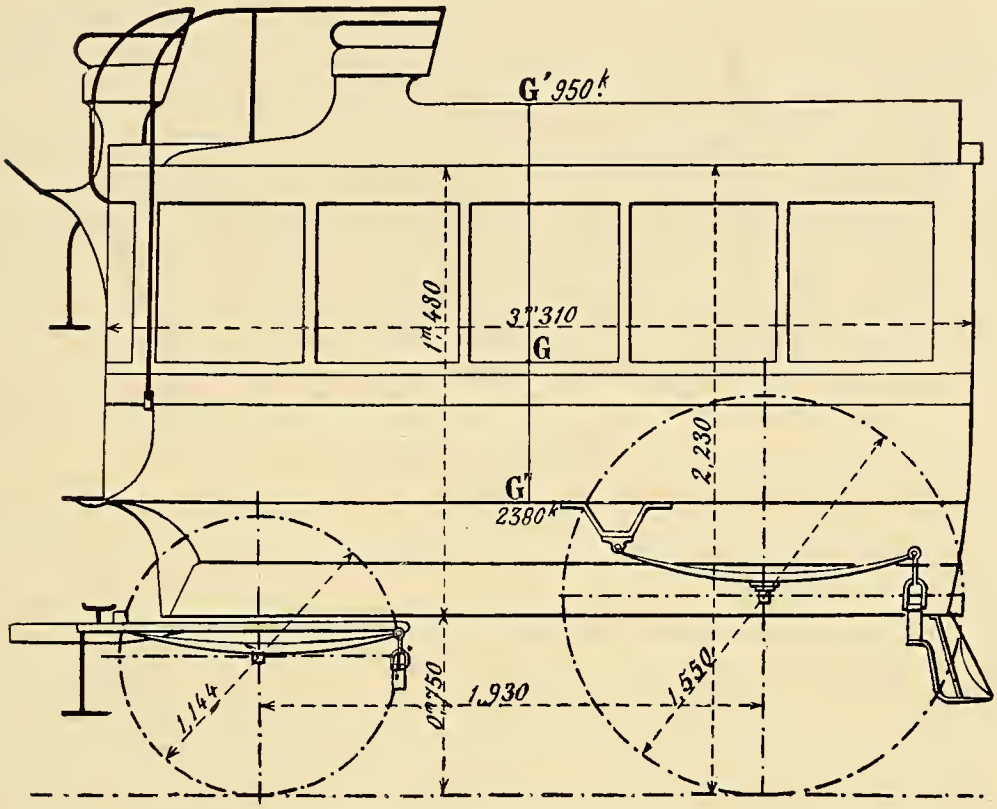


Fig. 25. Two-horse Omnibus

for suspension the arrangement best adapted for the object to be attained.

In certain American carriages with wheels provided with metallic spokes and pneumatic tires, the electric motor is carried directly by the driving-axle. The frame that connects the two axles rests upon them without the interposition of springs, and the body alone is spring-supported. In the first type, the method of attaching the transverse springs did not permit of any variability in the length of the plates; but in a new type now under construction at the Clement establishment, this defect will be corrected.

VIII.—Experiments to be Made.—We have already stated that the calculation of the power necessary for a motor to possess in order to impart a given speed to an automobile vehicle is somewhat imperfect in the absence of a precise determination of the numerical coefficients that enter into the formulas of the various resistant forces. We believe it to be expedient to say a few words as to the experiments that it would prove of interest to make in this connection.

(a) *Coefficient of Friction of the Axle-Journals.*—In a communication to the Academie des Sciences,* six years ago, M.

* Comptes rendus, 2d semestre, 1884, p. 861.

Marcel Desprez pointed out the method to be pursued in order to measure the coefficient of friction of axle-journals in their boxes. It is only necessary to raise the carriage, remove the driving-chain and give the wheel suspended in the air a rotary motion of which the velocity is determined by counting the number of revolutions made in a given time; and then to take the number of successively decreasing revolutions that the wheel, when left to itself, effects in the same period of time.

In fact, we have for φ the relation:

$$\varphi = \frac{p^2}{gr} \frac{d^2\alpha}{dt^2}$$

in which p is the radius of gyration of the wheel, and r the radius of the wheel.

The decrease in the velocity is feeble enough to allow the differentials to be replaced by the seconds differences without sensible error. So, it may be said that the coefficient of friction φ is sensibly proportional to the seconds differences of the mean velocities during 30 seconds, which may be easily obtained by counting the number of revolutions of the wheel during this period of time.

If, at the beginning of the experiment, we give the wheel a velocity corresponding to speeds of translation of 4.25, 4.8 and 5.4 miles an hour, we shall probably find a very rapid decrease in the number of revolutions of the wheel, since, at this moment, the sliding friction of the axle-journals does not alone intervene, there being likewise the obstacle that the air opposes to the motion of the spokes, rims and tires.

After the velocity has become sufficiently reduced to make this cause of retardation disappear, it will be found that the coefficient of sliding friction will continue to diminish in measure as the velocity diminishes, and that, too, so much the more quickly in proportion as the axle-journal is better lubricated.*

There will be an abrupt increase toward the end of the experiment, because at this moment the lubrication will be less perfect.

If the experiment be renewed in simply throwing the motor out of gear, but in leaving the wheel connected with the transmission, we shall obtain a new coefficient, φ^1, which, through its difference from the first, φ, will make known the loss occasioned

* There might seem to be a contradiction between this increase of the coefficient of friction as a consequence of incomplete lubrication and the increase, with the speed, of the coefficient of friction in the case of a too abundant lubrication. But such is not the case. The coefficient of friction between lubricated surfaces is always inferior to the coefficient of friction of the same surfaces dry; but the difference continues to diminish in measure as the velocity increases.

by the friction of the various parts of the transmission at the different velocities of the wheel.

(b) *Measurement of the other Resistant Forces.*—For ascertaining the value of the other resistant forces that oppose themselves to the motion of the carriage, the experiment is not so easy.

The carriage under experiment may be drawn through the intermedium of a dynamometric apparatus. In most cases, the apparatus employed in experiments of this kind are derived from the Morin registering device, which, being well known to every one, we shall only briefly describe. It consists essentially of the following parts:

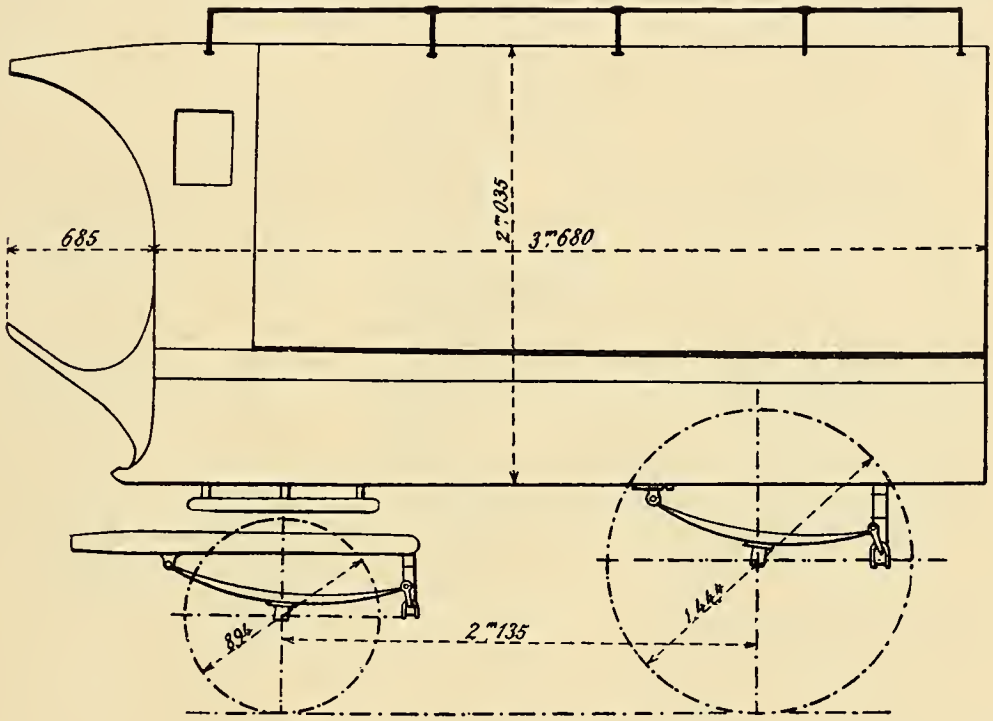


Fig. 26. Two-horse Delivery Wagon

1.—Of two spring-plates, *A B* and *C D*, properly connected by links *J* and *J'* at their extremities. One of the plates is fixed by its centre to the frame of the carriage, while the other is provided at its centre with a coupler, *P*, to which the motor is attached. The distance between the centres of these two plates is sensibly proportional to the static stress that is exerted upon the coupler.

2.—Of a registering apparatus formed of a band of paper which unwinds at right angles with the direction of the displacement of the movable plate of the dynamometer. To the centre of the plates are fixed pencils or styles. One of these, *R'*, fixed to the stationary plate, draws a straight line, while the other, R″,

fixed to the movable plate, draws a sinuous one. The distance between corresponding points of these two lines gives numbers proportional to the static stress at the time of taring the instrument.

In order to produce a regular unwinding of the paper, the best of the apparatus among those that have been experimented with seems to be the one devised by M. Paul Richard (Fig. 33). This consists of three cylinders: (1) one, *O*, of small diameter, loose upon its axis, around which is wound the registering paper; (2) one, *O'*, of large diameter, actuated by clockwork, and over which passes the paper, which is carried along either through

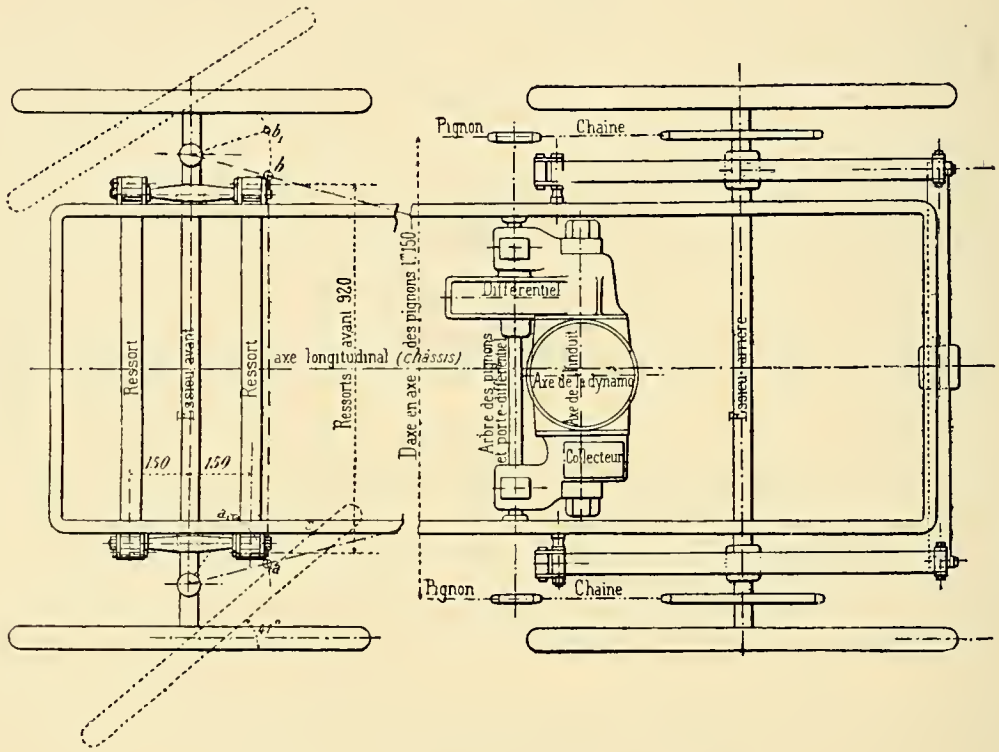


Fig. 30. Plan of the Landaulet Frame

simple adhesion to a rubber border, or through a series of small projections on the cylinder; and one, *O''*, of a diameter nearly equal to that of the first, actuated by a special clockwork movement, which unwinds the paper in measure as it is carried along by the large cylinder. The clockwork movement of the large cylinder is capable of taking on two velocities.

With registering dynamometers of the Morin type, we obtain only a record in gross of the various resistant forces, and that, too, only on condition that the vehicle and motor have the same velocity; since, otherwise, the dynamometric apparatus would register not only the tractive force necessary to overcome the

sum of the resistant forces, but also the relative acceleration resulting from the difference of the velocities.

A means of making the necessary correction is easily obtained by causing the apparatus to inscribe a dash upon the registering paper at every revolution of the wheel. If we suppose the unwinding motion to be sufficiently uniform, the spacing of these dashes will be in inverse ratio of the velocity. We shall therefore have a means of assuring ourselves whether or not the motion is uniform, or of calculating the acceleration concomitant with the stress registered. If there is any reason to suspect that the unwinding of the paper is not uniform, the vibrations of a tuning-fork may be inscribed, along with the dashes, at each revolution of the wheel.

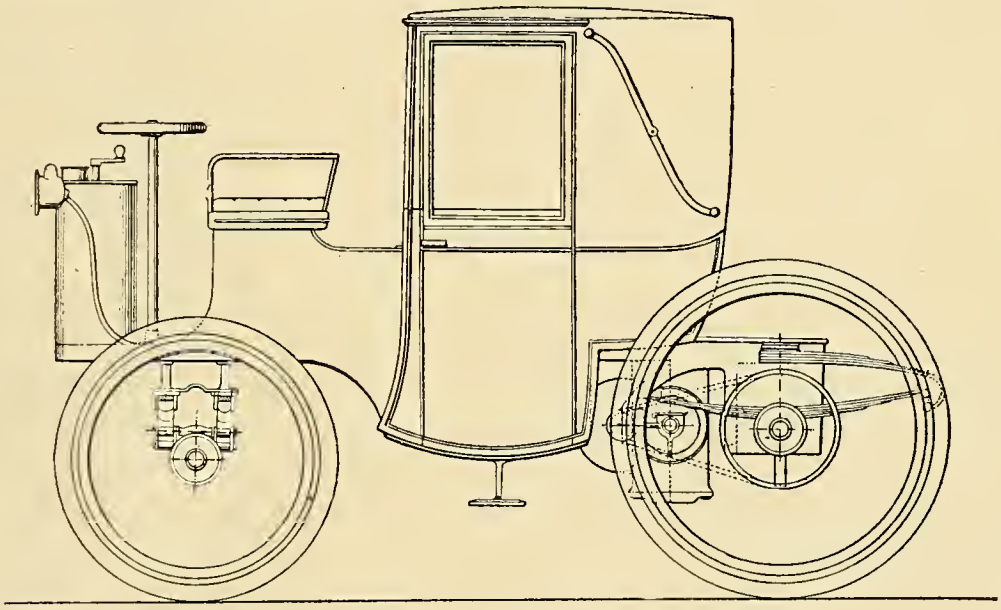


Fig. 29. Elevation of the Jeantaud Landaulet

Since in this apparatus the stress resulting from the slope of the ground intervenes, it is necessary to operate upon a road of which the leveling has been verified. Moreover, while the instrument is tared by static stresses, it is submitted during the experiment to dynamometric actions only.

With automobile vehicles, it is possible to interrupt the running of the motor and therefore abandon them to the various retarding actions to be measured. With a properly arranged track, very satisfactory results might be obtained by starting the carriage at the speed at which it was desired to obtain the pressure of the air and the sliding and rolling friction of the wheels and transmitting parts upon a portion of the track of sufficient length to obtain them without forcing the factor $\frac{P}{g}\frac{dV}{dt}$. The

speed obtained might be ascertained by causing the wheels, at a sufficient interval, to pass over two rubber tubes filled with air and of a diameter small enough to have no perceptible influence upon the motion. These two passages might be inscribed electrically upon a registering apparatus. At the entrance of the prepared track, the motor might be thrown out of gear and the vehicle be abandoned to the retarding actions enumerated above. Tubes like those already mentioned, placed here and there, would permit of registering the mean speed of the vehicle corresponding to each interval. The losses of live force, calculated with such data, would give the double of the resistant work.

The sliding friction in the hubs, the friction of the different transmitting parts, and the rolling friction upon the roadway could be progressively eliminated by successive experiments, and we should thus obtain the pressure of the air at different speeds, for a given carriage. Upon afterwards varying the diameter of the wheels, the suspension arrangements and the superficial state of the roadway, we should reach sufficiently exact results.

If, instead of having at our disposal a track thus arranged, and constituting a genuine laboratory, we were obliged to experiment upon some road or other, it might be possible to use the Morin dynamometer, even for an automobile, by interposing it between a traction vehicle and the carriage to be experimented with; but, fortunately, we have at our disposal a registering apparatus that permits us to dispense with a traction vehicle. We refer to M. Desdouit's dynamometric pendulum, which appears to us to be *the* dynamometric apparatus par excellence for automobile carriages.

This instrument is based upon the principle that a pendulum, capable of swinging freely in the plane of a carriage's motion, makes with the vertical, at every instant, an angle of which the tangent is equal to the acceleration of the speed at which the vehicle is running.

It consists essentially (Figs. 34 and 35) of a pendulum bob, $P\,P'$, formed of quite a heavy copper cylinder supported by two rods, $L\,L'$, attached at their upper extremity to a rectangular frame. Two other rods, $M\,M'$, parallel with the first, are fixed at their lower part to the same frame, at the same height as the centre of the bob.

These two systems of rods are connected by horizontal connecting-rods, $B\,B'$. For slight displacements, it may be admitted that the heads of the rods thus connected with the pendulum describe spaces that are augmented in a constant ratio with those described by the pendulum bob or with the tangents of the angles

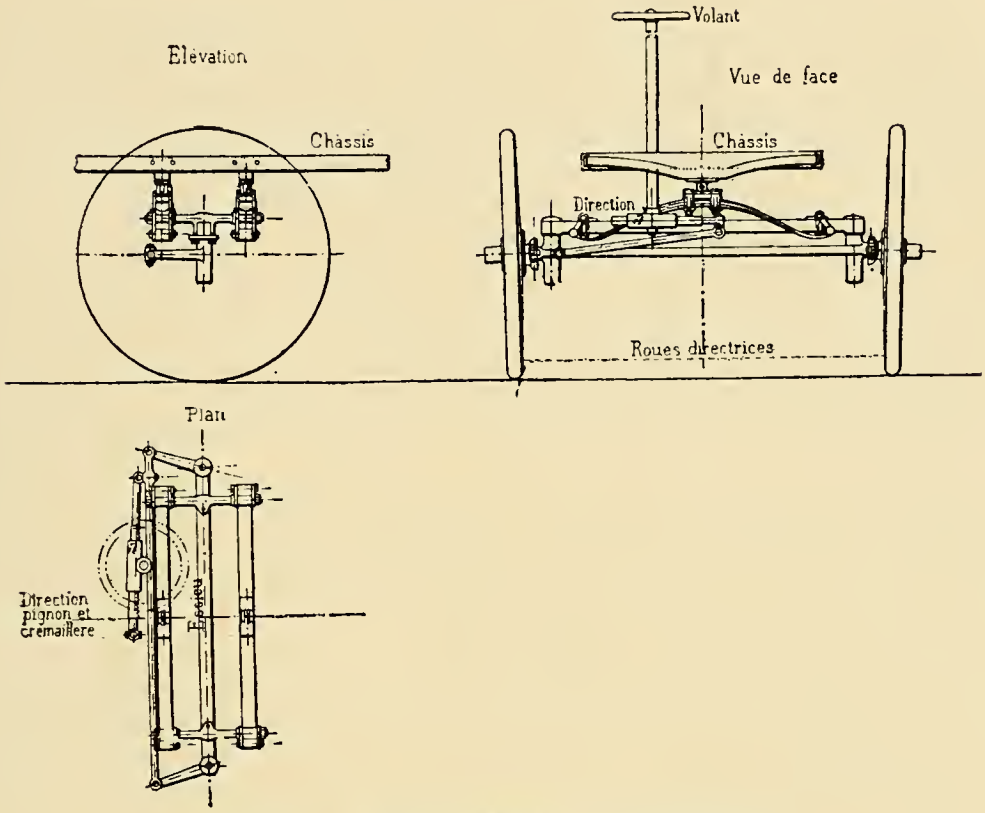


Fig. 31. Jeantaud System of Suspension

at the centre, which do not sensibly differ from arcs. These connecting-rods are jointed to two fly-wheels, *V*, which serve to reduce the too abrupt motions of the pendulum.

If, then, to the centre of a crosspiece, *T T'*, that connects the heads of the rods, we fix a pencil, *C*, the latter will inscribe lines proportional to the tangent of the angle α of the pendulum. upon a sheet of paper. It suffices to give the latter a proper transverse motion in order to preserve the measurement of the tangent of the angle made by the pendulum at every instant, that is to say, the measurement of the vehicle's acceleration.

The motion of the sheet of paper is effected through the arrangement that we described in speaking of the Morin dynamometer.

In order to utilize this property of the pendulum for the measurement of the various resistant forces that set themselves up in opposition to the movement of an automobile vehicle, it will suffice to throw the motor out of gear and take the angle of the pendulum upon the vehicle abandoned to its acquired speed. The angle of the pendulum will measure the retarding action.

But this latter is likewise a sum comprising the friction of the axle-journals, the rolling friction, the roughness of the road, the pressure of the air and the friction of the transmitting parts

between the disengaging gear and the driving-wheel. In an automobile carriage designed solely for the study of the resistances due to the state and nature of the road, we might have recourse to a transmission arrangement, such as an electro-magnetic device for throwing the sprocket that controls the toothed wheel of the driving-wheel into and out of engagement. However, with non-electric automobile carriages, if, after determining the coefficient of friction of the axle-journals through the Marcel Desprez method, analogous reckonings be made in leaving the gearings of the transmission in engagement, we shall have a sufficiently approximate measurement of the frictions of the transmitting parts. All that will remain, then, will be the retarding actions due to the air and road. The first will become nearly insignificant toward the end of the experiment, when the carriage has only a very low speed. At this moment, the angle of the pendulum will measure the retarding action due to the road alone, since the slope does not intervene.

If we operate in summer, upon a good macadam road, very free from dust, we shall be able to complete the experiment by having a definite quantity of dust sifted over the clean roadway after a certain number of days. It will be found that the angles of the pendulum continue to increase with the thickness of the dust.

After these experiments have been made, a definite quantity of water may be distributed over the road by means of a sprinkling cart, so as to convert the dust into mud. New readings of the angle of the pendulum will then give the retarding action of this changed state of the road.

A careful scraping will permit of making, upon a clean surface, some new experiments showing the influence of the mobility of the materials of the road caused by softening them progressively through the action of larger and larger quantities of water.

The experiments above suggested for trial upon metalled

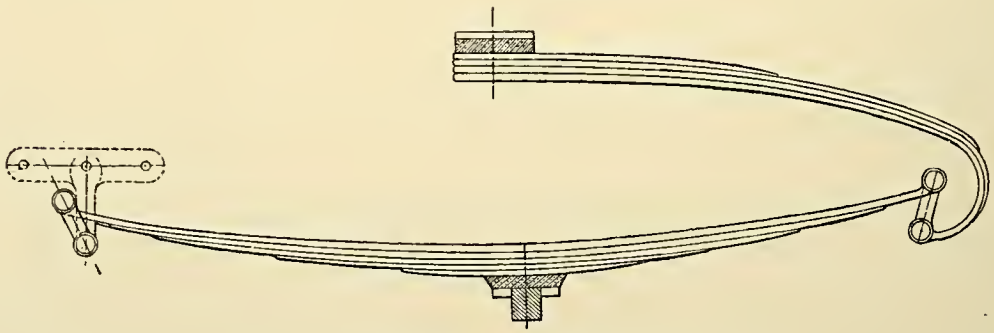


Fig. 32. Fragments of the Jeantaud Spring

roads may be repeated, with varying loads, upon asphalt, Belgian or wooden pavements.

The only difficulty connected with the use of the dynamometric pendulum resides in the maintaining of the zero of the graduation that corresponds to the position of the pendulum in the carriage without acceleration. Automobile carriages are generally provided with springs so soft and yielding that a change of position of the driver or experimenter suffices to cause the zero to vary; and in gasoline carriages, the same effect is produced even by the volume of the liquid that remains in the reservoir. So, what is obtained most accurately with this dynamometer is the difference of the stresses in passing from one road to another.

As regards the determination of the value of the pressure of the air at the different speeds of each carriage, the instruments herewith described leave much to be desired. On the contrary, should we have recourse to an electric carriage, it seems as if the experiment might be more easily tried with success. With the electric motor, in fact, nothing is easier than to note at every instant the quantity of energy consumed and, consequently, the power really developed, provided a table of the renderings of the motor has been previously prepared. It seems, moreover, as if such a table hight be easily established by placing the driving-wheels of the carriage upon rollers of which the resistant couple might be modified by a determinate tangential stress.

Therefore, upon running an electric carriage upon a given road, under the various experimental conditions enumerated above, we should easily determine the quantity of energy and, consequently, the power necessary to overcome the various resistances of the transmission, axle-journals, road, air, etc.

By running slowly at the outset, this latter resistance would be eliminated. Upon afterwards proceeding with increasing speeds, we should determine by subtraction the supplementary resistance due to the air at these different speeds.

It is evidently necessary that the experimenter shall be able to assure himself that the consumptions of energy ascertained are not rendered inaccurate by positive or negative accelerations of the vehicle.

Experiments with the electric carriage can therefore not be undertaken with advantage until we have a sufficiently accurate speed-registering apparatus at our disposal. As regards this, we shall confine ourselves to remarking that an apparatus of this nature consists of two distinct parts: an indicator of the number of revolutions of the wheel, and a device for converting such

number into speed. The odometer is a pretty delicate instrument to place upon a horse-drawn carriage, since it must connect the hub of the wheel with an apparatus fixed to the body, despite the variations in distance caused by the flexibility of the springs.

The majority of the systems adopted for such an application are based upon the compression, through a cam, at every revolution of the wheel, of a volume of air enclosed in a reservoir, which, through a flexible tube, communicates with another reservoir closed by a vibrating disk in contact with an indicating needle.

This method of communication, theoretically perfect, presents in practice numerous defects that result for the most part from the difficulty of keeping the joints tight for any length of time.

In the automobile carriage, such difficulties disappear, since the number of revolutions of the driving-wheels depends upon that of the transmission shafts—the differential shaft, for example. Since the latter is connected with the frame in an invariable manner, nothing is simpler than to transmit its rotary motion to a receiver placed upon the carriage body, and thence to a revolution counter.

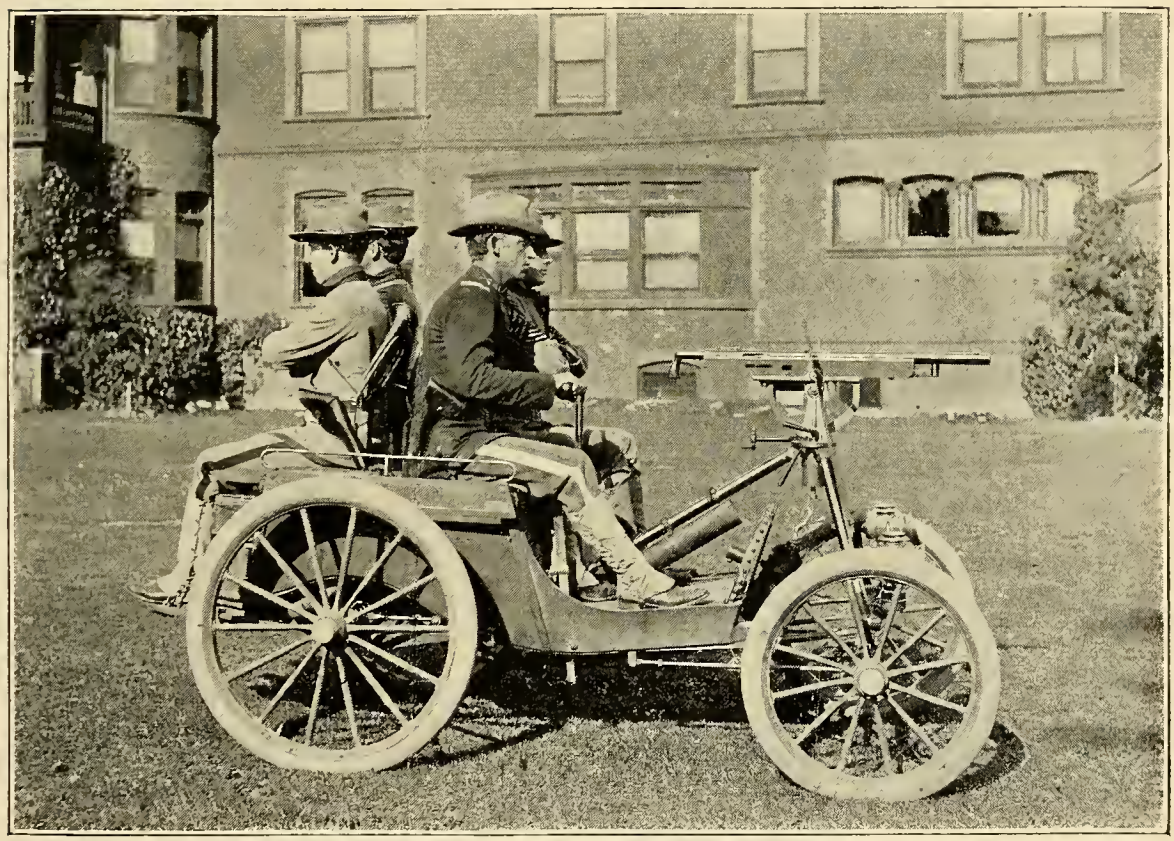
The apparatus for converting the number of revolutions into speed is as delicate in automobiles as it is in horse-drawn carriages. Nevertheless, there exist two or three types that are pretty accurate and, at the same time, quite simple.

It would evidently be possible to avoid the necessity of employing an odometer by using a dynamometric pendulum, which would immediately give the positive or negative acceleration corresponding to the consumption of energy ascertained.

Translated for the Automobile Magazine from *Le Génie Civil.*

Automobile for Light Artillery

FOR some time past Major R. P. Davidson, of the Illinois National Guard, has been making experiments with the automobile for the transportation of field artillery. He has invented a carriage large enough to hold four persons and to transport a rapid-fire gun. The entire weight of the carriage, with gun and equipment, is 1,600 pounds. The motive power is furnished by a 6 horse-power gasoline motor, with a reservoir



An American Military Automobile

containing sufficient fuel to operate the vehicle a distance of 100 miles. This motor has a speed of 30 miles an hour on a smoothly paved thoroughfare, while on the average country road a speed of from 10 to 15 miles an hour can be maintained where the grade is medium. The gun carriage is equipped with a special apparatus for hauling by hand up steep ascents, thus aiding the motor and for assisting the power on roads where the sand and mud are unusually deep. It is found that the gun crew of four men can

prevent the vehicle from being stalled by use of this apparatus, except where the roads are simply impassable on account of mud and sand.

The gun with which the automobile is equipped is of the Colt pattern, firing 480 shots per minute, of a calibre of 7mm. It has an effective fire range of 2,000 yards and uses smokeless powder. The bullets have a muzzle velocity of 2,000 feet. The gun can be loaded and fired by one man, who is protected by detachable bullet-proof steel shield. The gun squad is equipped with Colt army and navy revolvers of 38 calibre.

The tests made by Major Davidson have been extremely severe, and thus far the carriage and gun have given satisfaction. It has been utilized in cross-country marches with a squad of bicycle infantry, traveling over ground covered with large stones, pieces of wood and limbs of trees. It has also been manœuvred in stubble fields, where the ground was extremely soft, and has accompanied the cyclists on marches along roads where the mud was several inches deep in rainy weather. Military experts who have examined it are of the opinion that the carriage is extremely suitable for light artillery, and in some instances it is much better than the use of animal power.

The automobile gun and its crew, in command of Major Davidson, recently made what might be termed a forced march from Chicago to Washington over the ordinary highways. The commander brought a message from Gen. Wheeler to Gen. Miles.

A DEVOTEE

Fair Phyllis, once the humble slave of tennis,
Went forth to freedom in the throes of golf.
The shackles worn in courts of chalk and netting
Were straightway loosed and taken off.
And then a season's whirl of tees and cleeks and drivers—
A season's joy that lingers with her yet—
And glad, she views the shackles reappearing
Heart-forged within a little voiturette.

FRANK X. REILLY, JR.

The Automobile as a Pastime

By Miss N. G. Bacon

TO dabble in motoring as a pastime is an expensive luxury, and the devotee should furnish himself with a long and heavy purse, with very loose strings. The enthusiastic automobilist takes a keen and intelligent pride in all that pertains to his car. On all occasions, in season and out, he affectionately refers to the parts that form the internal anatomy of his hobby horse, which he "runs to death" in more ways than one, so far as can be gathered from the adverse criticisms of his compeers. The balance of time, talent, and money spent in adjusting, studying, or improving the mechanism greatly exceeds that given to the pleasures of driving. Clad in oil-stained overalls, hands soiled and greasy, the devoted motorist may daily be seen paying personal attention to the vital parts of the mechanism. On rare occasions, indeed, he may be discovered hidden in the depths of a pit, or lying on his back under the car, carefully and attentively paying his best respects to some otherwise un-get-at-able piece of workmanship. This labor of love is varied by attendance at the club-rooms for incessant repetitions of "tall tales," thrilling episodes and narratives of events worthy the genius of a Mark Twain or a fisherman. Luxuriously sheltered and comfortably seated in an upholstered sofa-lap, the captivated motorist spins out his experiences, or invents them, compares notes with his confrères, and acquires a renewed interest in the idol of the hour.

All this may be pure amateurism, but it represents the initiatory stages which all pioneers have to traverse ere they can evolve from the chrysalis into the full-fledged motorist. Experts who have safely maneuvered their destinies beyond amateur enthusiasm, speak eloquently concerning motoring, both as a sport and as a commercially successful means of road locomotion, whilst those who are of a "sportive" trend of mind claim for it an exhilaration and a fascination unexcelled by hunting or yachting. M. René de Knyff, the famous winner of French automobile races, goes so far as to declare that automobilism possesses a similar fascination to horse racing, except that the driver has to perform the double function of jockey and trainer. The automobilist is the trainer before the race has commenced, but when once started, his judgment comes into play to control and force speed, and to avoid "spills." The uninitiated imagine that the

automobile can be set going by the manipulation of certain levers, and that nothing further is required of the driver; but those versed in the ways of motors realize how much the speed and easy running powers of the vehicle depend upon the skillful handling and knowledge of the mixtures, the engine, and the mechanism generally. Any lack of adjustment, loss of rhythm in the movement of the engine, or failure of electric current means bad running and low speed. It remains for the genius of the motorist, who with skillful and delicate touch and hearing discovers the causes that prevent, or that seem to secure, the harmonious working of the machinery, and herein comes much of the fascination and charm of the pastime. When for some unknown reason the engine loses its "tone," the car shirks its work, and threatens at any moment to stop, the motorist is overcome by a very thoughtful and even pensive mood; his meditations are deep and penetrating, various trials of mixtures and complex adjustments are tested. If luck comes to the rescue, or knowledge triumphs, a happy hit is made, and the motor suddenly gathers itself up, springs to its work and recommences to pace its way merrily. Such exquisite experiences are rare, and for that reason give pure joy. Even the most fastidious critic would be tempted to become a rash enthusiast were the conditions invariably favorable to a successful trial trip, for the marvelous ease with which automobiles do sometimes run excites wonder, and provides enjoyment of the highest nature.

In comparing motoring with cycling a Frenchman denounces it to be inferior. To use his own phrase, he considers that "the memory of landscapes persists in the tourist's mind in inverse ratio to the rapidity of the means of locomotion which he employs to traverse it." I presume Ruskin himself would recognize this to be a truism. In the critic's opinion railway traveling only affords a brutal kaleidoscope, rolled so rapidly before the eyes that the attention can be fixed upon nothing, and the mind conveys but a fugitive impression of towns, historic neighborhoods, ravines ,suspension bridges, and landscape scenery passed. This may be, but surely it is false to state that the experienced driver lacks *opportunity* to enjoy the passing view, unless, indeed, his automobilism is reduced to a craze for racing at a break-neck pace to appease his ambition to cover as much ground in as little time as possible. But even in such a case there is exhilaration and exaltation in rushing through the air at such speeds unprotected by wind-guards or what-not. The control and steering of a car becomes purely automatic, and nothing is easier to those who delight in the beauties of Nature's handiwork than to slow down

the engine and view the scenery at any pace that suits the motorist's fancy when passing through ideal spots of natural beauty. Indeed, the thrill of motoring comes in when the motorist, by bringing into action his automatic brain, allows his mind to be concentrated upon the fascination and exhilaration of the pastime. Forgetful even of speed, and oblivious to all else except the pleasures of the sport he is at that moment enjoying, the automobilist is carried away into realms of fancy. The wings of his thought taking flight, he is so enraptured with the intensity of his feelings that he revels in a hitherto unknown joy. Whirling at a high rate of speed with little or no exertion affords a pleasure of the most exalted nature, especially in favorable conditions. During the winter months motoring is cold work, although exhilaration remains, but in the tropical heat nothing can be more pleasant. It is imperative, if comfort is to be assured, that plenty of fur and warm clothes are worn to keep out the cold and biting winds of indifferent weather.

The ways of motorists, indeed, are as variable as they are interesting; but if the poet who compressed his philosophy into "Variety is the spice of life" is correct, the automobilist's existence is one of continual spiciness. The craze for speed and extensive mileage, the poetic charms conveyed to the mind by Nature's grand display of beautiful scenery, the pure pleasure of threading shady lanes surrounded by natural beauty, the study of the experimental workings of the machinery under command for trial and test purposes, and the eventual control of the innate cussedness of hitherto incomprehensible motor maladies, all provide an everchanging range of recreative delights. Automobilism presents to the devoted aspirant an ambitious climb up the rugged ways towards heights hitherto unreached. At every point of the ascension there abound unpublished records awaiting the perseverance of the skilled automobilist to proclaim to an ignorant world. Speed there may be, but how can it be maintained and so controlled as to be, as it were, "on tap" when wanted? General efficiency comes next, and here again much experimental and practical work awaits the skill of the expert. There never was such a happy hunting ground for those with skill, knowledge and ability as there to-day exists in the arena of automobilism, and no better work could be done for the community at large than the solution of many of the intricate mechanical problems that beset the path of the pleasure-bent motorist.

Automobiles there are in abundance, in various stages of development and progress towards perfection. Maybe the novice feels most strongly drawn to the motor cycles, seeing that they

afford the easiest method of study. The driving mechanism is in evidence, and more get-at-able than in the larger cars. The motor-bicycle, only recently so perfected as to possess something more than a modicum of reliability, may eventually prove itself to be the most popular vehicle for experimental purposes, in consequence of its easy steering and storage, and its comparatively light weight and inexpensiveness. The tricycle and quadricycle take their stand as immediate successors. For winter riding the motor cycles, seeing that they offer facilities for additional assistance by pedal work, might by some be recognized as the most enjoyable, for in such machines the motorist can at will exercise his own motor muscles, and increase his personal warmth as well as the speed of his vehicle. Peculiarly enough, however, the motor cyclist *per se* dislikes to use his pedals, and is ever on the lookout for a machine which, although started and put into motion by the pedals, requires no further aid from them or his muscular development.

It should not be forgotten that motoring as a pastime is still in its infancy, and while a few pioneers are interesting themselves in its pleasures, the general public at large remain in lethargic ignorance and dubiousness of its incontestable delights. Yet one of the officers of perhaps the largest manufacturers in England has given it as his experience that even the most dubious are invariably converted so soon as they have completed their first ride on an automobile.

Gasoline Automobiles for Light Delivery Service

THERE are a great many small stores, laundries and other small business establishments, not only in the larger cities, but also in towns of moderate size and in suburban districts, the requirements of which for delivery service do not call for as great carrying capacity, either in bulk or weight, as is furnished by the electric delivery wagon. To meet the demand from this quarter, and also to assist in handling the delivery service of large establishments, such as department stores and others, for the major part of which electric wagons, or, what it may be safe to assume they will soon be called, the old-fashioned horse-drawn wagons are regularly employed, a little gasoline automobile was put out by the Pope Manufacturing Company nearly two years ago. In spite of the novelty of the gasoline vehicle in this work, and notwithstanding the unfortunate ignorance which still exists in many quarters as to the possibilities and limitations of all automobile vehicles, this small machine has slowly and surely been working out a good reputation for itself. It is believed that, incidentally, it has done some educational service in the gasoline automobile field. In any case, there is evidence that it has developed in several of the individuals owning these machines a desire to own as well a passenger vehicle of similar economy and convenience in operation. This gasoline motor delivery vehicle is a tricycle, the front wheel being used for steering and the two rear wheels for drivers. It is now being manufactured for the Electric Vehicle Company of New York by the Columbia and Electric Vehicle Company of Hartford. As an example of the trend which gasoline mechanical constructions are taking by force of American conditions, which are certainly in many cases widely different from the conditions prevailing in France, where gasoline automobiles are growing daily in popular favor, not slowly, but by leaps and bounds, some of the features of this tricycle are of interest.

It is driven by an Otto cycle engine, with cylinder measuring $3\frac{1}{2}$ inches by $3\frac{1}{2}$ inches. The engine is started by ordinary bicycle pedals operated from the rear saddle on which the driver sits, the pedals being also, however, available for use to assist in the propulsion of the machine when required for this purpose by an abnormally steep grade or the necessity of an unusual output of

power for any cause. As first placed on the market, the engine was entirely air-cooled, and lubrication was automatic from a single charge of oil, which was supposed to be placed in the crank case of the engine once a day.

After a year's experience it was found that much of the service to which the machine naturally gravitated was what might be called the "peak" of the load for large department stores, and service sometimes calling for hurried deliveries of packages in comparatively small numbers, besides the other classes of work for which it was planned. As a rule, no extremely heavy load being carried for any of this service, it became possible to run the machine at its highest speed, and hence, at the end of a year, the severity of the service on the engine was found to exceed what it would have been if greater loads had been carried.

As a result of this experience it was found that this size of engine running continuously with a cylinder and explosion chamber merely air-cooled would become overheated. Hence a water-cooled cylinder head was adopted, and proved to entirely do away with this difficulty, decreasing the cost of maintenance and increasing the capacity of the tricycle. It was also found that many of the drivers employed on these machines by their owners, were boys, and could not be relied upon to invariably give the matter of lubrication the attention it deserved A charge of oil was put into the crank case whenever the driver happened to think of it, and frequently he did not think of it for several days. One of the objects in building it has been to render it as simple as possible, even at the sacrifice of refinements in the line of automatic features. Therefore, in order to overcome the difficulty resulting from lack of attention to the necessity of daily oiling, it was considered advisable to mount a sight feed oil cup directly on the handlebars of each machine, and run from it a little tube to the engine gear case, so that whenever the driver mounted the machine the oil cup could not fail to be conspicuous, and suggest to him that oil was needed, in case it happened to be empty. Further, a sure and gradual feed of the oil was found to render very slight indeed the maintenance expense in cylinder packing rings, and the wearing parts within the cylinder, and the crank case.

Of course, for winter use in cold climates the oil has a tendency to thicken in the tube between the oil cup and the crank case, but, wherever required, this is easily overcome by mounting the oil cup over the top of the engine, where the heat is bound to keep the oil thin enough to feed properly The cup is still conspicuous enough there to remind the operator that if a horseless carriage does not need oats, it still needs oil.

While on the subject of oil, it may be of interest to many prospective users of gasoline automobiles to be informed of the desirability of obtaining for use in the cylinders of small gasoline engines, an oil which will both furnish good lubrication at high temperatures and at the same time not incrust in the cylinder. If oil not carefully selected is used here it will cake up in thin layers in the cylinder and over the piston, and these incrustations are liable to become red hot, thus causing premature ignition. The Columbia people claim that, after many careful tests of lubricating oil, they have succeeded in finding an oil which is entirely satisfactory for service here.

For ignition, both the means involving the use of a red hot platinum tube and of an electric current supplied by a battery and otherwise, were tried. It was found that while the hot tube method had several obvious advantages, the wick in the hot tube burner would gradually become charred and affect the flame to such an extent that the tube could not be maintained at a high enough temperature to give the right point of ignition. Of course, this resulted in lack of power and speed, and inability to cover distances in a reasonably short time. It also rendered the machine less attractive from the point of view of owners who desire to place it in the hands of drivers without any especial mechanical experience or insight. This objection, together with the advantage that would come from the possibility of making an instantaneous start, led to the adoption by the makers of electric ignition. The greatest difficulty here was the source of current. The magnetic igniter, in the hands of drivers of such vehicles, and especially on vehicles unprotected from the weather, as this machine is, would hardly be practical. Primary batteries of all descriptions were tried, but without success, and finally a two-cell storage battery of an ampere hour capacity of fifteen, was found to be the best and most satisfactory. A secondary or jump spark is used with a non-vibrating coil. This ignition gives excellent results, and if explicit rules laid down that a new storage battery must be substituted every Monday morning are followed, and the exhausted ones recharged, it is almost impossible to damage it.

The method of control involves the varying of the point of ignition. The lever by which this is done has a spring return to the position, which insures the engine running slowly. It is placed to be operated by the knee of the driver when he mounts the machine. The ignition is early enough to start with the lever held back as far as it will go, unless the mud is too deep or the grade too high. If necessary to advance it, either in order to start under adverse conditions or to speed up, the driver only

needs to push the lever forward with his knee. Of course, when he dismounts from the machine, the spring return lever instantly brings the ignition back to a point low enough to avoid racing the engine. This has proved on long service to be a valuable means of adding to the durability of the motor and its wearing parts, and certainly adds to the claim made by the company that their gasoline tricycle is as simple and as proof against injury due to carelessness or inexperience as any gasoline automobile can be made. With the two speeds provided for the machine by the change gear, this method of varying the speed is adequate to furnish all the variations in the rate of movement which are called for. Experience has indicated that it is more economical and otherwise satisfactory than the throttle control, which was also tried. In the majority of instances the boys hired to drive the machines would entirely forget to open the throttle in starting or to close it when throwing out the clutch. Of course, in the first case, the machine simply did not start, and, in the second case, the engine was allowed to run without carrying any load at an injurious rate of speed. With the method of ignition control described the throttle is left wide open, and, while in theory the use of gasoline is not in this way kept at a minimum, in practice it has been shown that by keeping the speed of the engine at the lowest point, the cost of gasoline per mile is in reality less than with a throttle. The carburation is by a surface carbureter of the standard type.

It is not necessary to say that the maintenance expense per annum of such a vehicle needs to be made low in order to suit the management of a dry goods department store. If the user of one of these machines will provide himself with gasoline of the proper test degree, which, by the way, is exactly the same quality of gasoline as is regularly used in gasoline launches of the leading manufacturers; if he will have the machine overlooked by the foreman in his delivery department, or some other fairly responsible person with a little mechanical insight, and if he will employ a boy of average intelligence to run it, the Columbia Company claims that it has been demonstrated that this little business vehicle will prove practical and reliable.

One of the large department stores in a Pennsylvania city made, in the course of its regular service with one of these tricycles during the week ending February 10, the following records for three different trips:

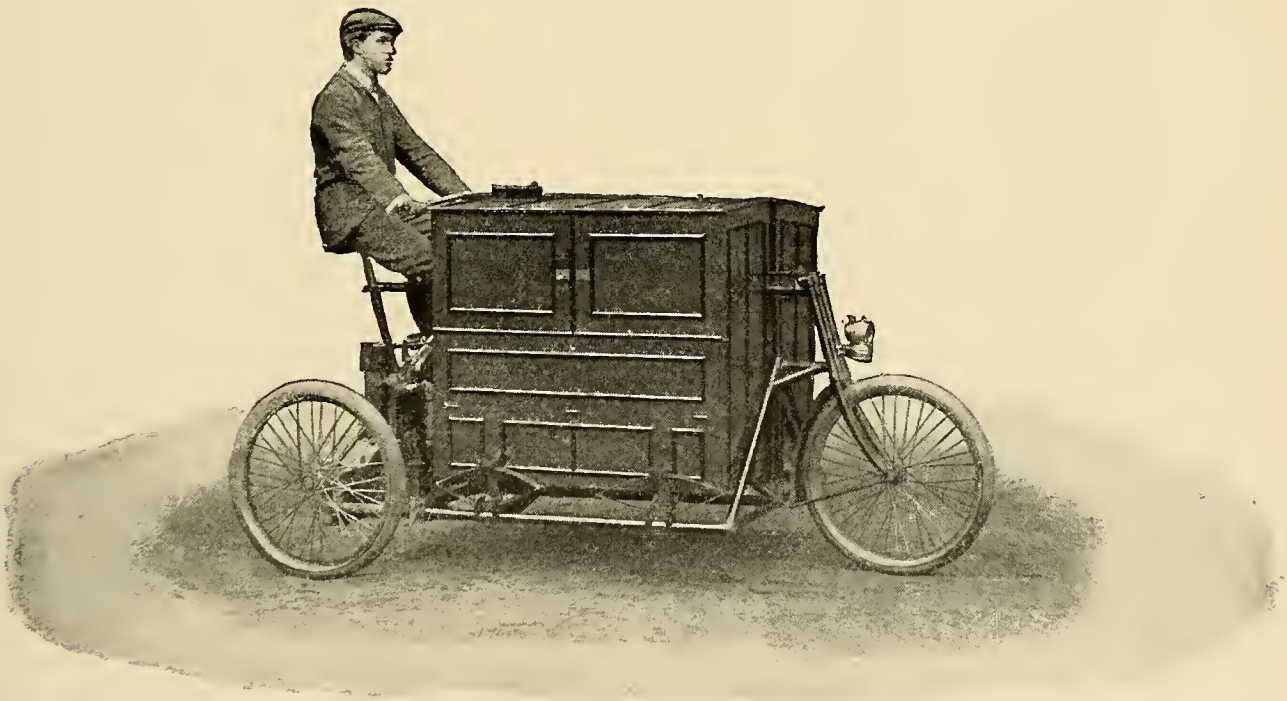
First trip, 32 packages delivered in 65 minutes; distance, about 4 miles.

Second trip, 31 packages delivered in 70 minutes; distance, about 4½ miles.

Third trip, 33 packages delivered in 90 minutes; distance, about 6 miles.

Another of these tricycles, during the week preceding Christmas, was run steadily each working day, and delivered each day a number of packages varying from seventy-four, the minimum for one day, to one hundred and ten, the maximum for one day. These figures, however, fail to convey an accurate idea of its possibilities, as it is almost invariably used for long-distance service, and for reaching points to which it would not pay to send a horse-drawn wagon or an electric wagon without a full load.

The tricycle feature of the vehicle makes it possible to guide it accurately where very little space is available for movement and turning. It can thread its way through an ordinary traffic in localities where it is intended for use. Its total weight is 900 pounds, and it carries enough gasoline on a full charge of the tank to provide for running 100 hundred miles and enough water for 25 miles. It has a maximum carrying capacity of 500 pounds, and with this load can easily be made to average in city service over 11 miles per hour The appearance of the machine is shown by the accompanying cut.



Legal Opinion on Automobiles

Interesting Decision Handed Down by Judge Sutherland

PROGRESSIVE VERSUS PRIMITIVE MEANS OF LOCOMOTION

A DECISION which is of considerable interest, in that it concerns the legal status of the use of automobiles or other horseless carriages in the public streets, was handed down by Judge Sutherland, in Rochester, N. Y., recently, in the case of Fred. Mason and another against Jonathan B. West.

In the opinion, which is published in full below, Judge Sutherland rules that the vehicles in question have a right on the streets, and that the owner or operator is not responsible for damages which may result from fright caused to horses, unless there is contributory negligence.

The decision is on an appeal taken by Mr. West from a judgment of the municipal court for $42.95 damages and $10.95 costs. Mr. West is the inventor and owner of a steam vehicle of the horseless variety, and while operating it on Tracy Park, October 18, 1898, a horse belonging to Mason became frightened at the vehicle and ran away, resulting in injury to the horse and damaging the wagon. Reed & Shutt were attorneys for the plaintiffs, and Hon. John B. M. Stevens, the present special county judge, appeared for Mr. West. The decision of Judge Sutherland follows:

Plaintiff's horse and delivery wagon were standing on Tracy Park, Rochester, October 18, 1899, the horse being hitched by a strap attached to a thirty-pound weight. The roadway on Tracy Park is fifteen feet from curb to curb. Defendant entered Tracy Park at Alexander street with his motor carriage, and as he approached plaintiff's horse, who was headed towards Alexander street, became frightened at defendant's outfit and ran away, damaging the wagon and harness to the amount of $17.45. The horse received no injury except such as come from fright. The municipal court, in addition to the $17.45, allowed $25 damages for deterioration in value of the horse, supposed to follow from the increased propensity of fright induced by its experience on this occasion.

In Hitchell *vs.* Rochester Railway Company, 151 N. Y., 107, it was held that mere fright caused by negligence does not give to the person frightened any cause of action, no matter how serious the fright may be in its after effects. It is argued with

much force that for the same reasons of public policy which were controlling in the Hitchell case, the item of $25 damage to this horse for fright should have been disallowed. Furthermore, this horse, it seems, had run away twice before, and it would require a very nice insight to determine, without speculation or mere guesswork, what effect this scare had upon its permanent psychic equipment.

But passing that, a more important question is presented, whether any recovery should be had. This motor carriage was made by defendant, and as described by the witnesses and shown in the photograph exhibits, while somewhat crude, it does not differ very materially in general appearance from the steam automobiles which are coming into common use. It runs on four wheels with pneumatic tires; has a canopy top and is about the size of a one-horse delivery wagon. The motive power is steam generated by a gasoline burner. A smokestack connecting with the combustion chamber extends to the top of the canopy in the rear. There are sinuations in the stack through which the escaping vapor and the exhaust steam passes, and the design is that the exhaust steam shall be condensed inside the stack. This stack would seem to be the main point of dissimilarity in appearance between defendant's machine and other motor carriages operated by steam.

The horse has no paramount or exclusive right to the road, and the mere fact that a horse takes fright at some vehicle run by new and improved methods, and smashes things, does not give the injured party a cause of action. As Judge Cooley says in Macomber *vs.* Nichols, 12 Mich., 212: "When the highway is not restricted in its dedication to some particular mode of use, it is open to all suitable methods, and it cannot be assumed that these will be the same from age to age, or that the new means of making the way useful must be excluded merely because their introduction may tend to the inconvenience or even to the injury of those who continue to use the road after the same manner as formerly." If the defendant's motor carriage is practicable for the purpose of travel and the noise and vapor caused by its use are kept within reasonable limitations and are no greater than are fairly incident to the use of motor carriages which are found adapted to the needs of the general public, then I cannot see how the defendant can be held liable in the absence of evidence that at the particular time complained of the carriage was operated carelessly.

If one should find it desirable to go back to primitive methods and trek along a city street with a four-ox team and wagon of

the prairie schooner variety, it would possibly cause some uneasiness in horses unused to such sights. Yet it could not be actionable, in my opinion, if a runaway should result, provided due care were shown not unnecessarily to interfere with the use of the highway. Horses may take fright at conveyances that have become obsolete as well as at those which are novel; but this is one of the dangers incident to the driving of horses, and the fact cannot be interposed as a barrier to retrogression or progress in the method of locomotion. Bicycles used to frighten horses, but no right of action accrued (Holland *vs.* Bartch, 120 Ind., 46; Thompson *vs.* Dodge, 58 Minn., 555). Electric street cars have caused many runaways. Automobiles operated without steam, by storage batteries or by gasoline explosion engines, running at a moderate speed, may cause fright to horses unused to them; yet the horse must get used to them or the driver take his chances.

The evidence in this case shows that defendant was running his motor at a moderate rate of speed and as it approached the horse he slowed up. Defendant and his wife, who was with him, say they came to a full stop before the horse started to run, but this is contradicted by plaintiff's witnesses, who admit he slackened speed.

It will not do to say that it is proper to run any kind of a contrivance upon the street in which persons may be carried. A machine that would go puffing and snorting through the streets, trailing clouds of steam and smoke, might be a nuisance, but this is not such a case. It cannot be said that the defendant's machine is such a departure in its construction or mode of operation from other steam motor carriages which experience has lately shown to be entirely practicable for street use, as to make it a nuisance, although, because of the present novelty of horseless carriages, horses may take fright at its approach. There was no proof of an unusual amount of vapor escaping at the time of the accident, nor of any amount of noise greater than is ordinarily heard in running a machine of that character, and to sustain this judgment is to condemn the defendant's motor carriage and all others operating in a similar way, and to declare them impracticable and unfit for use upon the streets.

There is a statute against the use of any vehicle propelled by steam in public streets (except on railroad tracks), unless a person is sent at least one-eighth of a mile in advance to warn travelers of its approach (Highway Law, sec. 155; Penal Code, sec. 640, sub. 11). This statute, though broad enough to cover the motor in question, was passed before automobiles were in use, and it was directed against traction engines, which are ponderous

and noisy affairs, and have been the cause of much litigation (Mullen *vs.* Glens Falls, 11 App. Div., 275). The provision of law that the forerunner must precede the steam carriage by at least an eighth of a mile, shows that it was not drawn with steam automobiles in mind of the kind used in this case; and if a man had been sent that distance ahead, it would have been of no value to plaintiffs as a warning, for their driver would not have met him, so it cannot be said the accident occurred because of defendant's failure to comply with the law referred to.

The temporary inconvenience and dangers incident to the introduction of these modern and practical modes of travel upon the highway must be subordinate to the larger and permanent benefits to the general public resulting from the adoption of the improvements which science and inventive skill have perfected.

The judgment appealed from is reversed.

A TRIP DOWN LONG ISLAND ON A MOTORETTE

Mr. Field, Vice-President and General Manager of the De Dion–Bouton Motor Company, of Brooklyn, accompanied by Mr. Andrew Binker and Mr. F. H. Ball, took a trip down Long Island recently on one of Mr. Field's motorettes and made a very successful run and creditable record. A considerable portion of the roads was found to be very dusty, owing to the fact that there had been practically no rain for two months. The average time of the vehicle was over 15 miles per hour and was maintained throughout the trip, except for about 10 miles in crossing the Island from East Cove to River Head, where, owing to the deep sand, it being eight and ten inches deep, much slower time was taken for these 8 miles. The route followed was down the Merrick road on the south side as far as East Cove, a distance of about 85 miles, and from there across to the north side to River Head, and from there along the north shore to Greenport. The total distance of the route traveled was about 120 miles which certainly seems a good record for one of these little motorettes with three persons on board, as well as a large amount of baggage and gas sufficient for the entire trip.

The Value of Alcohol in Automobile Practice

IT is extremely interesting to follow the course of the experiments with alcohol as a source of motive-power in automobile work, conducted in France and Germany, notwithstanding the fact that by reason of our foolish taxation of alcohol used in the arts, the matter at present has no immediate practical value for us in this country. In Germany alcohol so used is not taxed, greatly to the industrial advantage of that country. Great manufacturing interests have, in consequence, been built up there, and now the possibility of utilizing alcohol for motive-power gives another enormous advantage to Germany. In France there is a tax upon alcohol used in the arts, although slight in comparison with that imposed in this country. But now that alcohol has been shown to be of great value in automobile work there is in France a strong movement to have the tax removed. This movement naturally finds hearty support among agricultural interests, for it would mean increased demand for important staples.

Recent very thorough tests in France appear to show that alcohol can easily be used in ordinary gasoline motors, with little or no change in the mechanism. And the following advantages of alcohol over gasoline are said to be undeniably shown: Freedom from odor; greatly diminished vibration and consequently a notable economy in wear and tear of machinery; less violent explosions; greater power in up-hill work; reduced danger from fire; better regulation, and the utilization of an important national product. The only inconvenience is said to be the necessity of carrying a somewhat greater fuel supply for the same amount of work; an increase of one-quarter to one-third as much in quantity. The explosions being less violent, the operation of the motor is more like that of a steam engine. In consequence there is much less vibration. The better regulation is due to the fact that the volume of alcohol admitted into the explosion cylinder is considerably larger than in the case of gasoline, and in consequence a more exact charge or dose, is possible; moreover, a slight excess in the amount of gasoline admitted into the cylinder causes a complete derangement of the motor, a result which would only follow from the admission of a great excess of alcohol. The reduced danger from fire proceeds not only from the

fact that alcohol is less volatile than gasoline, and therefore much less liable to produce explosions either when transported or in storage, but also because from the nature of alcohol the application of water at once puts an end to combustion when it catches fire, water mixing with it and diluting it to below the burning point. On the other hand, gasoline being of an oily nature, the application of water only tends to aggravate the trouble by spreading the inflammable area.

It has been shown that alcohol can be produced in this country at a price per gallon less than that of gasoline. The latter, with other volatile products of petroleum represents only a very small percentage of the crude petroleum. Consequently the price must advance with the increased demand. Were alcohol, however, relieved from taxation when used in the arts the demand would lead to a greatly increased production and a tendency toward diminishing cost. The industrial possibilities are so great, and the economic advantages so manifest—resulting in an addition to our sources of wealth that would represent new products to the amount of millions and millions in annual value—that it would seem as if the relief from taxation must come in the near future. Indeed, that end was well nigh accomplished a few years ago, Congress having enacted a law to that effect, but unfortunately permitting its execution to rest with the discretion of the Secretary of the Treasury. Unfortunately the gentleman who occupied the position at that time was not inclined to assume new responsibilities, and the inertia of his subordinates led them to represent that it was inconvenient and inexpedient to carry the law into practice. In consequence the law was never carried into effect, and the country has consequently suffered a great loss in industrial possibilities.

The "laziness plea," however, ought in the nature of things not to be allowed long to bar the way to the achievement of the desired end. If it should, it would be a strange comment upon our national reputation for commercial energy and manufacturing enterprise, and we would suffer sadly by comparison with the astute and level-headed Germans. The great interests that would be benefited by such a step ought to unite in a vigorous effort to bring it to pass. Among these are the agricultural, which would profit by a greater market for their products, particularly in the way of grain, beet-roots, potatoes, etc.; the distilling interests, whose business would be vastly increased; and wide-spread manufacturing interests, which would be benefited in various ways. And the entire country would gain by the prosperity resulting from an increased volume of trade and the addition of valuable new products to our agricultural and industrial output.

Even now, however, our automobile manufacturers should be able to profit by the developments in relation to the use of alcohol by making vehicles especially designed to that end for export to countries where alcohol may be profitably employed for motive-power purposes. Among these countries both Cuba and Mexico should present very favorable fields, as well as Porto Rico and other West India islands—unless Porto Rico may be temporarily spoiled for the purpose by the extension of our internal revenue laws to the island. In all of these countries alcohol is produced very cheaply from the sugar-cane.

Mexico presents probably one of the best fields for exploitation in the near future along these lines, for the reason that the Mexican Electric Vehicle Company, one of the sub-companies of the great American Electric Vehicle Company, has laid the foundations for the building-up of a very extensive business there, with important concessions for cab-service and omnibus lines in what is becoming one of the magnificent capitals in the world. The company's range of motive-power is wider than its name implies, and it may use anything for the purpose it sees fit, beside electricity. And the field for alcohol seems to be exceptionally favorable, for the reason that at present motive-power is very costly there, owing to the high cost of coal, wood and other forms of fuel. All petroleum products are very expensive in Mexico, by reason of duties and freight charges, and this makes gasoline extremely high. On the other hand, alcohol is very low in price, so that its use in automobile practice would naturally be vastly cheaper than gasoline. The explosion type of motor, consuming alcohol instead of gasoline, hence seems to be peculiarly adapted to Mexican conditions. It would therefore be well for the Mexican Electric Vehicle Company—which is reputed to have an alert and progressive management—to take due advantage of the circumstance.

The object lessons furnished by the successful application of alcohol to automobile practice in countries so close at hand should have a powerful influence in inducing the relief of alcohol used in the arts from taxation in the United States.

It may be mentioned that the best results appear to be obtained from the admixture with the alcohol of a certain proportion of some product of petroleum. This likewise acts as a very effective "degrading" agent, for it not only prevents the use of such spirit as an intoxicant, but makes hardly possible its redistillation by fraudulent means for "moonshining" ends in the evasion of the revenue laws.

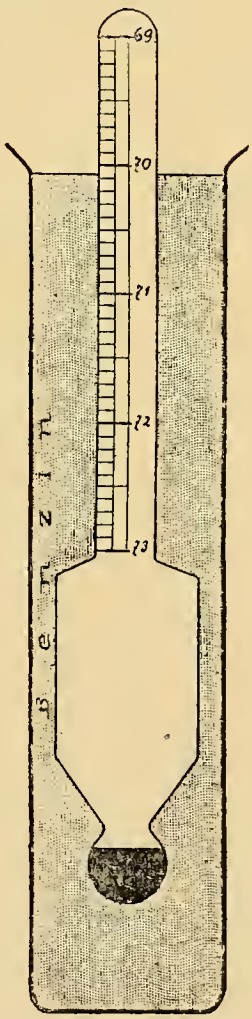
The high price of alcohol makes experimentation in its use a rather costly procedure for inventors or manufacturers. But

since alcohol used in the arts for scientific purposes in schools and colleges is exempt from taxation, such experiments might well be conducted in connection with the mechanical departments of some of our technical schools, like the Massachusetts Institute of Technology, the Worcester and the Troy Polytechnic Institutes, or the Columbia College School of Mines and the Lawrence and Sheffield Scientific Schools at Harvard and Yale, respectively.

SYLVESTER BAXTER.

A Gasoline Meter

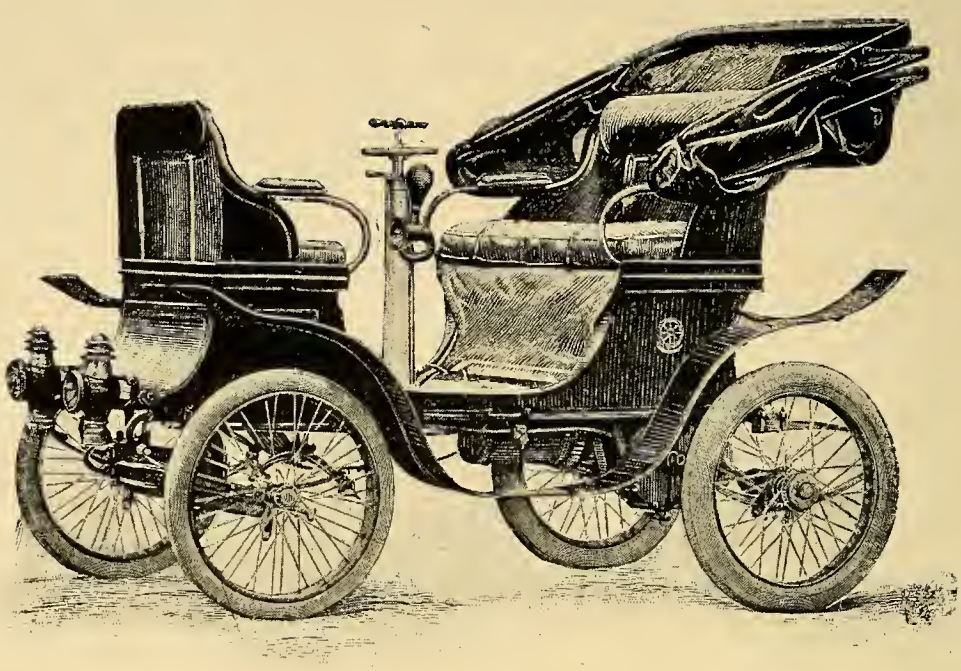
DRIVERS of gasoline carriages are perhaps not so well acquainted as they should be with the small instrument which we figure herewith and which is designed to test the quality of the hydrocarbon that they use in their motors.



The apparatus, which is a form of the hydrometer, and is called a "benzine meter" or "gasoline meter," consists of a closed graduated glass tube filled with air and terminating beneath in two bulbs, the lowermost and smaller of which is filled with a definite quantity of mercury.

The weight of the instrument is so calculated that when it is placed in the hydrocarbon the graduated tube rises or descends therein according to the liquid's density, which may be read upon the scale of degrees. Benzine of a density of 0.69 is of good quality, that of from 0.70 to 0.71 is middling, and such as is below 0.71 ought not to be employed.

Only a small quantity of liquid is required for making the test, and this should be placed in some narrow vessel like a test-tube, which, of course, should be so much the deeper in proportion as the instrument is longer.



The De Dion Voiturette

SEVERAL times during these dull wintry months it has been my pleasant lot to receive visits from various English friends connected with the automobile industry who were desirous of giving the De Dion-Bouton voiturette practical trials under the worst conditions of weather, up stiff hills and down deep dales in slush, loose gravel, some even stipulating that it should rain, and the weather and roads have been so continually bad that I have seldom had difficulty in obliging them. The same sentiments were always confided to me, "If she will go through this wind, rain, and over these sodden roads to Versailles and back without a mishap, then she will do everything and go anywhere in England."

English weather, hills, and roads were pictured to me in the worst possible light, until I began to think that I did not know the climate or country, and that no small carriages, without being specially constructed and fitted with very powerful motors, would make anything like headway, or be a commercial success in England, so that I was most anxious on each occasion to put the voiturette through the worst possible trial, though after the first ride with English friends aboard it was a matter of interest alone, as I had no doubt what their verdict would be.

I will describe one trip which may be taken as a fair sample of many. For reasons explained above the drives were taken under conditions of road and weather that would not usually be selected for recreational automobilism. From my particular suburb of Paris, near the De Dion-Bouton Works, perhaps the route to Versailles is one of the most difficult for a small car to accomplish, and one cold December morning found us leaving the works on the Quai de Seine, accompanied by two *gros bonnets* of the English autocar world.

Rain was falling fast as we steered towards Suresnes, over the horrible *pavé* through Puteaux, but, as we were provided with leather jackets and caps I had borrowed from sundry employees at the works, we were quite prepared to encounter any weather.

We were four robust companions *de route,* and each could comfortably turn the scale at twelve stone, excepting myself, as I weigh fifteen stone, so that our springs were well flexed.

As we drove along our pneumatic tires sank a good inch and a half into the loose, muddy gravel, comprising the road surface, so that the three horse-power motor had all its work cut out, and was put to the severest test, especially as we commenced to ascend the long two-miles hill of Suresnes, but the engine never faltered a piston stroke all the way, and we climbed at about six miles per hour with perfect ease. The rain had cleared up somewhat, and from the Suresnes Hill a magnificent view of Paris is to be enjoyed on a fair day. We could distinctly discern, in the distance, the Tower Eiffel, surrounded by the Exposition Buildings, and this bird's-eye view made one of my friends exclaim, "What a gigantic exhibition it will be." The whole plan of the exhibition could easily be followed from Suresnes just before we turned off sharply to the right, under the railway bridge, up a very stiff piece of hill about six hundred yards long, known as the "*Côte de la Tuilerie,*" which is about one in eight to one in nine all the way, before joining the road that leads up to the Fort Mont Valérien.

We got up this part of the hill so well that I noticed my friends were exchanging views with a smile of contentment upon their faces.

I explained to them that during the various road races I had witnessed many of the big motor cars shed their belts, whilst others had broken their chains up this hill, at which they did not appear surprised; yet our little De Dion voiturette was only a three horse-power motor, with four passengers aboard, and it was successfully doing the same work as a six or eight horse-power car. One enormous advantage, I pointed out to my friends, was

the lightness of the De Dion voiturette, all the frame being made of weldless steel tubing, and in the carriage body the panels are of sheet aluminium. One thing they were astonished to learn was that no belts or chains were used to drive the carriage (or to shed or break). But I promised them I would explain the voiturette fully when we stopped at Versailles.

At the top of the hill in question, like all motor men of a practical mind, they made our driver stop, as they desired to see if the motor had got hot, so we pulled up and descended in order to feel the water jacket around the motor, and examine the radiator, and we found everything to our satisfaction.

My friends desired to know what stroke and bore the three horse-power motor was, and I informed them it had an 80 mm. stroke and 80 mm. bore, and virtually gave three and a half horse-power, especially after it had worked the piston and cylinder to the ideal looking-glass polish, at which period it should put forth its maximum power of three and a half horse-power at 1,700 to 1,800 revolutions per minute. They pointed out that this motor intimately resembled the standard De Dion air-cooled motor, and my reply was, " The De Dion motor was a genuine success in the hands of its makers, as they knew their motor as well as a mother knows her child, on account of the number of years they had been 'nursing' this special pattern, consequently the higher-powered engine was but a natural development of the tricycle motor."

During this conversation we had again taken our seats, and were making our way through that lovely little town Ville d'Avray, having come along on the top speed, excepting up the hill after leaving St. Cloud, on the left, much to the satisfaction of my friends.

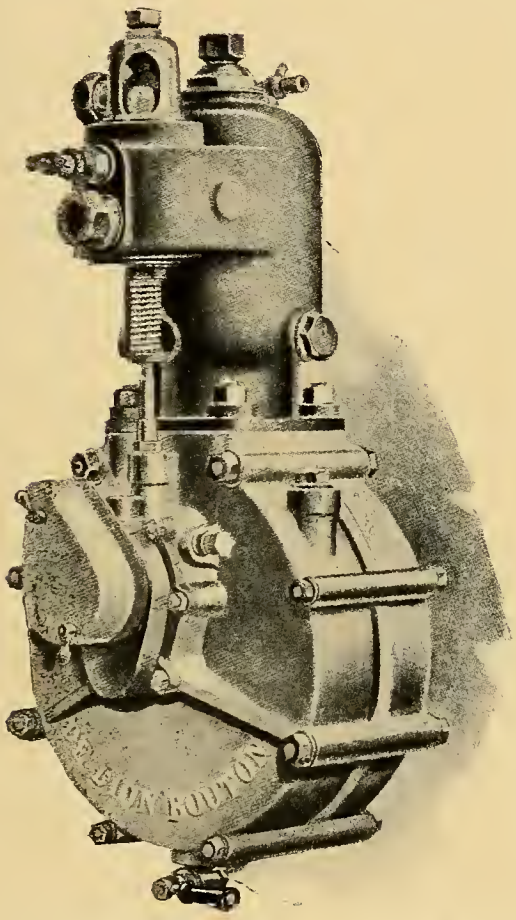
We stopped at the Hotel Cabassud for the usual *apéritif*, it being only about 11.30 A. M., still a glass of sherry did not seem amiss, if only to replace the tasteless rain.

Bent upon knowing every detail of the voiturette thoroughly, they said, " We noticed in changing the speed, by the wheel under the steering bar to the left for slow, and to the right for top speed, it made absolutely no noise."

" No," said I, " this is an ingenious invention due to Monsieur Bouton, and it is probably the most expensive thing to manufacture about the whole carriage."

This, I mentioned, was a difficult piece of mechanism to describe, but I would do my best to satisfy their curiosity. The speed-changing gear is placed alongside the motor, and is closed in an aluminium case. It is composed of two shafts on which are placed four cog wheels of different diameters, meshing

together and being always in gear. The first of these shafts, on which are keyed the pinions, is joined to the motorshaft by means of a coupling sleeve in two pieces. The second shaft is the one on which the throwing in and out of gear takes place. This is effected by the aid of a rack and pinion, which runs through the centre of the second shaft. By moving the rack and pinion rod one way one pair of wheels is put in gear; at the same time the other pair is thrown out. By reversing the action the gear in drive is put out and the other in. The driving is done by two separate friction clutches situated side by side, one being the slow speed and the other the fast speed. Each of these cases contains a set of divided segments of hard composition with metal flanges, and in the centre of each there is a small pinion upon which the rack acts as it moves to the right or left, by which movement the small pinion increases or decreases the diameter of the divided segments. When the rack is moved to the left the small pinion increase the diameter of the segments which bind tightly against the inner surface of the friction case in such a way as to cause the case to drive the toothed wheel connected to it. When the rack is moved along to the right this expands the fast speed segment, and contracts the slow, and when the rack is moved in the centre both clutches are thrown out of gear.



The Three Horse-power Motor with Water Jacket

The hand wheel placed on the pillar underneath the steering bar works the rack of the speed-changing gear by means of a chain.

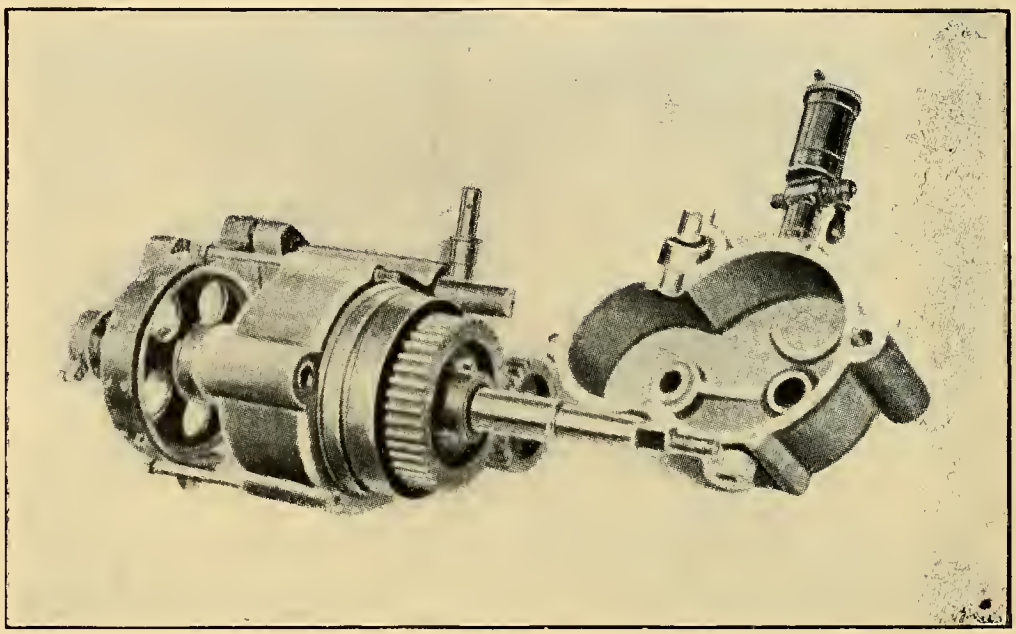
To the extremity of the shaft opposite the rack is fitted the small pinion which gears into the large spur ring encircling the differential gear box.

Twelve o'clock having chimed at the old wayside auberge, I suddenly stopped the conversation and informed my English com-

panions that "in France we usually had *déjeuner* about twelve," and as the keen damp morning had made feelings of hunger apparent, we started the motor on its throbbing way by the handle near the driver's seat, which, as one of my companions remarked, "was in a most convenient position."

I next called my friends' attention to the ascent of the very stiff and celebrated hill of Picardie, well known to cyclists and motorists, up which we simply "romped," and then we coasted down the other side at a forty-miles-an-hour gait.

We drove through Versailles up to the Hotel des Reservoirs, where we ordered *déjeuner,* over which I was able to give them a detailed account of the motor and car, illustrated by the photographs which are here reproduced.



The Two-speed Gear

Whilst lingering over our *café* I gave the following description:

You will have noticed the small De Dion voiturette is distinguished from most small (and large) cars by the simplicity of its machinery, and, at the same time, by its smart and open appearance.

The carriage part is constructed lightly and elegantly with all the sides in sheet aluminium, so that its total weight does not exceed 650 lbs.

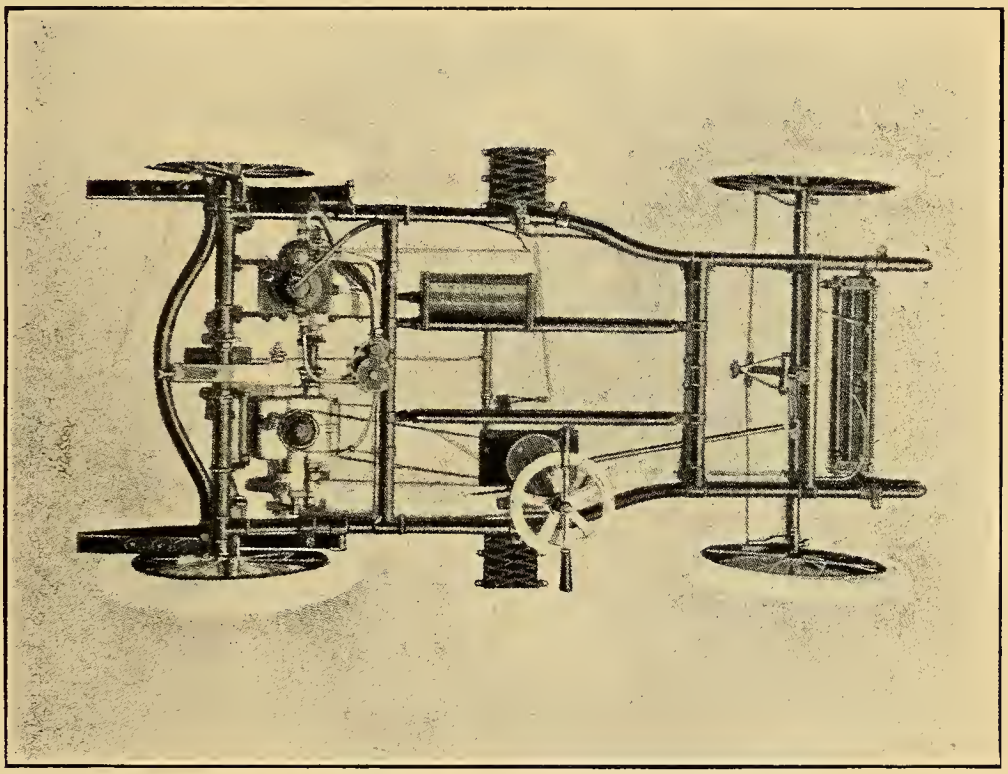
It is made to carry three persons comfortably seated. The four wheels are 26-in. with 2½-in. pneumatic tires on the steerers and 3½-in. on the drivers.

The De Dion Voiturette

The length of the carriage over all is 8 feet, and the width is 4 feet 4 inches. It is fitted with easy springs, and, at the same time, the whole carriage is exceedingly rigid and strong.

There are two brakes, one acting upon the drum on differential gear and one on the speed gear. The speed can be regulated to about twenty miles an hour on level and from six to eight miles up stiff hills.

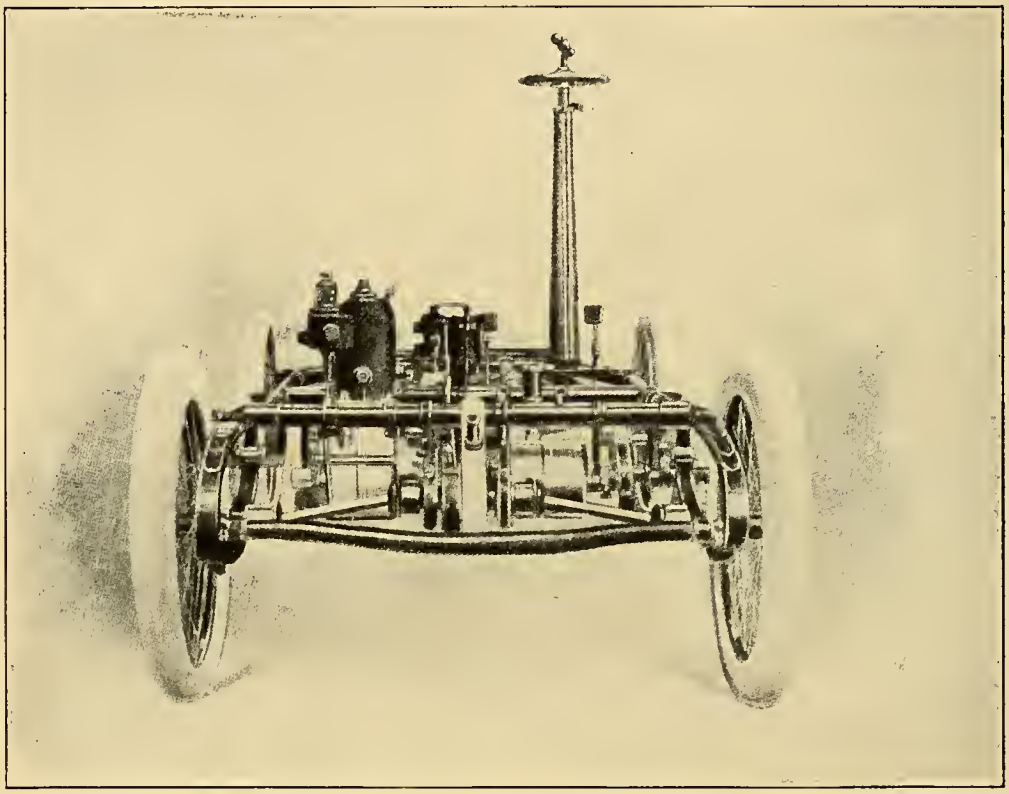
The reservoir contains about two gallons of spirit, and this quantity is sufficient to drive fifty to seventy miles, according to the weather and state of the roads. The capacity of the dry battery is about two hundred working hours.



A Bird's-eye View of the Mechanism with Body Removed

An important feature about the De Dion-Bouton voiturette is that the whole frame, speed and differential gears, axles, driving device *à la cardan,* as we call the universally-jointed axle, motor, and carburetter, have all been designed, manufactured, tested, altered, or improved, where considered necessary, during the past few years solely at their own works, and the fact that it is now being built in batches of hundreds is sufficient to convince the most pessimistic that the De Dion voiturette is likely to prove one of the most successful small cars upon the market at a reasonable price.

It will be seen from the illustration that the back axle is bent to leave the necessary space for the differential gear and to ensure that whilst the spring ends of the axle shall have free and full play, the short central portion, which contains the differential and gears with the countershaft, shall never alter its distance from the latter. At each end of the spindles are fixed the axles *à la cardan,* doing the duty of main driving axle. They are placed at an angle of 3° from the horizontal. The driving wheels are on the two short horizontal continuations of the spindle, and run on ball bearings.



A Back View showing the De Dion Driving Axle à la Cardan

The differential runs on ball bearings, and is mounted in the supports fixed upon the frame. A band brake is fitted to the left side of the differential.

The two axles that it drives have two steel sleeves fitted in each end, in which articulate the extremities of the axles *à la cardan.* The opposite extremities of these axles articulate in the same manner in the sleeves which complete the spindle. The ends of these axles are solid, with square joints, which serve to drive the hubs.

The carburetter is entirely a new departure from the ordinary De Dion carburetter, and is made exclusively by De Dion-Bouton,

and is on the float feed principle, but I cannot give full details just yet.

We now started upon our homeward journey, and one of my friends was anxious to take the driver's seat in order to get accustomed to steering and the general manipulation. After about a quarter of an hour's explanation in regard to the two small levers upon the steering-pillar, one for the mixture and one for the advance, and shutting back the contact breaker, brake pedal, and the electric ignition switch, we started off.

My friend was astonished at the simplicity of driving and ease of steering, but when he changed the speed upon the first stiff hill he burst forth with delight, "Why my wife and daughter will be able to drive this, without the slightest bother, in five minutes."

We sped along on the top speed at a merry pace until we reached Puteaux, where I left my companions thoroughly convinced that the De Dion-Bouton voiturette would be a great success in England. Only one disappointed look came when they asked Count De Dion:

"When can you deliver?"

"Ah, voilà la question."

—*Autocar.*

AUTOMOBILES USED FOR TOWING

The haulage of boats by automobile along the canal between Brussels and Charleroi has demonstrated, after a long trial, that the new method of towing is three times quicker than horse traction. The automobile derives its energy from a railway composed of six lines, three of high tension (6,000 volts) and three of low tension, on which the trolleys run. The electricity is furnished by three dynamos, each of 120 horse-power.

The Canello-Durkopp Motor-Carriage

REFERENCE has already been briefly made in these pages to the motor-vehicles of the Société des Automobiles Canello-Durkopp, of Courbevoie, France, and Bielefeld, Germany. Through the courtesy of the builders we are now able to publish some further information and illustrations of these vehicles which, both in appearance and arrangement, resemble very closely the well-known Panhard-Levassor type of automobiles. Notwithstanding this general resemblance, however, the

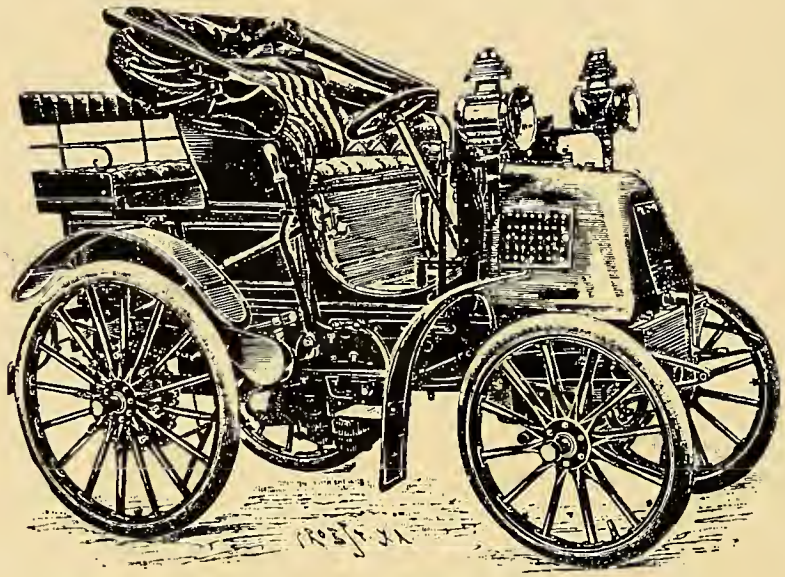


Fig. 1. General View of Canello-Durkopp Phaeton

following description indicates that there are many special features in the new cars worthy of close attention. The motor, of 4, 6, or 8 horse-power, as desired, is composed of two vertical cylinders, with incandescent tube ignition. It is placed in the front part of the frame (Fig. 2), and is concealed from view by a sheet-iron bonnet, as in the Panhard cars. Water for cooling is circulated by a thermo-syphon when the power is low and by a pump driven by a friction on the fly-wheel or by a gear on the regulating shaft in the large-sized motors. The inlet valves are automatic, as usual, and the exhaust valves are raised by a cam shaft located in a case and controlled by reduction gears *J*. The sectional view of the motor (Fig. 3) shows that the connecting rods are balanced by a counterweight, *Z*, attached to the motor-

shaft *I*, which on the left end has the starting gear 4, and on the right the fly-wheel *F*, hollowed out to receive the male portion of the friction clutch, by which means the motor is disconnected from the transmission gear.

The method of controlling the valves by cams and the governor is represented in Fig. 4. *M* is the motor-pinion engaging with the wheel *L*, attached to the cam shaft *A*. This shaft slides in the bearing *E E'*, which are fastened to the shaft by means of the keys *R*, allowing it to slide in these bearings, but forcing it when it turns to carry with it the bearings *P*, movable in the bearings *O*, the latter being fixed to special supports. The pinion *M* is of sufficient width that whatever the displacement of the shaft *A* it is always in gear with the wheel *L*. It will be seen that the shaft *A* carries the cams *B* and *B'*, provided with pro-

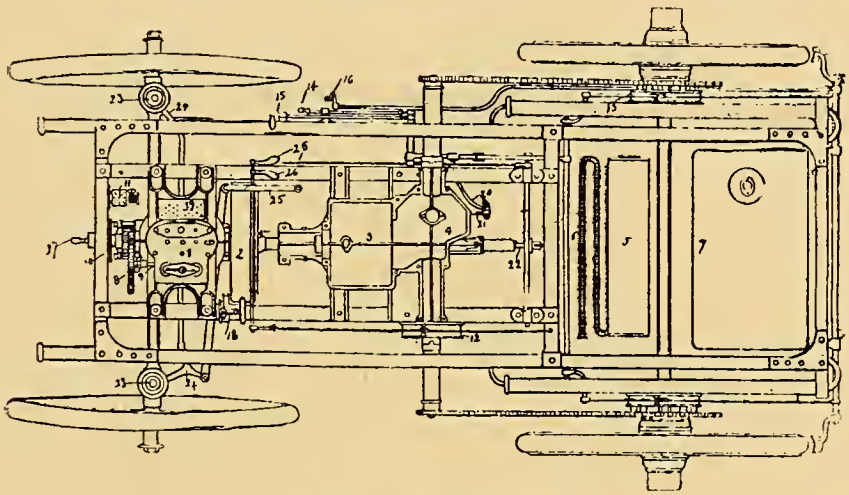


Fig. 2. Plan of Car

jections *b* and *b'*, of eccentric form, which act upon the rollers *C* and *C'*, attached to the ends of rods *D* and *D'*, which control the exhaust valves. The position represented in Fig. 4 corresponds to the moment when the roller *C*, being in full contact with the projection *b*, the corresponding valve is wide open, the valve controlled by the rod *D'* being closed. A centrifugal ball governor turns with the shaft *A*. If the motor "races" the centrifugal force, overcoming the power of the springs *I'*, will throw out the balls *I*. A force will then be exerted upon the collar *K* tending to move the shaft *A* sufficiently backward to bring the projections *b b'* out of contact with the rollers *C C'*. Consequently the rods *D* and *D'* are no longer raised at each revolution of the shaft *A*, and as the corresponding valves remain closed, the motor will slow down until the spring *I'*, acting upon the governor and upon the shaft *A*, brings the latter to its former position—*i. e.*, brings

the eccentric projections *b b'* back into play with the pulleys *C C'*. In order to exceed the fixed maximum speed in certain cases the operator is able by means of the rod *H* controlling the bell crank *G G*, which acts upon a fork in the grooved collar *F F'*, to force the shaft *A* into the normal position.

As has been already stated, the motor is located in front. It is so placed that the motor shaft and the fly-wheel are in the longitudinal axis of the vehicle. The burners are located at 19;

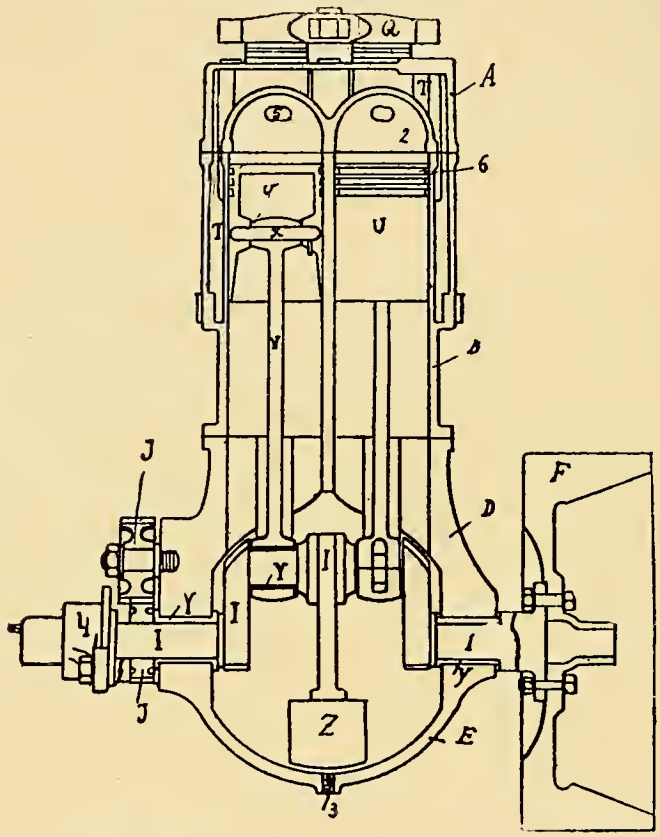


Fig. 3. Sectional View of Motor

at 10 and 11 starting gear; at 8 and 9 the regulation gear; at 11 the carbureter. The motor drives a longitudinal shaft through the medium of a friction clutch 2, controlled by the lever 22. The case containing the speed-changing gears is located at 3, while 4 is the case enclosing the differential upon the counter-shaft which command the rear road wheels by pinions and chains. At 7 is the water tank, holding thirty litres; the petrol tank, having a capacity of twenty-two litres, is in front. 18 is the centrifugal pump for the circulation of the water, while 5 is the muffler, the radiating coil being located below at 6. Four speeds forward and reverse motion are provided. Particulars of the

variable speed gear and of the special steering connections employed in these vehicles will be given in a subsequent issue.

The Canello-Durkopp Company is making a number of different types of cars, Fig. 1 showing a 6 horse-power four-seated phaeton. Four brakes are provided: a band brake (12) on the differential shaft, controlled by a foot-pedal (26); two band brakes (13) on the rear axle, actuated by the handle (15), and tire brakes (17) applied by the screw 16.

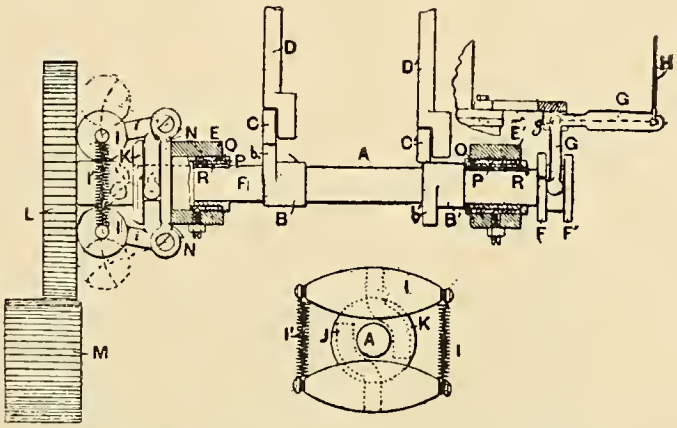


Fig. 4. Exhaust-valve Control Gear

Two New English Motor-Voiturettes

IT has already been stated in these columns that, just as in France, there is a distinct movement in this country in favor of the voiturette class of automobile, and this week we are able to give illustrations of two new cars of this type of English construction.

Fig. 1 gives a general view of the Billings voiturette, which is being introduced by Mr. J. Burns, of Berners street, London,

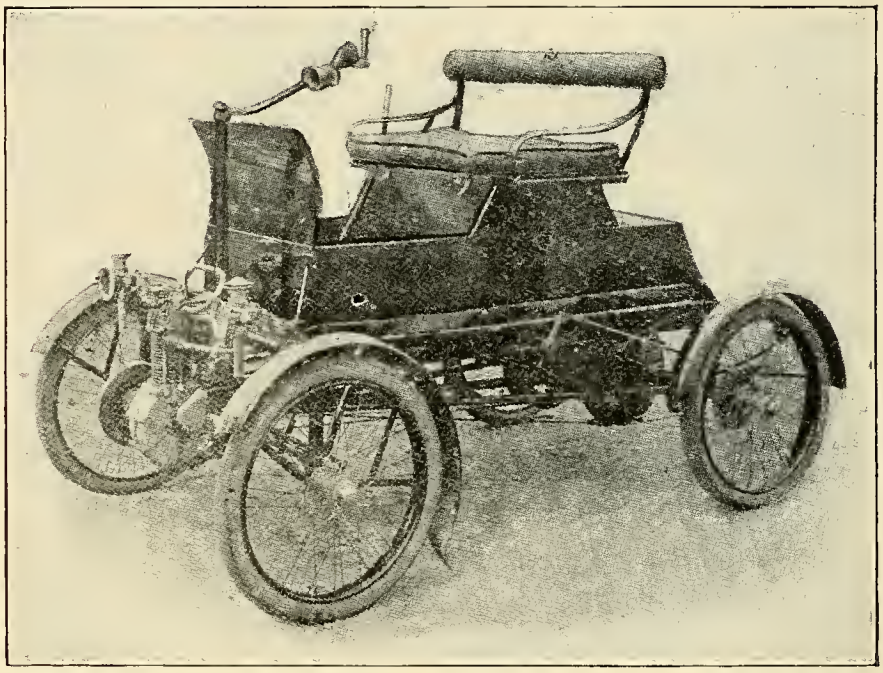


Fig. 1. The Billings Voiturette

W., and on one of which we had the pleasure of a short run on Tuesday in company with Mr. Billings, the designer of the car. As will be seen, the vehicle is propelled by means of a 2¼ horse-power air-cooled De Dion motor, located in the front part of the frame. The latter is of special tubular construction, there being practically two frames suitably braced together, suspended by steel springs on the axles. Two speeds are provided—six and twelve miles per hour, on the car we tried—the power being transmitted by belts working on fast and loose pulleys to a small differential counter-shaft at the rear, and from the latter to the

back axle by enclosed pinions centrally located. Not only is the car so arranged that the motor can, if desired, be started from the seat, but the oil from the crank case can be emptied and a fresh supply injected without the driver dismounting. Steering is effected by a tiller, the standard of which is located in front of the dash-board; the road wheels are of the cycle type, with pneumatic tires, while as to brakes there is one on the counter-shaft and one each on the hubs of the rear wheels. The petrol tank has a capacity sufficient for a run of 100 miles. The car, which only weighs 400 pounds, has already been driven several hundred miles, and is stated to have mounted a gradient of 1 in 10 with two passengers aboard. As a result of his tests with the

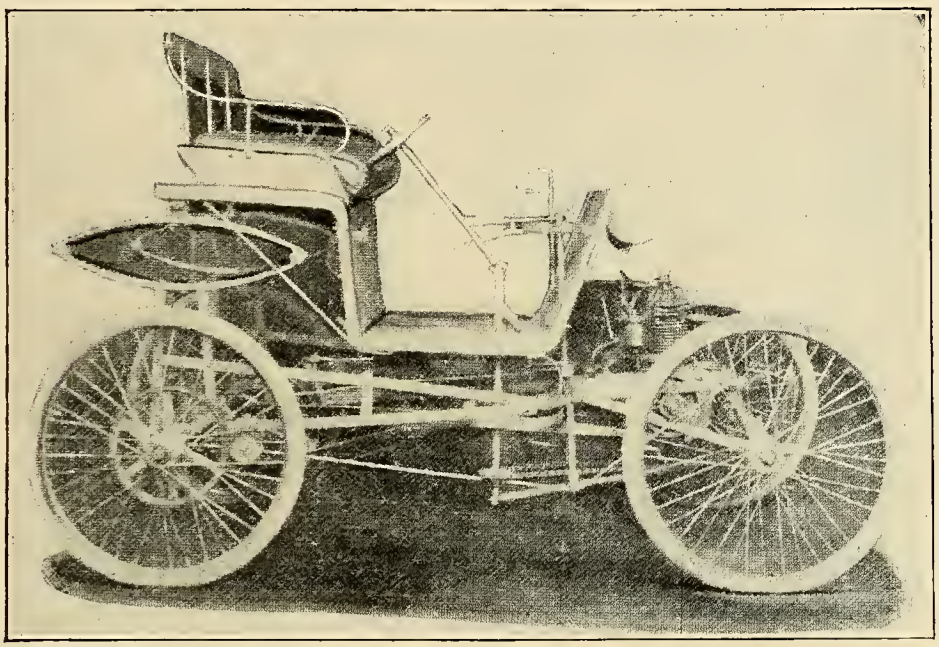


Fig. 2. The Monk and Lonsdale Voiturette

car, however, Mr. Billings informs us that he has resolved to fit future cars with a 3 horse-power water-cooled De Dion motor, in order to have a greater reserve of power at command than is possible with the air-cooled engine. Although the illustration shows the motor not to be provided with a bonnet, this will, of course, be fitted to all cars turned out, a number being, we understand, already in process of construction.

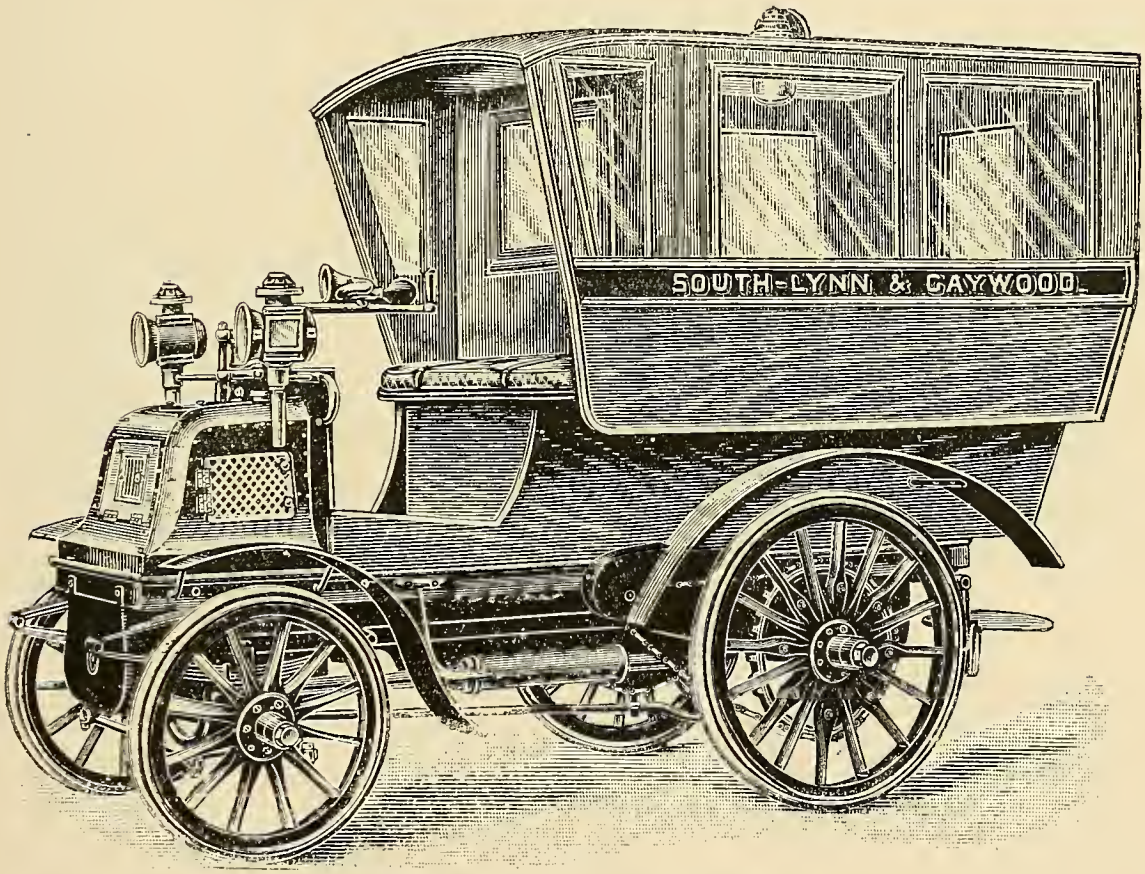
In Fig. 2 we give an illustration of the two-seated motor-voiturette lately constructed by Messrs. Monk and Lonsdale, of the Marlborough Motor Works, North Road, Brighton. The car is propelled by a 2½ horse-power vertical air-cooled motor, placed in the front of the frame; it is belt-driven, two speeds of

five and twelve miles an hour and a reverse motion being provided. The speeds are changed by a single lever. The frame throughout is made of spring steel riveted together. Steering is controlled by a sloping hand-wheel, in the standard of which a universal joint is introduced, so that it can be moved to allow for getting in and out of the car. Oil-retaining bearings, and a new type of silencer, are fitted, while provision is made for the engine to be started from the seat or in the ordinary way. Messrs. Monk and Lonsdale in sending us the particulars state that the photo., although not showing the car in its perfectly finished state, is quite enough to indicate the general arrangement. The body will, of course, be better finished than in the illustration, and C springs will be fitted, while the front will have a detachable cover to go over the engine. They further state that everything, except the raw material, is manufactured on their own premises.

The Morriss Motor-Omnibus

ONE of the most enterprising firms in the Eastern counties is undoubtedly that of Mr. Frank Morriss of the Motor and Cycle Works, London Road, King's Lynn. As mentioned in a recent issue of this journal, the latest venture of this gentleman is the establishment of a regular motor-omnibus service in the town—from South Gates to Gaywood. We are this week able to give an illustration of the vehicle which has been built by Mr. Morriss in his own works for this service, from which it will be seen that the 'bus has quite an attractive appearance. One noticeable feature of it is the protection afforded to the driver, the roof having been continued beyond the body of the vehicle to cover the "box," the sides of which are also enclosed. The propelling power is a 5½ horse-power Daimler motor mounted on a Daimler standard frame. The car is geared to a maximum of twelve miles per hour, and the body is mounted on hanging springs, and rides very easily. The vehicle is licensed to carry ten passengers—eight inside and two on the box; and their comfort has been well studied, the inside being nicely upholstered; there is also the novelty of a roof oil-lamp (of the type

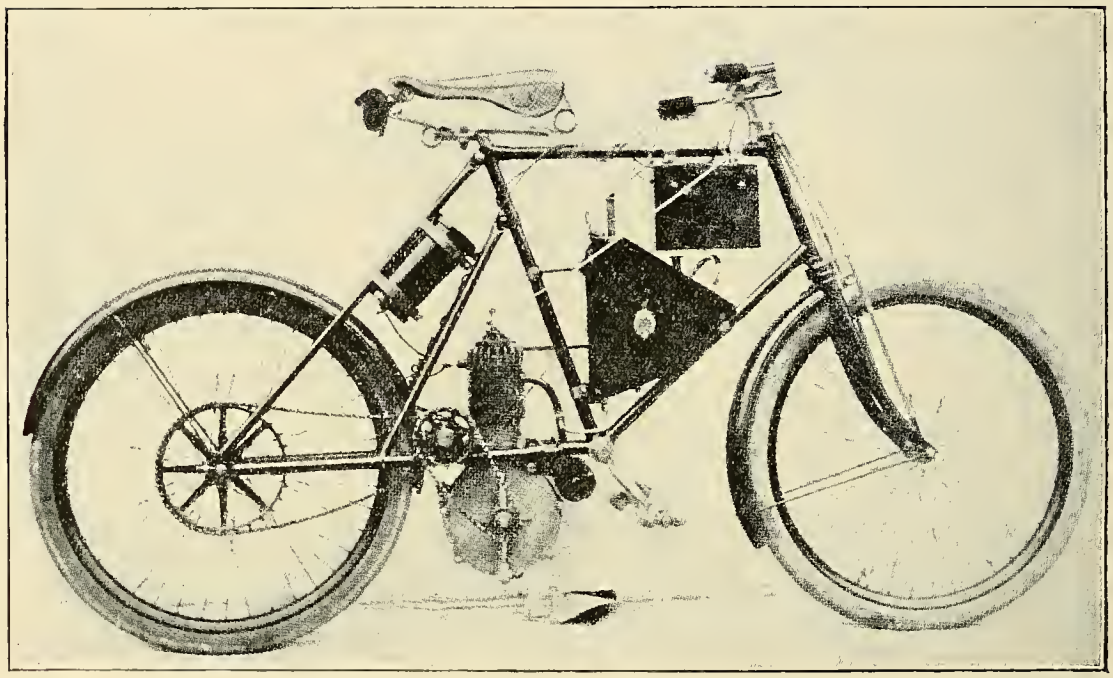
of those found in railway carriages) and a lever clock, while an electric bell affords communication between the conductor and the driver. The 'bus is timed to leave the South Gates every hour, commencing at 9 A. M., allowing twenty-seven minutes to arrive at Gaywood. There is a three-minute stoppage, and each hour, commencing at 9.30 A. M., the 'bus will travel from Gaywood to the South Gates. The fares are a penny from one stopping-place to the other, or twopence from the South Gates to Gaywood, or *vice versa*. Mr. Morriss informs us that he can supply these 'buses either complete with motor and frame or the bodies separately for fitting to customers' own frames.



The Morriss Motor-Omnibus

The Shaw Motor Bicycle

A STRONG looking motor bicycle with a good long wheel-base has been made by Messrs. Ambrose Shaw and Son, of the Gazelle Works, Crawley. The machine is driven by a 1¾ horse-power De Dion motor. Electric ignition is, of course, fitted, so that the speed can be varied in the same way as on a tricycle. A noiseless gear can be fitted to connect the motorshaft with the countershaft, instead of the chain driving throughout, as shown in our illustration. The appearance of the machine will be improved in future by the carbureter and battery being contained in one case. It will be seen that no provision



for pedal driving or pedal assistance is made on this machine, the pedals merely being used as footrests. Starting is effected by opening the compression tap and pushing the machine off. As soon as the motor commences to run, the rider steps into the saddle and closes the compression tap. The firm are working out a tricycle which, we understand, will practically be on the same lines as the bicycle, that is to say, with the motor in the same position as shown, and with a chain drive throughout, so that there will be no noise from any toothed gearing. The only difference between the bicycle and the tricycle will be in the fact that two back wheels, an axle, and a balance gear will be fitted to the latter with proper splayed stays from the saddle to axle sleeves.

The Hugot Motor-Voiturette

AMONG the many new types of light motor-voiturettes lately introduced is the one illustrated herewith, and made by M. Hugot, of 8 Rue Sainte Apoline, Paris. The body of the car is suspended on the steel frame by C springs at the rear and plate springs at the front, which are claimed to reduce the vibration experienced by the riders to a minimum. The vehicle has accommodation for three persons, two facing the direction of progression and one on a seat contrived at the

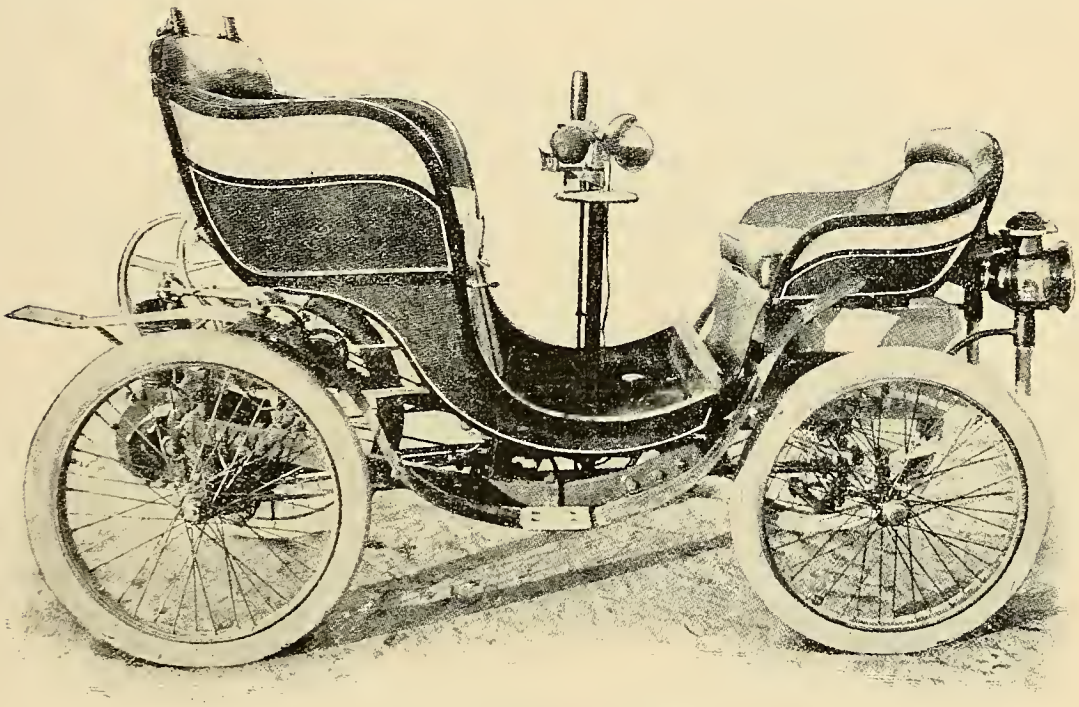


Fig. 1. General View

front on the box containing the battery, tools, etc. M. Hugot employs a 2¼ horse-power De Dion motor of the latest type, the ignition being, of course, electrical and the cooling by means of radial discs around the cylinders. The carbureter is of the Longuemare type. Two speeds are provided, by means of which, assisted by the variation of the sparking device, speeds of from 14 to 28 kilometres per hour on level roads and from 4 to 14 kilometres uphill can, it is claimed, be obtained. The transmission and variable speed gear presents some interesting features. As will be seen from Fig. 2, the motor is located at the back of the car and drives the rear road wheels, represented by *M* and *K*,

through the intermediary of the pinion *B* and the differential gear, which is made up of the pinions *C, D, E, F*. At *J* is an ordinary step clutch, by means of which the wheel *K* can be made rigidly connected with the right half of the axle or to run loose on the same. When the low speed is in gear, which in the Hugot car is the normal position of the transmission device, the wheel *K* is rigidly connected with its part of the axle, and the transmission of the power of the motor is made to the two rear road wheels through the differential gear. Around the differential gear is a gear case which also serves as a drum for the low-speed brake (not shown in Fig. 2). To change over from the low to the high speed the band brake *G* is tightened, the clutch *J* being at the same time thrown out, so causing the wheel *K* to run

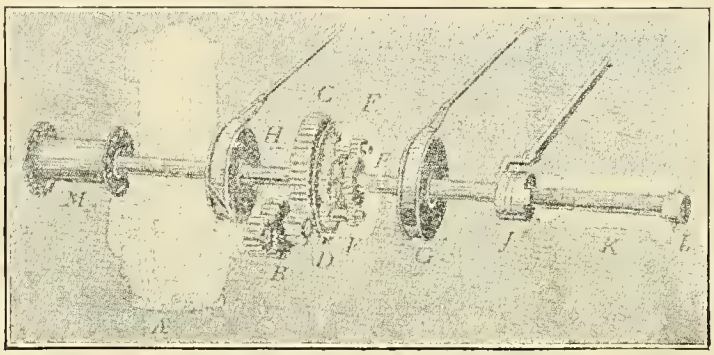


Fig. 2. View of Hugot Variable Speed Gear

loose on its axle, the result being that the wheel *M* becomes the only driven one and runs at double the speed of the low gear. To change back again the high-speed band brake *H* is applied. The gear is both simple and ingenious, the only drawback we can notice being that at the high speed only one of the rear wheels is driven. As the high speed in voiturettes is never very excessive it is probable that the drawback alluded to is more imaginary than real. The car weighs rather less than 4 cwt., and can, it is claimed, mount gradients of 1 in 10. The road wheels are of the suspension type, fitted with pneumatic tires; the car is 8 feet long by 3½ feet wide. The Hugot car is being introduced into this country under the name of the "Paris" by the United Motor Industries, of 3 Rue Meyerbeer, Paris.

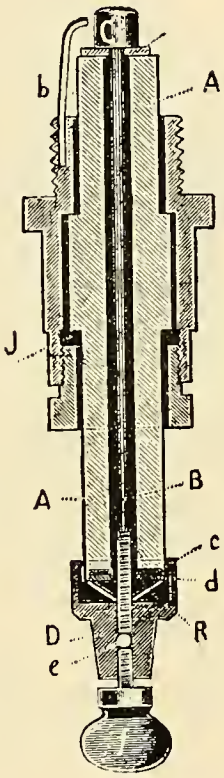
A New French Steam Omnibus

LA Compagnie Nationale des Courriers Automobiles, of 22 Rue Rossini, Paris, have lately constructed a new steam omnibus, of which a general view is given herewith. The car is propelled by a 14 horse-power two-cylinder compound engine, steam for which is supplied by a Thirion tubular inexplosible boiler. The engines are so located under the floor of the car that each cylinder drives one of the rear road wheels through chain gearing. The vehicle has accommodation for fifteen per-

sons, including the driver, and can, in addition, carry 12 cwt. of luggage or merchandise. The water tank has a capacity of 300 litres, which, states *L'Avenir de Automobile,* to whom we are indebted for the illustration, is sufficient for a run of thirty kilometres. Steering is controlled by a vertical hand wheel, while the driver has three breaks at his command. The wheels, which are of wood with iron tires, are 31½ inches in diameter in front, and 47 inches at the rear. The weight of the 'bus complete is given as 2 tons 15 cwt.

The Georges Richard Sparking Plug

THE ordinary sparking plug consists of a metal spindle passing down the centre of a porcelain tube, its end being near another rod which is connected to the main body of the motor. Between these two rods the spark passes. The rod passing down the axis of the plug is fixed either by some kind of cement or by two screws, which hold it between their ends.



These two systems have their disadvantages. Under the influence of the high temperature cements deteriorate, while, on the other hand, if the rod is fixed by means of screws it comes about that, owing to the difference in the expansions of the rod and the porcelain, the joints are altered in such a way that a current of gas or air sufficient to extinguish the spark may be produced around the rod.

The figure indicates the method by which Mr. Georges Richard seeks to avoid these causes of breakdown. A is the porcelain tube inclosing a metal rod, B, at the end of which is a head, C, separated from the end of the porcelain tube by a copper washer, *a*. Close to the head, C, is the rod, *b*, which is connected to the mass of the motor. At the other end of the tube is an asbestos washer, *c*, over which is another copper washer, *d*. A spring, R, presses against this washer.

According to the usual practice the rod, B, has its end threaded to receive the nut, D, by means of which the rod, B, is firmly held

in the porcelain tube; this nut, D, receiving the conductor, *e*, of the electric current; *e* being held by the thumb-screw, *f*.

Owing to the spring, R, which is compressed by the screw, D, the head, C, is pressed firmly against the tube, A, and there is also a tight joint at the other end between *c*, *d* and A. Thus a good joint is formed which does not allow the passage of gas or air when the parts expand, the difference in expansion being met by the action of the spring.

AN AUTOMOBILE SLEIGH

The curious automobile sleigh shown in the accompanying illustration consists of a Bollee gasoline automobile altered by the removal of its front wheels and their replacement by runners to adapt it to be used on ice and snow. A wooden rim carrying conical points is put around the rear motor wheel and gives a sufficient bearing on the surface of the ice to propel the vehicle. This curious automobile was designed and made by Dr. E. Cas-

En Tour

grain, of Quebec. The reservoir of gasoline holds enough for a run of 45 miles and the motor develops two horse-power. The vehicle can be speeded at will from 5 to 14 miles per hour. The whole running gear and frame of the machine is made of hollow tubing, the front runners doing the steering. We are indebted to the *Literary Digest* for the illustration of this interesting automobile.

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Editorial Comment

The Motocycle

THE organization of the Motocycle Club in Boston is significant, as indicating a growing popularity of that form of the automobile in this country. It is, we believe, the first organization in the United States specially devoted to that style of vehicle. In France the motocycle is exceedingly popular; in fact, the most popular of all motor-vehicles, but in this country various reasons have given the automobile proper the precedence. The motocycle is a combination of the cycle and the automobile idea. It has the pedals and the saddle of the former and the motor of the latter, and in general shape is an evolution from the bicycle rather than from the animal-traction vehicle. In its combination of muscular and mechanical traction it may be compared to the sailing vessel with auxiliary steam-power—once a familiar form of ocean craft, but now nearly obsolete. In the motocycle, however, it is the muscular traction that furnishes the auxiliary power, pedalling being resorted to for starting the motor, while the machine may also be pedalled home in case of a breakdown in the mechanism—a pretty laborious process, to be sure, comparable to rowing a motor-launch to the shore when the machinery refuses to work—as is too often the case with the

freaky explosion-engine type. Since the motocycle is of comparatively low cost, we may look to see it achieve a rapid advance in popularity. But we hope it will not become the scorching nuisance upon our highways that it is in France. The motor-bicycle is growing in favor, but is a dangerous machine, not to be commended for general use. The tricycle and the quadricycle are the best forms, and we may expect to see notable improvements in their manufacture in this country.

Railways and the Automobile

It is not unlikely that the automobile, although to a certain extent a rival of the railway, may prove eventually a very powerful auxiliary. And this service it may perform for both steam and street railway. There are certain indications of the direction which such a development may take. For example, the New York Central and the Pennsylvania Railway Companies have established excellent cab-services in connection with their terminal stations, the former in New York and the latter in both New York and Philadelphia. The former, it is said, proposes to establish a similar service in the principal cities along its line, as in Albany, Syracuse, Rochester, Buffalo, etc. And in all likelihood, on taking over the Boston and Albany, it will establish such a system in Boston, possibly in conjunction with its co-occupant of the great South station in that city—the New York, New Haven and Hartford Railroad Company. It is said that, as soon as practicable, both the Central and the Pennsylvania will substitute mechanical traction for animal traction in these cab services. Again, the Boston and Maine Railroad owns and operates the electric street-railway service in Portsmouth, New Hampshire, with excellent results, and the New York, New Haven and Hartford controls or operates extensive lines of electric cars near New York, Boston and Hartford. Now why might not a great steam railway go a step farther and run automobile omnibus lines at every important station along its line, transporting passengers at low rates to and from their homes? The automobile might thus become a powerful feeder for the railway. Again, there would seem to be a field for the automobile as a feeder for street-railway systems as well, with motor-omnibus lines running to points where it would be impracticable to construct the railway itself.

The Tire Problem

The tire appears to be the element that is giving the most concern to automobile manufacturers just now, or at least the makers of heavy vehicles devoted to passenger transportation. The pneumatic tire for bicycles had been carried to such a degree of perfection, and it had been applied so successfully to horse-drawn vehicles, that it had been taken for granted that practically no difficulty would attend its adaptation to automobile requirements. Its extraordinarily strong construction for the new purposes, with special provisions against puncturing, were deemed to be ample for making it conform to automobile work. But the tremendous wear and tear to which the tire is subjected in its work of sustaining a load so heavy as the electric vehicle, with its dead weight in storage-battery, was all too lightly reckoned with. Under such a strain the life of a set of tires is exceedingly short, and since they are pretty costly items, their frequent renewal makes an enormous figure in the annual maintenance charge—a figure that has quite upset all calculations as to profit on the part of the transportation companies to whom automobile traction seemed such an assured bonanza.

There is nothing, however, disheartening in this development, unpleasant as it is. It is merely one of the drawbacks that inevitably attends every notable advance in inventive science. The difficulty is slight in comparison with the obstacles that the steam railway had to overcome, or the steamboat, or even the development of electric traction. It simply for awhile makes sailing less smooth than had been anticipated. Human ingenuity can be depended upon to overcome the obstacle in the comparatively near future. For all we know to the contrary, it may, indeed, already have been surmounted.

The bicycle did not teach us everything there was to be known about the rubber tire, after all. It looks as if, in relation to the automobile, a course of experimentive development in regard to the tire would have to be gone through with, comparable to that which characterized the evolution of the bicycle. And possibly the perfected shape will be something as radically different from anything now existing as the pneumatic tire differs from the narrow rim of rubber that, in the old high wheel, proved the foundation of the bicycle's potency.

At present the tendency appears to be away from the pneumatic tire. In its huge and disproportionate bulk it has been the chief contributor to the clumsy aspect of the electric cab as until recently known, and has been the main element in giving that vehicle the look of a steam roller. Surely nothing so ungainly

to the eye ought to be mechanically efficient! The new cabs, however, that have made their appearance this season are of a model that in elegance vie with the hansom, or any other horse-drawn vehicle. The effect of lightness is enhanced by the substitution of the cushion tire for the pneumatic, with well-designed wooden wheels, a superior construction of springs doubtless making up for any inferiority to the pneumatic which this form of tire may have. And should its life prove less than that of the pneumatic, the difference in original cost ought to bring the maintenance charge within reasonable limits.

The Odor Problem

With the multiplicity of automobiles the problem of offensive odor will have to be solved. While those that use petroleum in any shape remain comparatively few in number, there will be little trouble. The occupants of the vehicle do not mind it, for they leave their scent behind them. But if they chance to run behind another vehicle like their own, they are apt to curse the other fellow roundly, just as people in their rear curse them! With a road filled with such automobiles the effect would be extremely unpleasant to all concerned. A little unconsumed petroleum vapor will charge many thousand cubic yards of air with its odor, and when the atmosphere is humid and calm the smell will linger long in one place. A public park, with pleasure-drives thus thronged, would be intolerable. It is important to know, however, that perfect combustion prevents odor and that in the average gasoline motor now employed in automobile practice the combustion is remarkably complete. Where does the smell come from, then? An eminent authority finds that it proceeds, not from the products of combustion, but from the lubricants, which, becoming vaporized by the heat of the motor, leave their scent in the air. It may, perhaps, be an expensive and difficult task to avoid this. If, however, in some way, inoffensive and deodorized lubricants can be used, or if the vapors which they produce can be superheated so as to consume their gases, the offending cause will be abolished. Perhaps the remedy will ultimately turn out to be relatively simple. The problem will have to be solved sooner or later.

The Letter That Killeth

An amusing, though annoying, instance of corporate chuckleheadedness is reported by an English automobilist in Worcestershire, England. He had often crossed a certain toll-bridge, paying the costly rate of nine pence a time, but it saved him a

detour of 12 miles. The last time, however, he was absolutely refused passage across. Complaining to the corporation owning the bridge, he was answered that the bridge had been purchased by the county council and would be shortly made free to the public. Meanwhile an old act of Parliament controlling the bridge, which did not provide for its use by automobiles, would have to be observed, and the gatekeeper had been instructed not to allow any to pass!

Improvements in Construction

A recent number of the *Autocar* comments on the marvelous progress in improvements in automobile construction made in the past three years: "In the first place we have but to point to the speeds made in the great continental races. It is but three years ago that an average speed of fifteen miles per hour throughout one of these long contests produced a winning car, whereas, to quote the latest instance, the Gordon Bennett cup race, the average was very little short of forty miles per hour. And this increased speed has not been obtained entirely by the increase of motor power, but by general attention to details throughout the vehicle, to the lessening of friction in the transmission gear, to the reduction of weight in the car and its mechanism, and to the use of pneumatic tires. To come nearer home, we may recall the fact that on our John-o'-Groat's tour—which was carried out less than three years since—we averaged over no single stretch of the journey more than twelve miles per hour, and in comparison with this we may quote the performance of a member of the Automobile Club, who finished up the Whitsuntide tour by a run from Cambridge via Bedford, Aylesbury, Oxford and Maidenhead to London, a distance of 149¾ miles, in 9 hours 49 minutes running time, which gives an average of 18.9 miles per hour, or, including all stoppages for meals, etc., of 15.2 miles, this latter average including also the slowing down when passing through the numerous towns encountered *en route*, the many stops for cattle, etc., and one stop to relight a lamp. This comparison is interesting because the car was fitted with an identical motor, both as to the make and power, to our own, and carried three passengers, the third person about counterbalancing the baggage and supplies with which our car was loaded. The difference in the two cars is mainly to be found in the reduction of weight—some seven hundred-weight—pneumatic *vs.* solid tires, a higher gearing, and the use of an accelerator, but the difference in the two performances is a striking commentary on the assertion that no improvements have been made."

One of the Decorated Vehicles at Guttenburg

The Automobile
MAGAZINE

VOL. 11 OCTOBER 1900 No. 7

Three Notable Motor Carriages

THE Shah of Persia is probably the first notable from the Eastern countries to use an automobile, and will probably astonish the natives as well as be the recipient of many prayers for his protection from accident with the new foreign invention. His visit to the Paris Exposition showed him so many of the new vehicles, as well as their advantages, that he could not forego the temptation to have some of his own. He decided on the steam vehicles of M. Leon Serpollet, and the one shown has already been shipped. It is an eight horse-power double phaeton and is equipped with the latest type of Serpollet boiler.

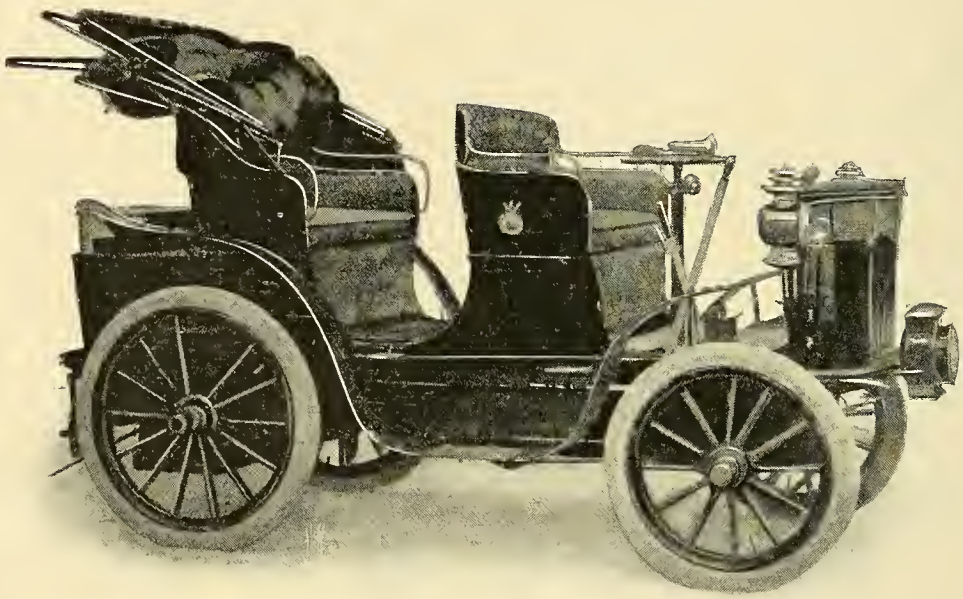
The Right Honorable A. J. Balfour's choice fell on a De Dion voiturette, as shown. Report has it that he is so highly pleased with its workings that he has ordered another for his daughter, who has handled it herself to considerable extent. The one shown is painted dark green with fine white lines and is upholstered in dark green morocco.

Mr. Oliver Stanton has the new twelve horse-power Daimler carriage shown with this article. The motor is of the four cylinder type with a gravity feed for fuel and pressure feed for lamps. Mr. Stanton is well known in England as being the instructor of the Prince of Wales in his automobile ventures, as well as a general mentor for notables with similar tendencies. It will be seen from the above that the automobile is fast making friends among the nobility and royalty of European countries. It does not seem to make any difference who enters the ranks of the automobilist; it fascinates all alike, and the sensation one's first experience brings is delightful.

The Genesis of the Automobile

By Dr. A. Neuberger

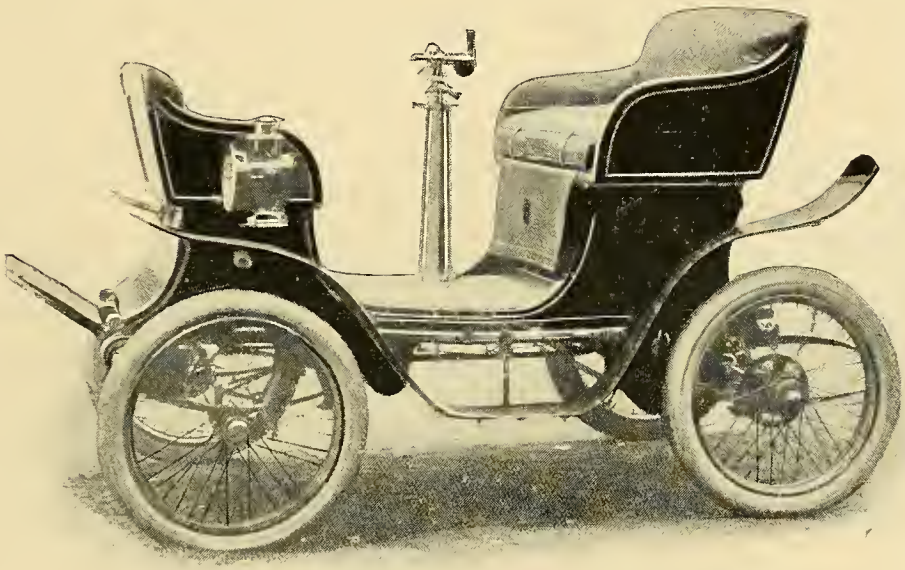
SO suddenly has the automobile sprung into prominence that many of us are apt to look upon it as one of the remarkable and startling products of an inventive age. But the automobile is by no means new. Horseless carriages are old, very old, and can be traced back to early times. At the beginning of the century, it was by no means uncommon to see an automobile, driven by steam, winding its way through the streets of London.



Carriage of the Shah of Persia

The history of the automobile is interesting because it teaches us something of a technical problem which long baffled many a keen mind and which at last seems to have been solved just as a new century is dawning. If we examine the monumental records of the human race, we find carved upon the stone memorials of the Egyptians, a wagon or chariot driven by the repellant force of a jet of steam. Whether the vehicle was ever actually built or whether it was the idea of some brilliant inventor born out of his time, archeologists have not been able to determine. Be that as it may, at all events these graven records of a by-gone day prove that the idea of a wagon propelled by some mechanical means was known in the time of the Pharaohs, and that the

realization of this idea was attempted by a method, which technically considered, was far from being the worst that could have been chosen. With the fall of the Egyptian Empire, the automobile seems to have disappeared for a time from the memory of man. It is not until we come to the Roman Emperors that we find traces of the automobile in the documents which have been handed down. There must have been some mechanically-driven vehicle in the time of the Emperor Pertinax (192-193 A. D.), for we find in the well-known life of that Emperor a passage which reads: "Emperor Pertinax sold everything which belonged to his predecessor, Commodus, and among other things, newly-invented wagons in which a very ingenious but complicated mechanism automatically turned the wheels and

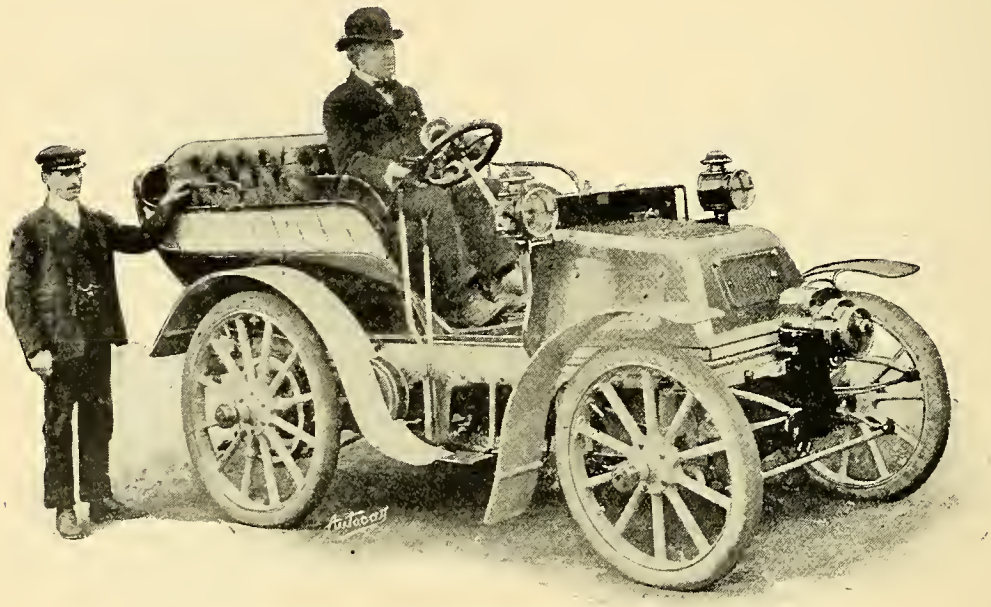


Voiturette of the Right Honorable A. J. Balfour

simultaneously operated fans which served to cool the driver. The wagons also indicate the distance traveled and the time elapsed." These wagons may possibly have been devised by Hero of Alexander, a well-known physicist who constructed a great number of mechanical contrivances and scientific toys. In the fragments of his writings which have come down to us he describes methods of building motor carriages. It is not very certain when Hero lived. But it is generally agreed that he flourished between the first and second centuries A. D.; so that the theory that he was the builder of the chariots of Pertinax may have some foundation. With Hero and Pertinax the automobile seems again to have been lost. But in the writings of the scientist-monk, Roger Bacon (1214-1294), mention is again

made of wagons "which were moved only with the help of science and art, without the use of beasts." The passage is very obscure; nothing is said of mechanical construction. Nevertheless it can hardly be doubted that Bacon had a dim idea of an automobile.

The first motor-carriage which is actually known to have been used was that constructed in 1649 by John Hautzsch, a Nuremberg watchmaker. The vehicle was driven by a clock-train; and although the spring had to be wound up at intervals of a few minutes, it managed to crawl along at a speed of one mile per hour. Although its swiftness of motion was not very startling, the carriage met with the royal approval of Prince Karl Gustav of Sweden, who bought it for $500. In 1663, the



Mr. Oliver Stanton's New 12 H. P. Daimler

celebrated Isaac Newton also built an automobile which, like its Egyptian predecessor, was driven by the recoil of a jet of steam.

By the close of the eighteenth century, a number of automobiles were in use, all of them clumsy, heavy, and slow. In Augsburg an unknown craftsman built a wagon driven by steam and human power, which carried a cannon and three artillerymen. A similar vehicle was constructed in 1765 by Nicolas Cugnot for the Marshal of Saxony which seemed to have a will of its own; for on its first trial (which was also its last) it ran against a stone wall, despite all the efforts of its driver to guide its course, and completely destroyed the masonry. In 1771 Cugnot built a better machine, which was to be used in the transportation of artillery. The inventor of the steam-engine, James

Watt, devoted his attention to the construction of an automobile, and although he did not carry out his own ideas, nevertheless he lent his assistance to William Murdoch, to whom our modern system of gas-lighting is due. Murdoch, in 1781, succeeded, with Watt's help, in producing a tricycle driven by steam. Evidently the inventors to whom the modern motor-carriage owes its origin, were men of prominence in the mechanical world.

Passing over the awkward contrivances of Evans (1786), Symington (1786), Previthik (1802), and others, we come to the vehicle invented by a man to whom, more than any other, the automobile is due, Sir Goldsworthy Gurney. In 1822 he built a steam-carriage with which he even climbed hills. His ideas were further developed by Walter Hancock (1799-1852), whose heavy omnibuses, each with no less than six smoke-stacks, ran merrily along the highways of England. I have an old caricature before me, printed about 1828, in which a Gurney carriage is pictured in the midst of a crowd of people, running over a woman and dragging a young girl to death. The caricature was certainly uncalled for; as a matter of fact, but a single accident can be traced to the Gurney omnibus—an accident which suddenly checked the development of the automobile in England. The accident in question occurred in June, 1834, on the road between Glasgow and Paisley. As a result, the railway-companies, who had long been enviously watching the rapid strides of automobilism, forced a bill through Parliament, which stipulated that a man carrying a red flag was to walk before every "road locomotive" and that the speed was not to exceed four miles per hour. Naturally the enforcement of such a law completely checked the development of the motor-carriage.

Other countries took up the cause of automobilism. France seems to have been most interested in the efforts of inventors to provide practicable automobiles. But the vehicles were all driven by steam, and the necessity of providing sufficient boiler-space and fuel capacity had the effect of rendering the construction exceedingly cumbrous. In was not until the early seventies that the automobile began to assume the form to which we are gradually becoming accustomed. About that time the well-known manufacturers, De Dion et Bouton, were beginning to build vehicles driven by steam, which were lighter, more elegant and graceful than the awkward contrivances of Gurney's day. With the invention of a benzine carriage the future of the automobile seemed assured. But its inventor, Pierre Ravel, who received a patent for his contrivance, was compelled to wait many a year before his dream was realized. As he completed

his model, war broke out between France and Prussia. His model was kept in an out-house, which was on the Parisian line of defenses. One day, officers appeared, who gave orders to have the out-house pulled down, in order to make room for fortifications, under which the first benzine automobile to this day lies buried.

The automobile of the petroleum type was first made a practical success by Gottlieb Daimler, of Cannstatt, Germany. He it was who devised the first benzine-motor with ignition devices that were reasonably trustworthy. He patented his invention in 1883. The firm of Benz & Co., of Mannheim, soon after also began to produce benzine-motors, which, following Daimler's example, they applied to carriages. The vehicles which the company patented in 1886 are essentially similar to our most recent motor-carriages of the petroleum type.

Restrictions for Automobiles

IT would seem as though park commissioners and others who have it in their power to make life miserable for owners of new vehicles, would learn from the experience of their predecessors of, say, twenty years ago. But judging from the rules and regulations we find in many places this does not seem to be the case.

Those who rode bicycles in the early days, when high wheels were the mark of up-to-date wheeling, remember the idiotic and ludicrous regulations which were made in various places and the attempts to keep it off the highway. Prospect Park, in Brooklyn, allowed wheels only on the walks and paths—the very places they had no business to be.

Gradually both horses and commissioners came to their senses, and the special restrictions were removed, leaving only the very proper one regulating speed.

But with all the experience with the bicycle the park commissioners are using the same tactics with the automobile and trying to bar it from the parks just as they did the bicycle. Of course, the attempt will fail, but it is almost pitiful to see the commissioners bucking against the same wall twice in such a few years. They seem to have forgotten the former fiasco and must have a fresh example.

One, Two and Three Track Auto Vehicles

THERE seems to be a growing tendency toward three-wheel automobiles, and they certainly have advantages for what may be called local use. It would seem that for touring where all sorts of roads are encountered the four wheelers were better suited, as they only have two tracks and follow the ordinary carriage closely. The third wheel takes the horses tread.

Bicycle motors are also gaining ground and for individual touring possibly have advantages over any other vehicle, for side paths can be ridden as with the regular bicycle.

But for solid comfort the four wheeler has good points all its own, and will be the favorite with most people. This is especially true where the owner enjoys the company of wife, sweetheart or friend, and is not built on the hermit order.

Rights of Motor Vehicles

THE question as to the rights of a motor vehicle on a public highway was raised in the Bergen County Court at Hackensack, N. J., recently, and Justice Jonathan Dixon, of the New Jersey Supreme Court, in charging the jury, interpreted the law bearing upon the issue raised. As the question depends not upon the construction of statutes, but upon the application of principles of common law, the Justice's analysis applies with equal force in any State.

The suit was for damages for the death of Mrs. John L. Guyre, who died from injuries received by being thrown out of her carriage at Midland Park, N. J., her horse having taken fright at a motor vehicle operated by Dr. William L. Vroom. After taking twenty-three ballots the jury reported its inability to agree upon a verdict.

The prosecution having made the contention that the motor vehicle was a nuisance and had no rights upon a public highway, Justice Dixon charged as follows:

"The question is whether the machine driving along the country roads without a horse in front and discharging steam

behind is so likely to frighten a horse on the highway and thus endanger the road as to constitute the machine a nuisance.

"It is argued that it is an improved method of locomotion, but it does not follow that it is to be tolerated. The right to drive horses along the highway is an established right, a common right, and if a modern method of locomotion is used of such a nature that it commonly brings discomfort and danger to those exercising the common right, the established right of travel on highway, then it is a nuisance and cannot be tolerated.

"But it does not follow it is a nuisance because it occasionally or exceptionally frightens horses. That would not make it a nuisance. In order to make it a nuisance its common effect must be to substantially interfere with the people who drive horses along the highway.

"Is it of such a nature that it is so likely to frighten horses and thus endanger travelers on the highway as to make it a nuisance, or is it only its exceptional effect? If it is its common effect, then it is a nuisance, if exceptional effect, it is not a nuisance.

"If this method of locomotion is a common nuisance, and was the approximate cause of death, then the defendant is responsible."

My Neighbors and Their Automobiles

By Isaac B. Rich

SEVERAL of my neighbors have purchased automobiles, no two alike, and, of course, they are all the best. In fact, when you are with Jones you are dead sure you wouldn't buy anything but a Winton—couldn't be anything half as good, anyhow. Brown, on the other hand, has a Locomobile, and when I ride with him that's the only machine on earth. Always ready, just right in every way. But White has an electric runabout and delights in telling me that's just what I want. Takes me to ride to prove it and almost does it.

Now, Jones, Brown and White are nice fellows, careful men all three, and seem to get along nicely with almost anything and everybody. When I ride with them everything goes as it should, and I'd be willing to take either of the three machines and get along—or try to.

But I have other neighbors not so fortunate. Mr. Larkin has a gasoline motor—which shall be nameless, though it's no fault of the machine itself—and he has a circus every time he goes out. I've never been out with him, but a friend of mine told his experience about like this:

"Larkin asked me out with him and I went over with great anticipation—likewise my best clothes. 'Jump in,' says Larkin, 'and we'll be off soon as I start the motor,' and he grabbed a handle and wound it around a few times—but she didn't start. 'Wonder if I turned on that oil,' says Larkin, and he goes behind to investigate. 'Forgot it,' says he, and winds away at the handle; still no movement of the motor.

"'Rather aggravating,' he mutters, with an adjective in front, 'just when I want it to go. Well, by jinks, if I didn't forget to turn on the spark; course she wouldn't go. Third time fixes it, and here we go,' as the motor gets to work and he climbs into the carriage.

"Everything went nicely until he got rattled at a street car and a balky horse, and then he had the machine backing before I knew what was up—or he, either. But that's his way; did just the same with a horse and can't expect him to change just because he has a new carriage."

Mr. Baldwin, on the next street, has a steam carriage, and he is always in trouble. Not because it's steam, but because it's Baldwin. When he drove horses he killed three in one summer and then wonders why his automobile costs so much for repairs. Why, he don't break his neck is a mystery to all of his friends. He will probably go back to horses next year—until he kills a few more or the society with the long name makes it uncomfortable for him—and then he'll try autos again. If I were selling motor carriages I'd fight shy of such customers, as they don't help any machine; hurt it, if anything.

There is another neighbor, too, who needs mention—quite a lot of the residents of Riverside have them, you see—and he is Mr. Jewett. Now, Jewett is a nice fellow—like him in almost every way, but he is one of these amateur mechanics you read about. He can drive a nail without bending it or smashing his finger over one shot in five; can saw a board without breaking the saw, and fixes all the clocks and the sewing machines in the house—so they don't go. Then his wife gets a tinker to come during the day and gets things straight again, and all is lovely in the Jewett household.

Well, Jewett is also something of an electrician, and nothing would do him but a storage battery runabout. He bought it—

and the makers wish he hadn't. He's improved (?) it in so many ways that his wife says she's never sure of getting home the same day. He has the motor apart and the battery connections loosened up to see if they are corroded (generally forgets to tighten a few, which makes it interesting when he starts out), and, in short, he does what most amateur mechanics do with any machine—tinker it to death. If I sold a machine to a man of that kind I'd want to put a time lock on every part and have it open once a year for general overhauling.

When I get a machine myself I expect the neighbors will pick out my weak points, just as I have theirs.

A Good Way of Dealing with Objectors

MR. ALBERT C. BOSTWICK, well known to all automobilists, has taken a very sensible stand in regard to the objections raised to his vehicles in Mamaroneck. He offers to have any horse trained not to fear motor vehicles if the owners will bring them to his estate at Orient Point.

Mr. Bostwick's letter in the local paper contains some good advice to drivers. He says:

"If people would pay a little more attention to their horses and less to my automobiles when passing, they would have better-behaved horses the next time they meet one.

"You are no doubt putting the automobile in the same class as the horse, and think it cannot be stopped as quickly, its direction changed, and people in the street warned of its approach as quickly. If, however, you would like to make a bet that I cannot bring my car, going at a speed of fifteen miles per hour, to a dead stop as soon as a horse and wagon going ten, I would be very glad to accommodate you, and would consider it a good way of impressing it on one's mind. I would also like to make a bet that I can drive a car through obstacles placed in the road at a greater rate of speed than a horse-drawn vehicle.

"The introduction of the motor vehicle is an important step in the advancement of road locomotion, and as such deserves to have the help of everybody, and especially of the press, which does so much to get people's minds started in either the right or wrong direction. It should be clearly shown how easily it can

be steered and controlled, how capable it is of making long trips, if properly taken care of, and how few accidents occur from automobiles as compared with those resulting from horses, taking into consideration the number of automobiles as compared with the number of horses."

The Guttenburg Races

THIS was one of the best contests yet held in this country, the mile track at Guttenburg (N. J.) being a decided improvement over the half-mile course at Newport, and allowing better time to be made. Then, too, the famous Panhard machine, formerly owned by M. Rene de Knyff, but now the

Mr. T Walsh, Winner of Race for American Machines

property of Mr. Albert C. Bostwick, made its first appearance on American tracks. This seems to be the fastest four-wheel machine in the world (a broad statement, but apparently borne out

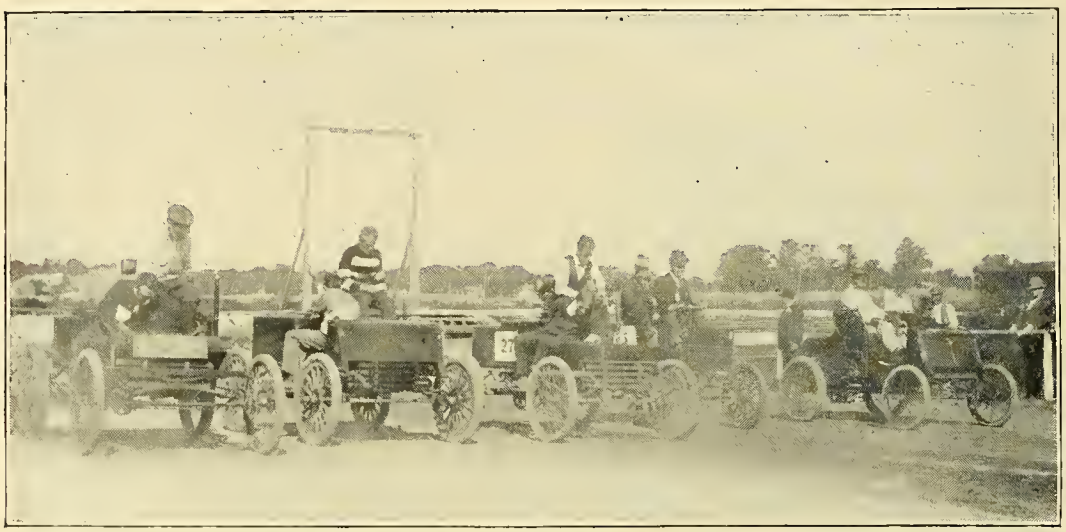
by facts), being capable of developing twenty-four horse-power when necessary.

That Mr. Bostwick does not intend to let the laurels of his famous Panhard grow dim, is shown by his operation of the machine in this race, where his daring, yet successful, running won him the admiration of all.

While there were a few trifling accidents, there was not a single case of serious damage to machines or any collisions.

To be sure Mr. Riker blew out a fuse on his electric machine and Mr. Hibbard broke a chain on his steam-driven carriage, but these are easily remedied and would not delay one long on the road; in a race it is different, of course.

The race for gasoline machines of American make was won by T. Walsh, New York, in 10 minutes 10⅖ seconds; F. Nagel,



American Machines Ready to Start in the Five Mile Race

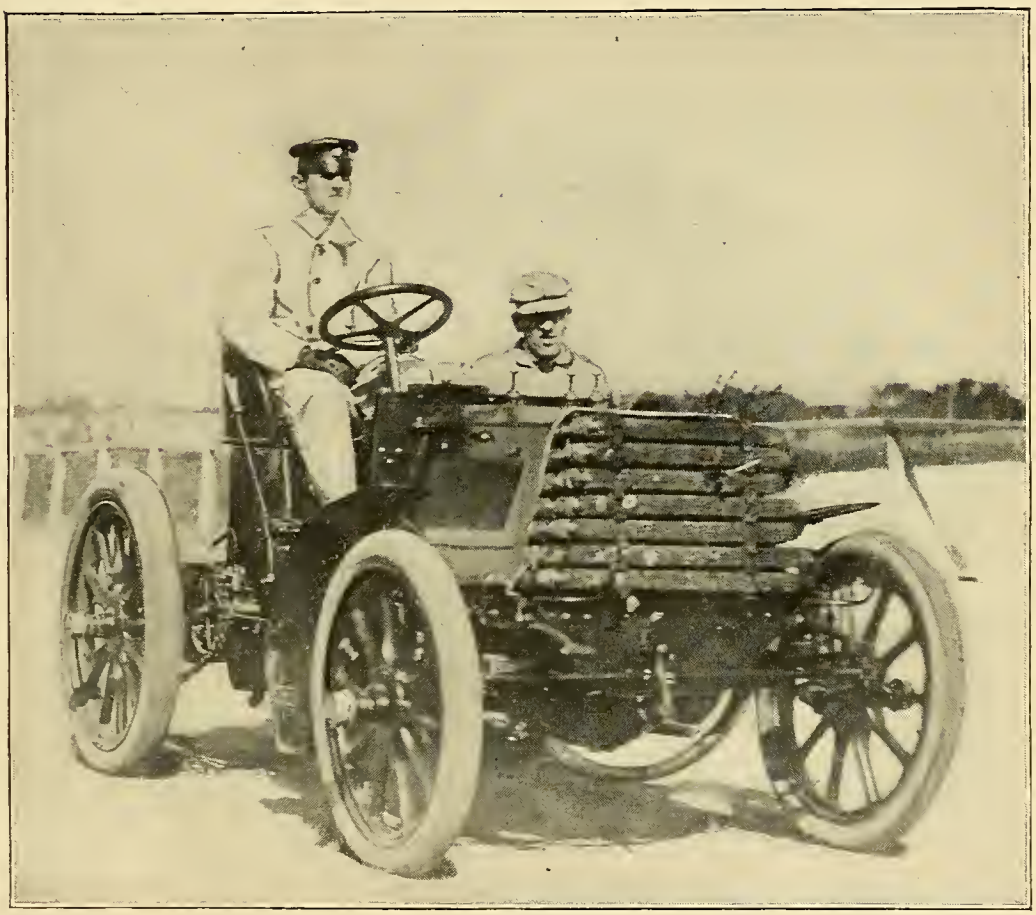
New York, second, in 11 minutes 3⅖ seconds; Albert C. Bostwick, New York, third, 11 minutes 13⅘ seconds; J. Rauchfuss, New York, fourth, 12 minutes 15⅕ seconds. First and second men in this and all other classes were entitled to compete for the open ten-mile championship.

The five-mile race for gasoline machines weighing under 1,000 pounds was won by Cornelius J. Field, Brooklyn, time, 11 minutes 43⅗ seconds; F. D. Craven, New York, second; J. Louvegnez, third; C. S. Henshaw, Brooklyn, fourth. Mr. Field won this race easily, using a De Dion voiturette.

The five-mile race for gasoline vehicles weighing over 1,000 pounds was won by Albert C. Bostwick, New York, time, 7 minutes 43⅕ seconds; David Wolfe Bishop, Newport, second, in 8 minutes 30⅘ seconds. These were the only starters, the only

other machine now in this country which could make a showing being William K. Vanderbilt, Jr.'s German Daimler motor. This was Mr. Bostwick's first official test in this country of his Panhard car.

The five-mile race for steam vehicles was won by W. S. Stewart, Newark, time, 11 minutes 48 seconds; W. L. Hibbard, Bridgeport, second, 11 minutes 48⅕ seconds; S. Huston, New York, third. Robert Dairs, New York, did not finish. This



Albert C. Bostwick in his New French Panhard Racer

was the best race of the day, as can be seen by the times of first and second, only about a yard separating them at the finish.

The five-mile race for tricycles was won by C. S. Henshaw, Brooklyn, time, 8 minutes 24⅗ seconds; J. Louvegnez, Brooklyn, second, in 9 minutes 46⅗ seconds; S. R. Atkinson, New York, third. F. D. Craven did not finish.

The race for electrical vehicles resulted in a walkover for A. L. Riker, who went one mile to qualify for the championship race. Mr. Riker's time was 3 minutes 16⅕ seconds.

The ten-mile championship for all classes was won by Albert C. Bostwick, time, 15 minutes 9⅕ seconds; David Wolfe Bishop second, in 16 minutes 43⅖ seconds. A. L. Riker and W. L. Hibbard did not finish on account of the accidents above described. Mr. Riker led at one mile, finishing in 1 minute 46 seconds; then Mr. Bostwick took the lead and held it to the end, averaging about 1 minute 30 seconds for each mile, or about forty-five miles an hour for the full distance. The speed was so great that both Mr. Bostwick and Mr. Bishop could not keep the carriages near the curb in taking the turns, and to get around

The Waverley Brake

safely at all both had to slow up. The big machines slid sideways even at that at this part of the track, and had one overturned no surprise would have been felt. Mr. Bostwick made his fastest mile, the last one, in 1 minute 27⅘ seconds, and declares that he does not care to go any faster on a mile track. His companion in riding (every machine being compelled to carry two persons) spent nearly all his time during the race in crouching and leaning out toward the inside of the track, being given this seat purposely so that he could render such service. There surely were times when Mr. Bostwick's machine was taking curves that but for the ballast the machine would have turned over. Taking every-

thing into consideration, the races furnished as much valuable experience for those who took part as they did excitement for the spectators. Following is the summary of the ten-mile open class race, the figures constituting best records for a mile track:

Mile.	Leader.	Time.	Mile.
1.	Riker	1m. 46s.	1m. 46s.
2.	Bostwick	3m. 20⅘s.	1m. 34⅘s.
3.	Bostwick	4m. 49s.	1m. 28⅕s.
4.	Bostwick	6m. 18s.	1m. 29s.
5.	Bostwick	7m. 47s.	1m. 29s.
6.	Bostwick	9m. 15⅘s.	1m. 28⅘s.
7.	Bostwick	10m. 44⅗s.	1m. 28⅘s.
8.	Bostwick	12m. 12⅗s.	1m. 28s.
9.	Bostwick	13m. 41⅖s.	1m. 28⅘s.
10.	Bostwick	15m. 9⅕s.	1m. 27⅘s.

About thirty horseless vehicles of all kinds took part in the parade; R. M. Barwise's golf trap taking the prize for the best appearance, and Miss Menken, on an autocycle manipulated by D. C. Goodman, winning the prize for the best decoration. The obstacle race was won by David Wolfe Bishop. The next automobile races will be at the Inter-State Fair, Trenton, N. J., September 24 to 28.

A machine which attracted considerable attention was the break shown in accompanying illustration, a product of the Waverley Factory, at Indianapolis.

The machine has a seating capacity of eight passengers and the operator. It is driven by electricity, and a very noticeable feature of the vehicle is the absence of noise in its operation. This is largely due to the special form of gear used, it being a spiral tooth gear, used only by the company mentioned.

A single motor with compensating gear is used, having forty-cell battery. It is of the multipolar ironclad type, dust proof and self oiling.

It has a powerful band brake, which is actuated by a foot lever, a ratchet device enabling the operator to lock this brake in cases where it is desired to leave the vehicle standing on an incline. An auxiliary electric brake can also be fitted capable of stopping the machine in its own length when running at full speed.

The wheels are fitted with solid rubber tires, and run in ball bearings, with a very efficient scheme for oiling.

As shown by illustration, the steering is accomplished by a wheel, the action of which is very positive.

The gearing is of phosphor bronze with steel pinions.

The frame is made of tubular steel, with forged connections and brazed at each joint. This makes a very strong frame and one capable of resisting extraordinary strains.

The arrangement of the fifth wheel is such as to relieve the frame from all side strain.

The vehicle presents a light appearance, and its lines, for a machine of its size, are very graceful.

Waverley Electric Runabout

It was awarded first prize for appearance in the parade, in which about thirty vehicles took part.

The other illustration shows an electric runabout, which won second prize for the best decoration. This is also a Waverley machine. It is fitted with a motor of 2½ horse-power, and can be run thirty miles on a single charge. The machine is extremely simple in its operation. The young lady shown seated is Miss Eva Mudge, of New York, and while the machine failed to capture first prize, it was accorded great applause.

Importation of Machines Abroad

A REPORT has recently been made which gives the total number of automobiles imported through the different ports of Great Britain during the month of July last. The port of London alone has received 70, of which quantity 41 were received from New York, 5 from Ostend, 13 from Anvers, 3 from Rotterdam, 4 from Paris, 2 from Brussels and 2 from Hamburg. The places where the machines were received from were not, naturally, the places of manufacture, but the ports of exportation. The port of Liverpool, on its side, has received one automobile from New York and another from Hamburg. For the other ports of England we may say that in them all there has arrived: 1 from Calais, 1 from Cologne, 1 from Antwerp, 50 from Dieppe, 2 from Havre and the same from New York.

It will be seen from these figures that the American industry in the manufacture of automobiles is already making its mark abroad. There is every indication that within a few years our makers of this kind of machines will have a market in Europe and the British Colonies. France had the start in this line of industry, but our makers are achieving such good results that our export trade will exceed that of France in a few years.

Some Results at Chicago Races

THE International Exhibition and Race Meet held at Chicago last month proved a success. The novelty of motor-vehicles on exhibition was very large and extremely keen interest was manifested in the races, particularly in the contest between Messrs. Winton and Skinner.

It is said that at the close of the exhibition many sales of vehicles were effected, and in some cases purchasers bought machines and rode home in them, some of them coming from a considerable distance. Persons who were likely to purchase were treated royally to rides about the grounds.

One of the prominent features of the racing was the wonderful performance of the Winton gasoline motor piloted by the designer. This machine came in first in the ten-mile race, covering the distance in sixteen minutes 2 seconds. It was also first

in the twenty-mile event, the time being thirty minutes thirty-one seconds, while it traveled fifty miles in the record making time of one hour, seventeen minutes and fifty seconds, an average speed of thirty-eight miles an hour.

Unusual speed was made by Albert Champion and Kenneth A. Skinner on double motor tricycle and De Dion racing tricycle, respectively.

In the manufacturers' parade, which had very few entries, the first prize was taken by Hewitt-Lindstrom Motor Co. for the largest number of practical designs. This company was also awarded second prize for having the greatest number of machines in line. For the most practical design the Woods Motor Vehicle Co., of New York and Chicago, was awarded third prize.

In the second event, a mile run for steam vehicles only, M. T. Griffin, who rode in a locomobile, came in first, the time being one minute thirty-nine seconds. In another mile race confined to gasoline motor vehicles Arthur J. Eddy, with a Winton road wagon, came in first. Time, two minutes nineteen seconds. In a similar race for electric vehicles a Hewitt-Lindstrom runabout came in ahead. Time, two minutes thirty-four seconds.

There were eight starters in the ten-mile race, in which, as already stated, A. T. Winton was victor, all the others dropping out.

The five-mile race for members of the Chicago Automobile Club was won by J. W. Bate; time, fourteen minutes thirty-two and one-fifth seconds.

In the ladies' two-mile race for private owners, Jeanette Lindstrom, the thirteen year old daughter of Charles A. Lindstrom, was the winner, covering the distance in a Hewitt-Lindstrom electric vehicle in seven minutes twelve seconds.

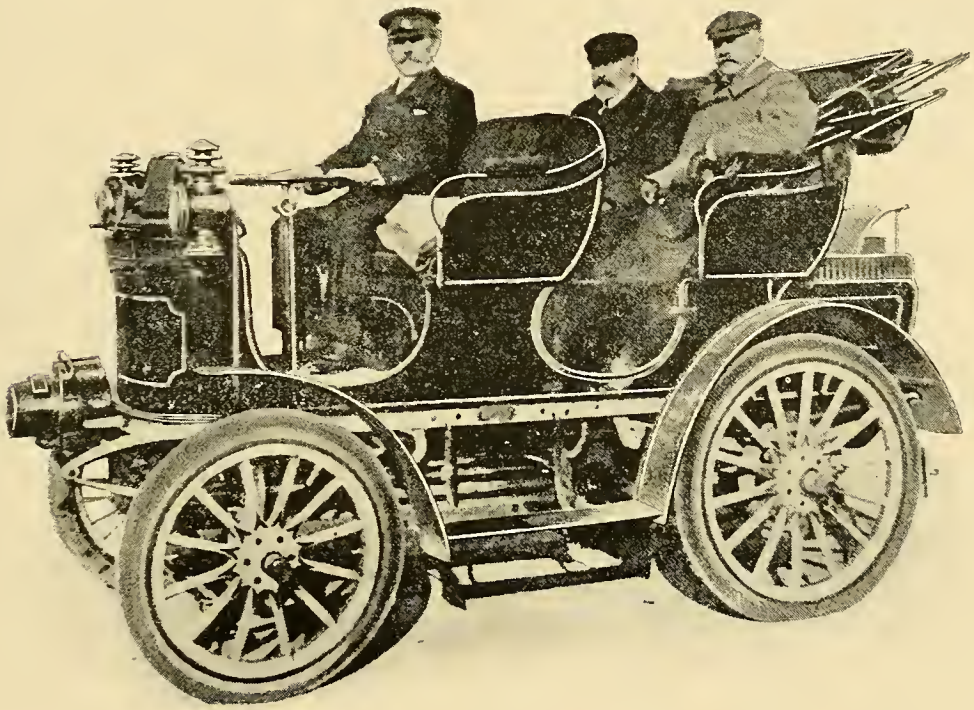
An event which caused unusual interest was the fifty-mile race between Messrs. Champion and Skinner, in which Champion was declared winner, his time being one hour fifteen minutes fifty-seven and two-fifths seconds.

The ten-mile manufacturers' race was won by the Locomobile Company's machine, the time being twenty-one minutes thirteen seconds.

There were other events of somewhat less importance. Wet weather prevailed generally, making the track dirty, as well as doing much to prevent a larger attendance.

The Prince of Wales and the Serpollet Motor-Car

THOSE who recall the early efforts of motor carriages know that M. Leon Serpollet was one of the pioneers of steam-driven vehicles. Of late he has been gaining distinction as an instructor of Kings and Princes in the art of automobilism and has had the distinction of accompanying the Shah of Persia



The Prince of Wales in M. Serpollet's Steam Carriage

on his first drives, as well as the Prince of Wales in the carriage shown above.

M. Serpollet reports that he found the Prince an excellent passenger and was charmed with his reception. He had an agreeable surprise in being presented with a beautiful scarf pin after lunching with the Prince, who took a second ride the following day.

Changing Seating Capacity of Automobiles

By R. E. Marks

AS the average user of the automobile is not a millionaire the question of getting a carriage for all around use is quite an important one. Having a horse, it is not very expensive to have two or even three vehicles, a runabout or a Stanhope, a surrey and possibly a wagonette, or something similar, as the cost of each is not excessive, and the same horse or horses may be used in all cases.

But with the motor carriage it is different, for the "horse" is part and parcel of the carriage and not many of us want to invest in two or three automobiles.

For our own use a Stanhope or voiturette is just what we need, but when our friend Brown and his wife come to see us from a nearby suburb we are in a pickle. We want to show them the beauties of our particular town and its numerous advantages over theirs and we also want the Browns to know what a fine carriage we have and how well it runs.

To be sure I can take Mrs. Brown with me and hire an ordinary horse and buggy for Mr. Brown and my devoted wife, or we can let the two better halves drive together in the aforementioned antedated vehicle. But as Brown used to be a suitor of our own beloved and we only beat him by a narrow margin from getting her, the former arrangement isn't quite to our liking, while with the latter there is always the possibility of the weak-minded horse taking fright and causing a smash.

What we need is a surrey to hitch our motor to, but as the maker hitched it pretty effectually to the Stanhope or voiturette this is out of the question. So I show Mr. B. the automobile and discourse on its beauties and advantages and express regret that it hasn't room for four.

Seriously, though, there is a field for a style of body which can accommodate two extra on special occasions, and I believe at least one firm is seeing this and has a design out which allows it to be done.

The size of the motor, of course, prevents obtaining the same speed with four as with two, but we never expect a horse to do as well with a surrey as with a runabout, so there need be no change in the motor part of the machine.

For the average man who will use an automobile for pleasure or business the question of seating capacity is quite a serious one.

Actual Cost of Steam Motor Wagons for Street Watering and Dirt Removal

ALTHOUGH it is quite a drop from the excitement and exhilaration of the racing automobile to the plebeian steam watering cart, the question of dollars and cents in their operation is always a live one for those who contemplate using them in a business way. A paper was read on this subject by Mr. E. Shrapnell Smith at the annual meeting of the Association of Cleansing Superintendents of Great Britain, at Salford, on August 30. He said:

"At the Birmingham Congress of the Sanitary Institute, two years ago, I read a paper entitled 'Some Sanitary and Allied Advantages Attending the Introduction and Use of Motor-Vehicles,' and at your own Congress at Glasgow last year I read a second entitled 'The Application of Mechanical Power to Street Cleansing.' On each of these occasions I was rewarded by a unanimous resolution in favor of the adoption of self-propelled vehicles in place of animal haulage, and one may, perhaps, be excused for inquiring as to the *raison d'être* of a third paper. Two replies suggest themselves in explanation. The first is that, the motor-vehicle industry being a new one, fresh data will probably have accumulated in an interval of twelve months. The second is that a few more facts will not fail to have their effect in deciding authorities who are at present in doubt. These contentions are certainly sound, for the experiences of the last twelve months are most important and in close agreement with previous estimates; in fact, it would have been a source of subsequent regret to me had I neglected this opportunity of speaking for the movement whose good I have at heart. And here I may venture to remind you that I have no connection with any firm manufacturing motors, my position as Hon. Secretary of the Liverpool Self Propelled Traffic Association being contingent upon perfect freedom. Consequently I feel that you will have confidence in my views and in the absence of bias or prejudice from any opinions I may express."

He then referred to the very damaging reports made by Mr. Arthur Ramsden, the Surveyor of Chiswick, on the cost of motor vehicles there, and continuing says:

"These data look very bad for the motor, but they are no criterion of the results that have been obtained since the two motors were purchased in June, 1897. Furthermore they are incomplete, even for the period embraced, without an explanatory statement respecting local circumstances. Mr. Ramsden, who is a firm believer in the economy of mechanical cleansing, has supplied me with facts which place an entirely different complexion upon what, at first sight, admits of nothing but a construction adverse to the motor. I have collated these facts in tabular form:

Year Ending March 31.	Estimated.		Cost of Dusting.
	Population.	Houses.	
1895	23,982	4,796	£1,400
1896	24,582	4,916	1,065
1897	25,000	5,000	1,545
1898	25,972	5,195	1,253
1899	26,772	5,354	1,410
1900	27,772	5,554	1,809

The first motor began work on August 14, and the second on November 6, 1897. The horse contractors' tender for the year ending March 31, 1898, was £1,900, whereas the actual expenditure was only £1,253. Thus the motors, for which £350 each was paid, effected a saving of nearly their prime cost in the first six months of their employment. At the end of this period the Surveyor referred to the motors as follows in his annual report: 'I am very pleased to say that they have in every respect answered what I foreshadowed in my last year's report. Owing to the rapid growth of the parish, coupled with a large decrease in the number of empty houses, the amount of dust to be removed has increased considerably, and I should strongly recommend the purchase of another steam tip-wagon, which could be used as a slop cart, dust cart, or water cart.' Now, since the horse contractors' tender for the year ending March 31, 1898, was £1,900, it is pretty certain that it would not have been reduced for subsequent years, when provender and other stores had advanced in cost. Three years' work at this rate would have amounted to £5,700, whilst the recorded cost has been £4,472.

Will anybody quarrel with a departure that has reduced the cost of dusting by £1,228 in thirty months, notwithstanding a mean annual growth of the district by 185 houses? But this does not dispose of the high costs of the motors during the last

year. I have made careful inquiry into the falling off, and have come to the conclusion that the motors are now worked at not more than about half their capacity, even for the single shift during which they are out. The mileage is only seven per day, and not more than three loads are collected. Furthermore, there appears to be steady obstruction by horse interests in the Council, whereby order for repairs are delayed, and the motors obliged to spend days, and even weeks, in enforced idleness. In addition, the motor performs services which are not included in the statement of dust collection. These are, particularly, carrying five to six ton loads of slop on Sundays and on other occasions, a matter which will soon add, say, 100 tons to the weight stated in the published results. Again, until a few months ago the motors had to run over about 300 yards of an uneven sleeper track leading to the tip, which seriously strained the connections and mechanism, whilst it saved the Council 2s. 6d. per ton for barging. Lastly, the two motors are of the earliest type, now relatively obsolete, and I cannot comprehend the parsimony of the Chiswick Urban District Council in not getting rid of them and purchasing two modern ones, such as that now at work for the Strand Board of Works, with which I deal later.

I had hoped to refer at some length to the costs of working at Liverpool and Chelsea. Mr. John A. Brodie, the City Engineer of Liverpool, has been using a vehicle, built by the Lancashire Steam Motor Company, Ltd., Leyland, for eighteen months, but has so far given it work upon the conveyance of four-ton loads of tramway material and other heavy stores. The working has proved satisfactory and highly economical, but has no reference to watering or dusting. Mr. T. W. E. Higgens, Surveyor to the Chelsea Vestry, has had a Thornycroft motor at work for six months. This was purchased from the makers at a reduced figure, on account of its not being a new vehicle, and was fitted with watering and dusting bodies, but Mr. Higgens, like Mr. Brodie, has found the motor so useful for carting four-ton loads of stores, flagging, cement, etc., that, whilst it has at times done the work of four vans in watering the King's road, Chelsea, no dusting has been done. Partly in consequence of this splitting up of the work, and for other reasons, Mr. Higgens informs me that he is not publishing any figures at present. The Chelsea Vestry have also ordered two motors from the Lancashire Steam Motor Company, one of which was delivered two weeks ago, whilst the other is nearly ready for delivery.

I am indebted to Mr. Arthur Ventris, Engineer and Surveyor to the Strand Board of Works, for detailed information upon the working of the Board's Thornycroft motor between February 5

and August 4 of this year. The records are divided into three periods, viz.:

First—Motor on hire from February 5 to March 31, say eight weeks, used in dust collection only.

The motor was then sent to the makers' works, where it remained for the month of April for overhaul, painting, and the construction of new tipping and watering bodies. It was then purchased complete, with two bodies, for £750.

Second—Motor working from May 1 to June 18, say seven weeks; used in dust collection only.

Third—Motor working from June 19 to August 4, say seven weeks; used in dust collection between 6 A. M. and 11 A. M., in street watering between 11 A. M. and 6 P. M., and in flooding the street (preparatory to the flushing by fire hose) between 11 P. M. and 5 A. M.

The performance obtained has been as follows:

Period.	Work.	Weight of Dust Collected and Tipped.		Watering.		Flooding.	
		Total.	Weekly Average.	Days.	Loads.	Days.	Loads.
		Tons.	Tons.				
First	Dusting—6 A. M to 6 P. M....	252	31.5	..	..	..	..
Second ..	" "	363	52.0	..	..	..	..
Third ...	Dusting, watering, flooding, two shifts	189	27.0	25	225	37	777

It will be observed that better work resulted during the second period than was the case when the motor was on trial. This is due partly to increased experience in handling, and partly to the regular use of a trailing dust-van on one run per day. But the third period is the most interesting, and I pride myself that Mr. Ventris has followed the suggestion contained in my paper read at Glasgow last year. The motor is at work day and night, though the fires are drawn at 6 P. M. and relighted at 11 P. M., the duties being divided between two drivers. At present it is found necessary to have an assistant with the watering-tank body in the day time when the traffic is heavy, to work the levers controlling the water delivery, but Mr. Vestris thinks this extra man may be superfluous if a van is fitted with foot levers. The water tank has a capacity of 700 gallons.

Passing now to a comparison with horse work, Mr. Vestris points out that he has discontinued the work of three single dust carts, horses and drivers, and finds that the work is done

better and more speedily. The house dust, which is collected for the most part between 6 A. M. and 10 A. M., is very light, and the weight does not convey a correct idea of the labor in collection. I may say that the yearly average for the Strand district, exclusive of street and market sweepings, is 1,265 tons per mile of street per annum, whilst the bulk is 4,216 cubic yards. This gives an average weight of only 6 cwt. per cubic yard. The average morning run of the motor in this collecting is sixteen miles. In addition to this replacement, Mr. Ventris has discontinued the use of two water-vans, horses and drivers that were previously engaged in flooding the streets prior to the flushing by fire-hose at night.

The reduction of cost thus obtained is, per annum:

Hire of five horses and harness (feeding and stabling done by contractors), at £65 per horse	£325	0	0
Dust vans are owned by Board and used for other purposes	0	0	0
Hire of two water vans, at £16	32	0	0
Three drivers of dust vans, at £71 10s	214	10	0
Two drivers of water vans, at £84 10s	169	0	0
Oiling and repairing three dust vans, at £8	24	0	0
Third-party insurance on five vans	7	10	0
Total reduction in cost per annum	£772	0	0

The expenditure in respect of the motor has been:

First Period—Hire for eight weeks, at £7 10s. per week, for day work only, inclusive of all charges.

Second and Third Periods—These aggregate a clear three months. The appended table, supplied by Mr. Ventris, is in proportion, and may be relied upon as being the outcome of experience.

Estimated Annual Expenditure.

Interest and return of capital, spread over ten years, say	£82	6	0
Fuel—36 cwts. per week, at 32s. per ton, say	150	0	0
Wages—			
Two drivers, at 37s. per week	192	8	0
Attendant to work levers of water van on day shift, at 25s	65	0	0

Repairs—Thornycroft's guarantee	£75	0	0
Lubrication and waste	20	0	0
Boiler insurance on £2,000	3	4	0
Third-party insurance	10	10	0
Total cost per annum	£598	8	0

The saving per annum is, therefore, £173 12s. per motor, when the capabilities of the mechanical vehicles are properly utilized, and the operations organized upon such excellent lines as one finds in the Strand district. Steam is the only power within the range of practical politics, and solid fuel, *i. e.,* coke or coal, is more economical than oil fuel. Prospective users must not be afraid of the high prime cost, for motors give results commensurate with the initial outlay.

I have every confidence in urging the adoption of motors for use in operations similar to those so admirably carried on in the Strand district. The warnings I would give are:

(*a*) Concentrate sufficient dustmen upon the motor to permit of its large capacity being taken advantage of.

(*b*) Arrange for all repairs to be made promptly, and for periodic tightening of the wheels in a hydraulic tire-setting machine.

(*c*) Work the motor two shifts per day."

This is a good showing for the motor wagon, and we hope to have other good reports in the near future.

A New Nine Horse-Power Motor Vehicle

WE present herewith half-tone illustration of a 9 horse-power gasoline motor vehicle from the factory of the Ohio Automobile Company, of Warren, O.

The engine on this carriage is a horizontal single cylinder four cycle engine, having a high compression and being variable in speed, and is very sensitive to control. The engine shaft is

The Packard Automobile

short, being connected with the clutch and gear shaft of a spring compression. This arrangement permits a slight flexibility, insuring against binding in any of the bearings.

The gasoline tanks will hold sufficient gasoline for a run of from 100 to 150 miles; this, of course, depending upon the condition of roads traversed.

The igniting apparatus used is the jump spark with induction coil. This system has given entire satisfaction on large numbers of machines, particularly of European make. Dry batteries are used, the amount of current taken being minimum.

The machine carries a single oil box of ample capacity to lubricate all important bearings.

The speed of the engine is controlled by means of a pedal which is operated by the foot of the driver. The two forward speeds, the reverse and the brake are all under the control of the driver by means of a lever at his right hand.

The wheels are fitted with bicycle type spoked wheels, with flat base. All the wheels are of the same diameter. The wheel bar is long while the gauge is standard wagon gauge, 4 feet 8½ inches. By the use of a single cross spring in front no side strain is brought on the frame by inequalities in the road.

To the inside of each rear wheel is fitted an auxiliary brake rim to which is applied a large brake shoe. Being independent of other mechanism this is an effective and safe arrangement.

The chain used is made of special nickel steel, and throughout the machine is constructed from the best material.

The machine is known as the Packard New Model 9 Horsepower Automobile.

Endurance Test of Motor Vehicles

IT is announced that an anonymous donor has offered the Automobile Club of America a cup valued at one thousand dollars, to be given for an autocar endurance test, the contest to be held in connection with the forthcoming Automobile Exhibition to be held in Madison Square Garden, this city, November 3 to 10. The contest, which is to be one of endurance only, is to be presented to the owner of the vehicle which makes the fewest number of stops in a run of six hundred miles. The course will be from New York to Hudson and back, a distance of two hundred miles. This will be covered three times by the competitors.

No time limit is fixed, although the speed at which cars are to be run will be subject to certain restrictions.

The result of such a contest will be looked forward to with considerable interest, and probably the run will reveal a number of weaknesses in the staying power of some of the vehicles which may enter. We think that over in France more attention has been paid to endurance tests of automobiles than over here, which fact probably makes this contemplated contest possess greater interest.

Parade of Automobiles at Philadelphia

THE parade of automobiles held at Philadelphia Saturday, October 6, had eighty-nine vehicles in line, as against sixty in the recent parade of the same kind held in New York. It was a parade of which its promoters had reason to be proud. It was also a success as an exhibition, showing, as it did, all makes, styles and variety of automobiles, locomobiles and mobiles propelled by electricity, steam, gasoline, etc.

The parade was held under the joint auspices of the Pennsylvania Automobile Club and the Automobile Club of Philadelphia. Captain John S. Muckle was Chief Marshal, with L. Goodman as chief aide; the aides were John L. Wilson, Henry J. Johnson, Frank C. Lewin, Dr. F. L. Sweaney and T. B. Entz, all members of one or the other of the two clubs named. The object of the parade was to celebrate the great victory won by the automobile after a long and hard fight with the Park Commissioners to gain admission to Fairmount Park and obtain the same privileges, rights and protection granted to other vehicles, including bicycles.

The route was down Broad from Walnut to Lombard, then up Broad to Diamond, out Diamond to Fairmount Park and through the park to Riverside, the intention being to come down the river drive past Lincoln Monument, and then in Spring Garden street to the starting point and dismiss, but so many vehicles either fell by the wayside or got too far behind climbing City Line Hill that the parade was practically broken up at that point. The Chief Marshal was at the foot of the hill and ordered all the vehicles to stop after reaching the top and wait for those having trouble to climb it. Captain Muckle says while he was at the bottom of the hill trying to keep the parade intact Mr. Samuel Gustine Thompson at the top of the hill gave the command to go ahead, so that when he reached there he found the line all broken up. Without a leader the automobiles started to race each other and branch out in different directions, with the result that the large crowds that had gathered along the river front and at Lincoln Monument to view the pageant were disappointed, the procession never reaching that point.

Park Commissioners David W. Sellers and Samuel Gustine Thompson rode in the procession, while the Mayor viewed the parade, seated upon a fine looking bay saddle horse, at Riverside.

It is interesting to note that hundreds of horses were passed and that there was not a single accident nor a single case in which a horse was frightened by the horseless carriages. They were highly pleased at this, for it was because of the claim that horses would become frightened and many accidents would result therefrom that the automobile was denied admission to the Park for so long a time. After the parade both expressed themselves as pleased, and both were of the opinion that horses would get used to the automobiles, the same as to bicycles, trolley cars and locomotives.

The parade was a really attractive affair, and presented a novel sight, with scarcely any two vehicles in the procession looking alike or being built after the same pattern. Quite a number of ladies were out "mobiling," and no doubt they enjoyed the parade.

Among others in the procession showing attractive vehicles were Henry L. Meyer, Henry Elliott, Robert C. McCurdy, S. R. Weaver, James Elverson, Jr.; Thomas H. Straley, George E. Gosslers, Mr. and Mrs. George P. Spittall, Mr. and Mrs. Jules Junker, Charles Junker, Henry Benners, William F. Rudolph, Joseph K. Wharton, Charles E. Wright, Benjamin T. Seay, D. W. Webster, Charles L. Klauder, Edward M. Rosenbluth, E. W. Rosenbluth, Dr. Benjamin F. Busby, Charles S. King, T. C. Palmer, Alexander Russell, Louis Kolb, Maurice Loeb, E. H. Adams and Clifford Mackie.

Electric Omnibuses

THE experiments which have hitherto been made in this country in the direction of applying electric power to the operation of omnibuses, says the *Mechanical World,* of London, have related solely to vehicles equipped with storage batteries, but the trials in this respect have for various reasons been discontinued for some time past. In France, however, a system has been devised which dispenses with the employment of accumulators, and which, according to a paper read recently before the British Association, is actually in use in the environs of Paris at the present time. The system consists in the use of omnibuses fitted with electric motors and controlling gear, the current being collected from a pair of trolley wires supported on short brackets arranged on one side of the road. On these wires runs a two-

wheel trolley equipped with a small motor for its own propulsion, whilst the connection between the trolley and the motor on the omnibus is effected by means of a flexible cable attached to a pole on the roof of the vehicle. It will be understood from this that the trolley wires which are supplied with continuous current at 500 volts pressure furnish the current through the trolley wheels and flexible cable to the omnibus motor. The latter, by means of a rectifying arrangement of three collecting rings on the armature, and suitably connected with the winding, supplies three-phase current which serves to drive the trolley motor, the leads for this purpose being embedded in the flexible cable. It will be evident that except for the absence of rails as a track, the system is practically an electric tramway on the overhead double-trolley principle, with omnibuses substituted for tramcars. It is difficult to see what advantages the method possesses as compared with an electric tramway on the trolley system. It may be of interest as showing that electric omnibuses can be operated without the use of storage batteries; but if overhead conductors have to be used, preference will undoubtedly be given in this country to their employment in connection with tramways, and not in relation to omnibuses equipped according to the above-mentioned system.

The annual meeting of the Automobile Club of America, which at present has headquarters at the Waldorf-Astoria, this city, will be held October 22, when new officers for the ensuing year will be elected.

The following nominations have been made by the Board of Governors: President, Albert R. Shattuck; First Vice-President, Gen. George Moore Smith; Second Vice-President, J. Dunbar Wright; Third Vice-President, David Wolfe Bishop; Treasurer, Winslow E. Buzby; Secretary, Whitney Lyon; Governors for Class of 1903, Dave H. Morris, Albert C. Bostwick, Charles P. Doelger. Notice has been given to members of a few proposed changes in the by-laws, these changes being unimportant and relating only to the conditions and wording of proposals of new members. Among these is one to make the membership section read as follows: "Each candidate for active membership must be proposed and seconded in writing and must be personally known to the proposer and seconder, both of whom shall be members in good standing." It has been decided to create a place of working secretary; F. W. Toucey, who has been associated with the Automobile Club of Great Britain, being spoken of for this position. Mr. Toucey had charge of the automobile 1,000 mile endurance test in England last Spring, and is well informed on automobile topics.

Races at Inter-State Fair, Trenton, N. J.

THE automobile races held in connection with the above-named fair were attended by large crowds of people, and that they were exciting was evidenced by the general enthusiasm which prevailed while they were going on. It is estimated that fully 20,000 witnessed the races which were held on the 24th ult.

There were six events on the program, and one of these was scratched, another being added. As automobile racing goes it is said that the events at this meet was better than the ordinary.

The first event of the afternoon was the five-mile race for gasoline vehicles. There were seven entries originally, but two of the machines that were to have entered were damaged at Guttenburg and others had been disabled on the way to Trenton, so that there were but two to start, A. C. Bostwick and Percy Owen, of New York. Mr. Bostwick won the championship at Guttenburg by beating the record made only the week previous by William K. Vanderbilt, Jr.

For the first few laps Mr. Owen held the lead, but Mr. Bostwick soon left him behind when he began to put on more power. After that Mr. Owen was never in it, and Mr. Bostwick won the race, the time being 11.58.

The second event on the program was a five-mile race for steam vehicles. Three of the four entries started, but one broke down early in the race, while it was in the lead by a good margin. Those who started were S. T. Davis, of New York; W. H. Hall, of New York, and W. J. Stewart, of Newark.

Mr. Stewart led at the start and stayed there for two miles, when his machine broke down. Mr. Davis then took the lead and was never in any danger from Mr. Hall's Locomobile. Mr. Davis won the five miles in 11.24. His machine seemed to be a favorite with the crowd, as it ran without very much noise. Mr. Davis' machine was the fastest four-wheeler on the grounds evidently.

The next race was one that interested the crowd more than anything else on the program. It was a five-mile pursuit race between two three-wheeled automobiles or tricycles. Charles Henshaw rode one of these machines and A. C. Bostwick the other. The Henshaw machine carried a four and a half horse-

power motor, while Mr. Bostwick's machine was of ten horse-power; nevertheless Mr. Henshaw won with the greatest of ease, lapping the bigger machine in two miles, the time of which was 3.48. During this race there was considerable excitement manifested among the spectators.

Following this came a five-mile exhibition by Mr. Henshaw on the tricycle to beat the record of 7.23. The attempt was not a success, owing to the machine being unable to take the corners and hold the high rate of speed necessary.

Mr. Henshaw gave a fine exhibition of daring riding, and even though he failed in his attempt he was given a warm round of applause at the end of his ride.

Below is given a list of events, with names of winners, times, etc.:

Gasoline Vehicles, five miles—Won by A. C. Bostwick, Automobile Club of America; Percy Owen, New York, second. Time, 11 minutes 58⅖ seconds.

Steam Vehicles, five miles—Won by S. T. Davis, Jr., New York; W. H. Hall, Bridgeport, second. Time, 11 minutes 24 seconds.

Tricycles, ten miles, limited pursuit—Won by C. S. Henshaw, Brooklyn; A. C. Bostwick, A. C. A., second; distance, two miles. Time, 3 minutes 48⅕ seconds.

Ten-mile Championship, open to winners of events 2, 3 and 4—Won by S. T. Davis, New York; A. C. Bostwick, New York, second; Percy Owen, New York, third. Time, 20 minutes 20½ seconds.

Reserved Race, ten miles, open only to members of the Automobile Club of America—Won by S. T. Davis, New York; A. C. Bostwick, New York, second; Percy Owen, New York, third. Time, 20 minutes 49 seconds.

Five-mile Exhibition on a tricycle by C. S. Henshaw against record—Record, 7 minutes 32⅕ seconds; Henshaw, 8 minutes 29 seconds.

A Frequent Caller

THE following story is told at the expense of a well-known man who calls frequently upon an equally well-known young woman who has been summering at Arlington, near the Country Club, at Columbus, Ohio:

The gentleman, so the story goes, engaged an electric automobile for the trip one afternoon, and, armed with a new book, a box of candy and a bunch of roses, went speeding out Fifth avenue for a long afternoon visit.

Just as the turn was made on the road leading toward the club the manipulator of the automobile discovered that some trifling disarrangement of the brake would prevent his stopping the machine. It sped along notwithstanding the call of the passenger to stop at the first house on the right.

Finally the motorman was forced to confess that he could not stop until the electric charge in the storage battery had exhausted itself.

That seemed funny enough for the first trip or two around the block, but riding about in a circle under the circumstances got exceedingly monotonous after awhile.

Then the young woman, it is said, became curious and was at a loss to understand why her caller preferred to ride aimlessly around in that fashion. She went to the front door and down the road in answer to the gentleman's signal.

He explained the best he could as the automobile flew past, and after a half dozen more turns she began to understand the situation.

It seems the battery had two hours more to run, and if it all ran out at Arlington there would be no way of getting the machine to town. Then they arranged a sort of railroad station mail catcher plan and the gentleman passed out the book, then the candy, and finally the roses to the young woman as the vehicle whizzed past her.

It took a trip for each article and a few more trips to say goodbye, when they were warned by the operator that he must start for town or risk being stranded somewhere without motive power.

A few farewell waves, and amid the amused shouts and laughter of the Arlington resorters, who had gathered by this time, the disobliging and obstreperous machine disappeared over the hill toward town.—(*E.r.*)

Boston Park Commission Allows Additional Privileges to Automobiles

THE Park Commission of Boston has just granted more privileges, which shows that the agitation of the subject by owners and users of the now popular "auto" has borne fruit.

At a meeting recently held the Board voted to extend the time within which automobiles are allowed in the park one hour on each end of the day. This means that automobiles can have free run of the parks in the morning before half-past eleven and in the evening after half-past eight. In commenting on the change Chairman Stratton said:

"The Commission thought it best to hold to its policy of going slow in admitting automobiles until horses such as are driven in the parks become accustomed to the vehicles and until we have a chance to see just how they will be operated. The principal thing now is to see whether the automobiles observe the road rules adopted for the parks and keep within the speed limit.

The Commissioners are evidently uncertain as to just how much of a tendency there will be for automobilists to spurt their machines in the parks or to abuse the privileges already granted in such a way as to infringe on the rights of ordinary frequenters of the parkways; and the strictness with which operators keep within the present regulations will evidently have a good deal to do with the granting of further privileges later. The present speed limit in the parks is ten miles an hour."

In the October number of *Outing* Mr. Robert Bruce contributes an interesting article entitled "The Place of the Automobile." He points out the peculiar enjoyment of those who ride in an automobile for the first time, drawing comparison between the person who rides behind horses and the automobilist. The article is replete with references to the delights of automobile riding and contains a number of illustrations of well-known automobilists, each seated in his or her conveyance.

Items of Interest

The following statement with regard to the intentions of the American Bicycle Company, so far as the manufacture of automobiles is concerned, was made at the annual meeting of that company held October 9.

In his report, President R. Lindsay Coleman, in conclusion, said:

"The policy adopted by the company in marketing its goods has had a good effect, and we believe that during the coming year the trade will be on a more staple basis than it has for some years. The auditing of the various firms and corporations purchased by the American Bicycle Company has finally been completed, as of the date on which they were taken over by this company; and the claims against the vendors under the contracts for purchase are now being adjusted, and will be pushed to final completion of settlement as rapidly as possible. The manufacturing and sale of automobiles has had much attention by the executive of the company, and, as our facilities are unequalled for the manufacture and sale of such goods, we believe that the company is in a most excellent position to prosecute this branch of the business."

Mr. L. H. Bill, who has been prominently identified with H. A. Lozier & Co. since their inception, has acquired an interest in the E. R. Thomas Motor Co., of Buffalo, N. Y., manufacturers of the "Autocrat" motor bicycles, tricycles and carriages.

The automobile is fast making friends among the royalty of European countries. Among the latest converts to the new form of conveyance are the Prince of Wales, who has tried almost every type of motor vehicle, and the Shah of Persia.

The automobile is being put to many uses, one of the latest being its adoption in conducting political campaigns. The gentleman who is to put the machine to such use is Mr. F. H. Hunter, of Pelham Manor, N. Y. He has just been nominated for member of Assembly and intends to travel around in an automobile when working for his seat.

Items of Interest

It is rumored that the French generals will use automobiles in the next army maneuvers. Some of them, it is said, will carry guns.

The automobile clubs of Philadelphia, two in number, have decided to hold a semi-annual parade in that city, one in the spring, the other in the autumn.

The City of Cincinnati contemplates the use of a motor vehicle by the patrol wagon service of the police department.

The absence of noise and the general unobtrusiveness of a good automobile is recommending it to the leading undertakers of Philadelphia and other cities. Although some profess to be shocked at the use of machinery for such purposes, they cannot but admit that it is preferable to the clatter of horses' hoofs on city streets.

On October 5, while a motor vehicle, in which were Mr. and Mrs. Wood, of New York, was passing through Larchmont the Locomobile was wrecked by one of the wheels catching in the frog of a trolley car track. Mr. and Mrs. Wood were thrown from the machine and were badly bruised and scratched by striking on the macadam road.

The automobile manufacturers began by using too small motors, but they are now increasing their power in many instances. As a straw showing this tendency we note that it is announced that the 1901 "Napier" carriages will have nine horse-power motors instead of eight as at present.

On a recent occasion, when returning from a meeting of the Committee of Contest connected with the Madison Square show, which meeting was held at the office of Mr. A. L. Riker, Elizabethport, N. J., Cornelius J. Field rode in a De Dion motorette from South Ferry to Astor Court, back of the Waldorf-Astoria, in the short time of 17 minutes and 50 seconds. When one takes into account the great number of obstacles usually met while riding along thoroughfares between the points named, this is certainly a piece of good work.

William K. Vanderbilt, Jr., recently ran his racing auto from Newport to New York through all kinds of weather. He made the run in thirty-six hours.

The Quick Manufacturing Company, formerly of Paterson, N. J., has disposed of its patents and plants to the Remington Company, which manufactures firearms, typewriters and automobiles. The plant will be moved to Ilion, New York. E. M. Rodrock, of the Quick Company, will go to Ilion to superintend the building of gears and motors.

At the well-known auction rooms of Van Tassel and Kearney, East Thirteenth street, this city, where for the past thirty-eight years horses and wagons have been sold, the first automobile that has so far found its way into this famous old mart was sold a few days ago.

When the auctioneer put it up for sale a skeptical man among the crowd asked, "Is it warranted sound, kind and true, like horses?"

The auctioneer replied, "You buy it as it stands; it has been used only three months and cost $900 when new. How much for it?"

There was lively bidding from the start, and in a short time the motor vehicle was knocked down for $550.

Philadelphia Park Commissioners have just thrown open Fairmount Park to automobiles, except for West Side River Drive, used as a speedway for horses, and the Wissahickon Drive. But to meet complaints of reckless driving of automobiles they have decreed that every horseless vehicle using the park after October 15 shall display a number on the back. The numbers are to be supplied free of charge by the Commission.

As showing the strength possessed by some motor vehicles it is interesting to note that while at the recent Boston show one of the electric carriages was being run about the indoor area, showing the ease with which it could be guided among the posts, the operator missed his calculation a bit and crashed into one. The heavy carriage came out of the encounter with only a scar, but the wooden post was split sufficiently to make it necessary to put in a new one the following morning.

Items of Interest

The lost work in operating a good bicycle is less than 5 per cent., but the efficiency of the people who ride bicycles varies from 25 to 90 per cent. Inventors are constantly striving to devise means to increase the efficiency of the bicycle as a machine, but it would be better if more attention was bestowed upon the habits of the rider.

The Automobile Club of America has just issued its first club book, copy of which has been received by this office. The book contains a vast amount of information that should prove valuable to all users of motor vehicles. It may be said that, among other things, it contains names of officers of various automobile clubs in this and other countries, road ordinances, legal opinions on automobiles, road books and maps, etc. It also contains full names and addresses of members. The book contains 135 pages.

In America there is a tendency to blame the driver of an automobile for reckless running when an accident happens where a horse-pulled vehicle gets the worst of a collision. Automobiles are so popular in France, on the other hand, that a horse-pulled machine nearly always gets the blame when it does not keep out of the way of an automobile. A case of this kind came before a French court lately and the driver of a cab was assessed 2,000 francs damages for running into an automobile.

We never knew of an exposition being held where there was not dissatisfaction with the award of prizes, but we think the awards made by the judges of the present exposition at Paris have caused more heartburning than anything ever known before, especially in the transportation department. This is particularly noticeable in the automobile exhibits, where absurdities are more popular than sensible designs.

People who do not patronize artificial means of locomotion are often unfair toward innovations on walking. They demand that bicycles be prohibited from exceeding a walking pace and that automobiles shall not exceed the speed of a slow trotting horse. It is hard convincing some people that the world moves.

According to a consular report the City Council of Chemnitz, Saxony, has adopted the following rules, which apply to drivers of automobiles:

(1) Persons under fifteen years of age and persons who have no knowledge as to the management of such machines shall not be intrusted with the running of automobiles.

(2) All persons who do not give their undivided attention to the management of automobiles, or who, while using the same, fall asleep or get intoxicated, are liable to punishment.

(3) The signal to turn out shall be "Heeh." The use of signal horns will be permitted until further notice.

(4) Every automobile must carry at least one very good lantern; the same shall be lighted at the same time as the street lights.

(5) The speed of automobiles in the city shall not be faster than that of an ordinary trotting horse.

No one shall run an automobile faster than a horse walks—(*a*) On leaving buildings or sheds bordering on the street; (*b*) during church service in the neighborhood of churches; (*d*) in places where there is large foot traffic; (*e*) in places where fast driving is forbidden.

(6) Automobiles shall not be left unattended on the street. Any one disobeying these rules shall be punished.

Correspondence

THE OTHER SIDE OF THE ALCOHOL QUESTION

I have read with interest the article which appeared in the September issue of your valuable magazine entitled "The Value of Alcohol in Automobile Practice." The writer of the article referred to has evidently but slight knowledge of the question. He is correct in stating that alcohol for use in the arts is untaxed in Germany, but 10 per cent. of impure wood alcohol has to be mixed with it in order to destroy its use as a beverage, and the price at which the mixture, which is called methylated spirit, is sold in Germany and England is about 50 cents per gallon. The present price of wood alcohol is 75 cents per gallon, and it is just as effective as methylated spirit, and is more free from odor, as the refined wood alcohol made in this country is thoroughly refined, while the impure article used to mix with grain alcohol abroad is very rank in odor.

He also states that section 61 of the Wilson Bill, which pro-

vided that "alcohol for use in the arts shall be free of tax under such restrictions as the Secretary of the Treasury shall impose," was not enforced owing to the "laziness" of Mr. Carlisle, who was then Secretary of Treasury. The fact is, that after a careful examination of the subject Mr. Carlisle came to the conclusion that he could not enforce the law and give protection to the enormous revenues which the government derives from the tax on whiskey; as alcohol, whether mixed with petroleum or wood alcohol, may be separated, and the enforcement of the law would have meant hundreds of "moonshine" establishments. A committee of the large users of grain alcohol waited upon Secretary Carlisle, and asked him to enforce the law, and he told them that if they could devise proper regulations he would do so; but after a month of careful investigation they stated that they could not offer him a safe plan for putting the law into operation. It is rendered possible in Germany and England to give free alcohol under the restrictions before mentioned owing to the comparatively small territory of those countries and the enormous number of government officials who have such matters in charge, and even then there are constant infringements of the law. In the United States, with its large territory and comparatively small number of officials, it would be impossible to safeguard the revenues of the government. The matter has been careful investigated by committees of Congress and by the experts of the Internal Revenue office, with the result that it has been deemed impossible to give untaxed alcohol without giving untaxed whiskey.

J. W. Bowman.

Williamsport, Pa.

AUTOMOBILISM IN ONTARIO

The automobile industry in Ontario is yet in its infancy in spite of the fact that there are two first-class gasoline and electric equipments which are inventions of residents of Ontario.

The proverbial conservatism of the Canadian, inherited from his English and Scotch ancestors, is no doubt the cause for this state of affairs. It requires money, and lots of it, to experiment with "the carriage of the future," and your Canadian is rather too conservative to enter into anything so radically new to his training.

Time, money and demonstrations of the practicability of the automobile for both business and pleasure will change these conditions, and I do not know of a better medium through which to reach them than yours.

At present there are three automobile companies building practical carriages in Toronto and Hamilton.

The Canadian Motors, Ltd., using the still battery and motor. The McLaughlan Gasoline Engine Company, using the "McLaughlan non-vibrating engine," and the National Cycle and Automobile Company, manufacturing locomobiles.

There are no automobile clubs as yet in Ontario, although steps are now being taken for the formation of the first club.

There are several American automobiles in use in Toronto and Hamilton.

Automobile headquarters in Hamilton are at the office of Charles Cadmus, the automobile promoter, No. 14 Sun Life Building, where visitors are always welcome. Mr. Cadmus is now organizing an automobile manufacturing company to make electric "Ideal" and gasoline "Perfection" types of carriages.

More power to you, and if our "Horseless Man" can help, count on my aid at any and all times.

Hamilton, Ont. "Don."

RESTRICTIONS AGAINST THE STEAM AUTOMOBILE

For continuous runs with automobiles or for doing heavy work with that kind of motor carriage, no form of power has been so satisfactory as steam. There are now compact forms of steam engines applied to automobiles which take up very little space and are as easily manipulated as an electric motor, but they are not popular with users because restrictions concerning their use are weighted upon them by municipalities that make their use burdensome and attended with incessant annoyance. In many places a license is required for the operator of a steam driven motor of any kind, and those who by ignorance or design violate the license ordinance are likely to get into serious trouble. In New York City, for instance, no one is permitted to care for a steam engine without having a license. Certain villages in the neighborhood have adopted similar ordinances, with the result that a man from New York with a steam automobile dare not pass into any of these places without incurring the danger of arrest. There are no restrictions on those who handle other forms of motors, although some of them require more knowledge and skill in handling safely than do the steam propelled motors.

The weakest point about most of the boilers used for automobiles is that they are likely to scale up in a short time from the impurities in the feed water. As the boiler cannot be properly cleaned scaling up entails the expense of a new boiler. If boilers

of the Herreshoff type were used they would be much less liable to suffer from the effects of hard feed water than any other. The Hereshoff boiler is made of coiled water tubes and is particularly safe from the dangerous accidents to which steam boilers are usually liable.

New York, N. Y. S. Ancloss.

Notes from Abroad

COMPRESSED FUEL

According to a recent consular report from Frankfort, Germany, a syndicate has been formed for the purpose of acquiring a patent for improvements in machinery for agglomerating fuel, and the right of granting licenses for the manufacture of artificial fuel. It is proposed, in addition to working machines, to sell such machines to colliery proprietors or others, either for a fixed price or on royalty. The particular briquette proposed to be manufactured by the syndicate will be free from pitch or tar, and, while comparatively smokeless, will give an abundant flame, and will be of a convenient size, averaging about 9,000 to the ton. The briquettes are clean to handle and are not easily fractured.

It may be that fuel compressed as the above would prove of great value for steam road carriages, instead of coke as is now generally emloyed for firing the furnace.

NEW FRENCH MOTOR-TRICYCLE RECORDS

It is a long time since any attacks were made upon records in Paris, and it has been left to Rigal to do this. He simply slaughtered the previous best performances. His figures were: One lap (666 metres) in 31 3/5 seconds (previous record, 32 2/5 seconds); 10 kilometres in 8 minutes 25 seconds; 20 kilometres in 16 minutes 16 seconds (previous record, 16 minutes 47 seconds). The 20 kilometre record has stood to Béconnais' credit since May 20 last, but Rigal's time is no less than 31 seconds faster, and represents a speed of 73 kil. 800 m. per hour.

CUBA WANTS MOTORS

A letter received by a New York export house from a Cuban correspondent says there is a demand there for automobiles suitable for transporting cane on the plantations and to the grinding factories. At present the work is done with bull-carts, and is unsatisfactory. The larger plantations are equipped with railroads connected with the large grinding stations, but the smaller properties generally are less advantageously situated. It is from these that the demand for

automobiles, it is thought, will be large if a suitable type can be constructed. The correspondent wrote that a planter of experience told him such a cart should be an ordinary platform affair, without sides, about seven feet broad, and the capacity about three tons of cane. The wheels should not be high, and the motive power should be steam. Extraordinary speed, of course, would not be a necessity, though ability to get over the ground with fair rapidity would be an advantage.

ACCIDENTS IN FRANCE

According to the *Velo's* return of accidents for July last, the automobile has hardly been so blameless during the month as is its habit, but all the same fewer accidents can be laid to its charge than in the case of the three other principal means of locomotion. The motor-vehicle is held responsible for twenty-eight accidents, in three incidents these being fatal ones. In one case the victim was a pedestrian, but in the other two the *chauffeur* himself met his death. In the first instance an old lady, half blind and deaf, was knocked down by a car passing through Magny-en-Verin (Seine *et* Oise), and succumbed the following day to a fractured skull.. At Longwy a motor-cyclist fell from his machine and died almost immediately, while upon the same day, at Ville d'Avray, M. Jasques Ellisen was thrown from his car and killed on the spot. This is the motor-car's black list, and the record which most nearly approaches it for moderation is that of the railway. Here we find fifty-four accidents, bringing eleven deaths in their train. The bicycle has caused one hundred and seventeen mishaps, and claims ten fatalities, while the horse's record runs up to no less than six hundred and thirty accidents and sixty-eight deaths. The grand total, therefore, amount up to eight hundred and ninety-seven, resulting in ninety-two deaths.

In this connection it may be interesting to refer to a somewhat curious accident which occurred recently. The mishap occurred on the 18th ult., between Lyons and Aix-les-Bains, at what is perhaps the most dangerous place of the route, known as Pont de l'Abime. Here the road skirts the River Sierroz, and a sheer drop of some thirty-five feet to the surface of the water makes the spot by no means a pleasant one. On the 18th ult., M. Chappuis, of Lyons, accompanied by Dr. Lochon and a servant, were driving slowly, *en route* for Aix-les-Bains, when at this spot a sudden side-slip on the greasy road precipitated the vehicle and its occupants into the river. Dr. Lochon suffered a broken leg, but the other two travelers escaped unscathed from what one would have considered to be certain death. Even the car showed but comparatively little sign of its terrible fall.

Automobile Club Directory

Under this heading we shall keep a record of the motor vehicle clubs both of this and other countries, and we hope to have the co-operation of club officers in keeping it accurate and complete.

Automobile Club of America, Homer W. Hedge, Secretary, 120 Broadway, New York; S. M. Butler, Assistant Secretary, 95 Liberty Street. New York; representative on International Racing Board, Clarence Grey Dinsmore; Substitute, John H. Flagler.

Automobile Club of Baltimore, W. W. Donaldson, Secretary, 872 Park Avenue, Baltimore.

Automobile Club of Chicago, Andrew R. Sheriff, Secretary, Calumet Club, Michigan Avenue, Chicago.

Automobile Club of Columbus, O., C. M. Chittenden, Secretary, Broad Street.

Cleveland Automobile Club, L. H. Rogers, Secretary, Cleveland, O.

North Jersey Automobile Club, E. T. Bell, Jr., Secretary, Paterson, N. J.

Automobile Club of Rochester, Frederick Sager, Secretary, 66 East Avenue, Rochester, N. Y.

Philadelphia Automobile Club, Frank C. Lewin, Secretary, Hotel Flanders, Philadelphia, Pa.

San Francisco Automobile Club, B. L. Ryder, Secretary, San Francisco, Cal.

Columbia College Automobile Club, Lewis Iselin, Secretary, Columbia College, New York, N. Y.

Buffalo Automobile Club, George S. Metcalf, Secretary, Buffalo, N. Y.

Western Automobile Association, Chicago, Charles T. Jeffery, Secretary, Monadnock Building.

AUSTRIA.

Budapest—Magyar Automobil Club, 31 Musem Korül.

Innesbruck—Tiroles Automobil Club, Rudolph-Strasse 3.

Prague—Prager Automobil Club.

BELGIUM.

Antwerp—Automobile Club Anversoir, 34 r. Longue de l'Hopital; President, Baron de Bieberstein.

Brussels—Automobile Club de Belgique, 14 Pl. Royale; Moto-Club de Belgique, 152 Boul. du Nord; Touring Club de Belgique, 11 r. des Vauniers.

Charleroi—Automobile Club de Charleroi, Hotel de Esperance.

Ghent—Automobile Club de Flandres.

Liege—Automobile Club, Liegeois, 2 r. Hamal.

FRANCE.

Amiens—Automobile Club de Picardie, 36 r. de La Hotoie.

Avignon—Automobile Club de Avignon.

Bordeaux—L'Automobile Bordelais.

Dijon—Automobile Club, Bourguignors Cafe Americanie.

Lyon—Bicycle et Automobile Club de Lyon; Motor Club de Lyon, 3 pl. de la Bouise.

Marseilles—Automobile Club de Marseilles, 61 r. St. Fereol.

Nance—Automobile Club, Lorrain, Thiers pl.

Nice—Automobile Velo, Club de Nice, 16 r. Chauvain.

Paris—Automobile Club of France, 6 pl. de la Concorde; Motr-Club de France; Touring Club de France, 5 r. Coq-Héron.

GREAT BRITAIN.

Birmingham—Motor and Cycle Trades Club, Corporation street.

Edinburgh—Scottish Automobile Club.

Liverpool—Liverpool Self-propelled Traffic Association, Colquitt street. Secretary, E. Shrapnell Smith.

London—Automobile Club of Great Britain and Ireland, 4 Whitehall Court, S. W. Hon. Secretary, C. Harrington Moore.

HOLLAND.

Nimegue—Nederlandsche Automobile Club.

SWITZERLAND.

Geneva—Automobile Club de Suisse, 9 boul. de Theatre.

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MAGAZINE

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Announcement

HAVING purchased THE AUTOMOBILE MAGAZINE and everything pertaining thereto, it is our intention to make it the leading journal in the field, giving especial attention to the users and prospective purchasers of motor vehicles.

With this in view we shall be pleased to receive communications relating to the practical operation of the various types of motors and to hear of any difficulties which are encountered.

We owe an apology to our readers for the haste in which it was necessary to get the present issue together—but which could not be avoided under the circumstances.

We intend, however, to make a number of important changes in the near future which will place it in the front rank, and ask a little indulgence until the new machinery can be put in motion for its accomplishment. .

The Philadelphia Parade

Owners and users, builders, the mechanicians who look after the machines, the repair and supply men, are all interested in having all the available information in a convenient form, and can all assist in making THE AUTOMOBILE MAGAZINE a mine of useful information for all concerned. We feel sure we can count on your aid and hope to hear early and often.

Descriptions of tours or pleasure trips, illustrated by photographs, if possible, do much toward making converts to the vehicle which relieves us of the anxiety of over-driven horses and blind staggers. Tell us about some of your recent trips and how the motors behaved.

We also want to hear from all the Automobile Clubs, to have a list of their officers and members, and to know of their intended runs and social events. We intend making the magazine an encyclopedia of automobile information, without any of the "dry as dust" features of the aforementioned venerable volume. Please keep us posted on these matters, it will be mutually beneficial.

The new company is formed of members of the Angus Sinclair Company, who have had years of experience in successful publication work, and who propose to utilize this in making THE AUTOMOBILE MAGAZINE a first-class journal in every respect.

Believing that the readers and friends of the magazine will give us their hearty co-operation, we take up the work with every assurance of success.

THE AUTOMOBILE PUBLISHING CO.,
No. 95 Liberty Street,
New York.

The Philadelphia Parade

WHEN the leading newspapers continue to devote as much space to a subject as is accorded the automobile, it is pretty good evidence that the motor-vehicle is becoming more and more an important factor in the life of many people. In this connection the following editorial from the Philadelphia *Inquirer* regarding the recent parade in that city may be of interest:

"The gathering of automobilists in parade on Saturday showed this city a few things that are worth considering. In the first place it showed that automobiles have come to stay, and, perhaps, in the near future, to usurp the functions of the horse. It is only a year since the vehicle was taken up seriously by Phila-

delphians, and yet in that year the number and quality of the automobiles have increased in a remarkable manner. In the parade Saturday eighty-nine of these pleasure machines participated, and by this time next year it is safe to predict that the number will be increased by hundreds.

"In the second place it showed that a broad-gauge policy in regard to the city and her public places is the best policy, after all. When automobiles first became popular they were barred from Fairmount Park, and it has been only by the hardest and the most persistent work that the Commissioners have been persuaded to open the driveways and the roads of that pleasure place to the machines. It was to celebrate this reversal of the decision of the Commissioners that the parade was held. For this the Philadelphia *Inquirer* can frankly accept the thanks of the automobilist. It was through the work of this paper that the broad-gauge policy was inaugurated.

"A third fact was the remarkable interest displayed by the public in the parade. Crowds of pedestrians turned out to see it go by, and the streets were lined on both sides with vehicles drawn by horses, the drivers of which displayed as much interest in the event as the automobilists themselves. In recent days one of the great functions of society has been the coaching parade, but no crowds ever turned out to see those events that compared in number and in brilliancy with the one that watched the horseless vehicles in stately procession."

The Races and Exhibits of the Month

THE three race meetings of the month of September were all interesting events, and aside from the demonstrations of speed they have created increased interest in the machines and in their possibilities.

While racing will not be indulged in by the majority of users of motor vehicles, there is always an attraction about trials of speed or strength that command attention from all of us and make us think more about the machines than we would otherwise.

In this respect the races and exhibitions are excellent advertisements, as they show the different types of machines to those who may have considered automobiles as a possibility but not as an accomplished fact.

The Races and Exhibits of the Month

Those who drive horses are beginning to be interested in the machines which can cover so much ground in a day's traveling without going lame or getting winded, while there are many who have thought of horses, or both, but who have not decided which to get. Both of these prospective buyers are influenced by good exhibitions and the expense of such shows is sure to be realized at no very distant day. We believe they all help to make motor vehicles popular and should be encouraged.

The Motor Vehicle in Warfare

ONE or two of the European countries have been and are still devoting considerable attention to the subject of using self-propelled vehicles in the transportation of war material and in actual warfare generally.

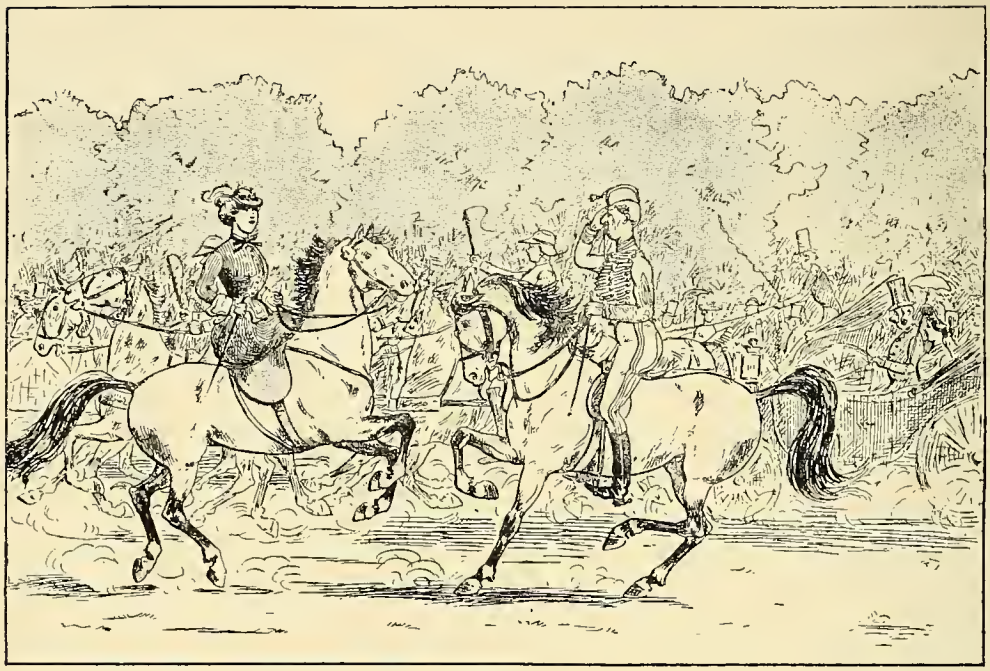
The South African war just about ended has demonstrated the fact that, especially in time of war, the death rate among horses and their disablement are vexing problems. The weight of some pieces which have to be drawn from one scene of operation to another are immense, and it is little wonder so many horses "fall by the way," especially in wild, hilly territory, and where the scenes of action are apt to change quite frequently. The problem of moving a large army with the necessary ammunition and stores is a difficult one to solve, and as endeavoring to arrive at a satisfactory solution it may be of interest to refer to the trials recently carried on by France and Germany.

In the tests referred to eight large wagons were employed for transporting material, guns, ammunition and stores—two Panhard *et* Levassor wagons, two De Dietrich lurries, two De Dion wagons and two Scotte trams. Each General had a patrol car at his disposal, together with a number of voiturettes and motor cycles. A commission was appointed to report upon the behavior of the vehicles referred to, as well as the cost of their operation, and its report will be looked for with considerable interest, especially by military men.

It is the general tendency both to underrate the horses' capacity for work and the increased power necessary for more rapid traveling. This was the case with the electric street car when they began by putting on a five horse-power motor, and on the same size car they now use one of at least twenty horse-power.

Automobile Humors

IN THE BOIS



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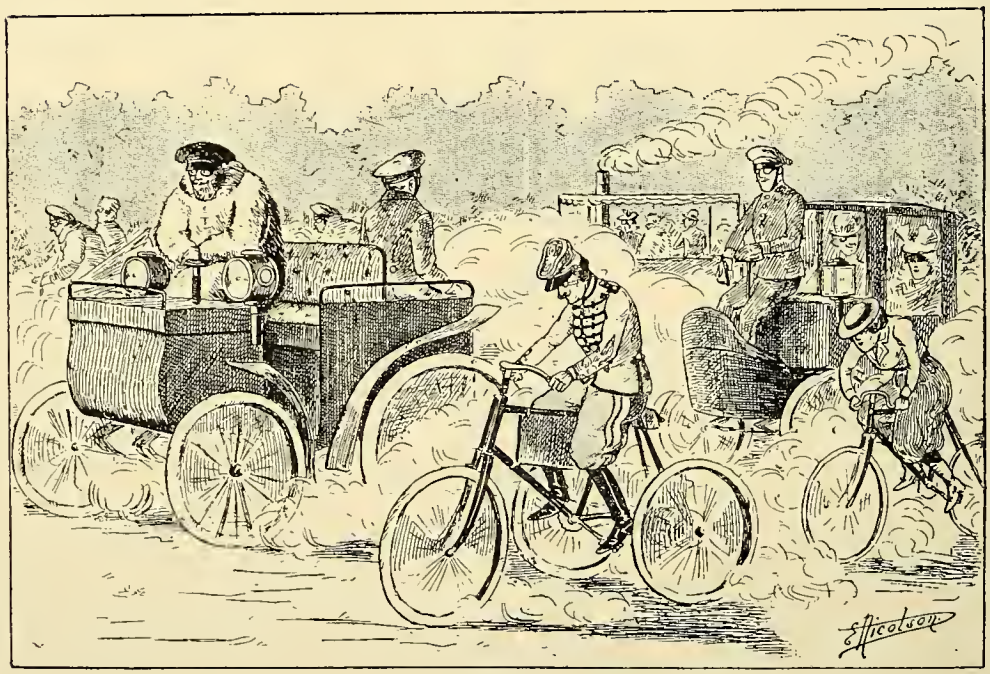


Now

—*Journal Amusant*

Automobiles for Stage Service

IT does seem as though the automobile could be used to decided advantage in the transport of passengers from small towns to the stations of the great railroad systems which enter the great cities.

There are a great many places where this is done by means of stages drawn by horses and sometimes over very hilly roads. Such traffic is very hard upon the horses, and after a few years continuous service as stage horses they are not of much further use.

If, in place of horses being employed, small self-propelled buses, say with a seating capacity of from 8 to 10 passengers, were used, it would be considerably more agreeable and would in the long run pay. Of course, the first cost would be greater than for horses, but ultimately those interested would find that this would more than be compensated for by the saving in losses from cost of feed, etc.

Not only that, but the patronage now accorded such stages would be more general. Perhaps it would be a good thing for the railroads to look into this, and see if anything can be done along the lines suggested. The traffic from such small towns is certainly great enough to justify the best that can be given in the way of transportation, and in cases where the trolley is not available it would seem the automobile might be used.

To the devotee of the camera the automobile presents great possibilities for the pursuit of his objects—the natural beauties that abound in almost every section of the country. The wheel limits one to the most compact of cameras, and a tripod becomes a veritable nuisance unless it is so full of joints that it will fold up very short. The automobile, however, allows you to carry as large a camera as you wish and any tripod that suits, while it enables you to go anywhere within reason without being exhausted by physical exertion. As a promoter of photographic work the automobile will be a grand success and the makers of such apparatus are sure to take advantage of it.

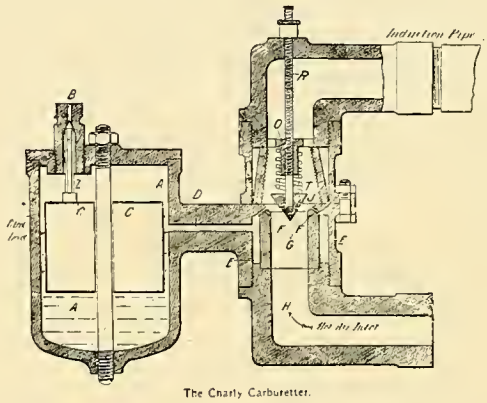
An Automatic Carburizer

THE *Autocar* shows an ingenious device invented by M. Charly, and is being used by Messrs. Burford and Van Toll, of the New Orleans Motor Works, Twickenham.

This simple appliance is said to act so well that they are able to do away with the mixture lever generally fitted to the steering standard. Only the throttle and sparking levers are retained.

The cut shows the construction to be of the float feed type with gravity feed. The operation is as follows:

The spindle *R* is set to permit of the passage of a certain proportion of air to petrol when the engine is running, say, at



The Charly Carburetter.

eight hundred revolutions, the truncated cone being raised against the spring by the induction to allow this at every intake. Should the engine begin to race above the normal speed, the force of the induction is proportionately increased, the cone *J* is raised higher up the rod *R*, admitting a larger proportion of air, thus weakening the mixture and slowing the engine. On the other hand, should the engine slow below the normal, the cone *J* is raised less, and the opening for air passage in *G* being more constricted, the mixture is proportionately enriched, and the explosion therefore more powerful. In all the carbureters made the cone *J* and the coned point of the rod *R* are turned much larger than is shown in the illustration, the apex of the cone penetrating much farther into the space *G*.

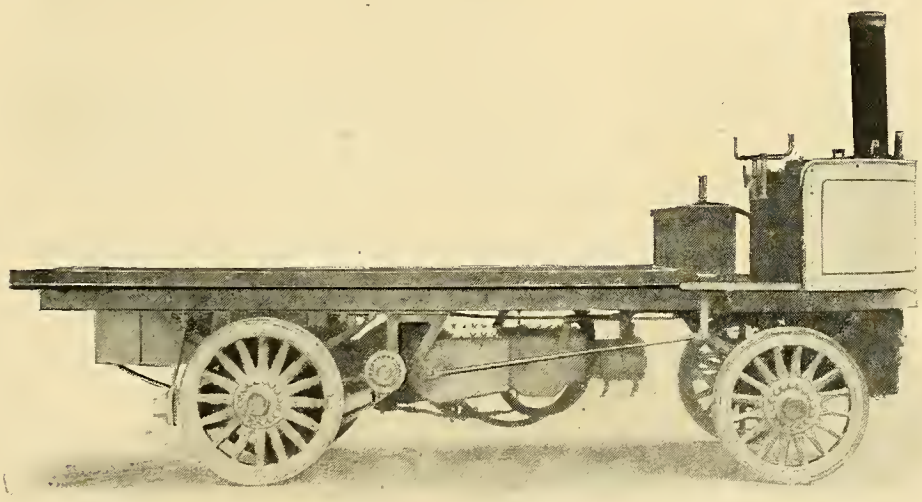
It has also been adopted by Mr. George Richards, who builds voiturettes under the Vivinus patents.

An English Steam Wagon

THOSE of our readers who are familiar with the English "lurry" used for trucking purposes as distinguished from those used here will readily recognize the wagon shown in the accompanying illustration as an English product.

It is probable that England, more than any other country, has gone further in the line of development of automobiles in their application to carrying of heavy loads.

The wagon shown, which was built by the Lancashire Steam Motor Co., of Leyland, England, possesses a number of interesting features. It is capable of carrying a maximum load of four tons, and is made sufficiently heavy to withstand severe shocks.



New English Steam Truck

The axles are of girder section, while the wheels are made upon the gun carriage principle, the hubs being of steel and fitted with bronze bushings.

It is possible with this machine to use such type of body as is most suitable to the work in hand. The one shown is made of oak framing with teak bottom, and, as will be seen, simply rests on the steel framework, being entirely free from the machinery.

The boiler, which is placed in front, is designed to burn coke as fuel, most of the former machines turned out by the company having been made to use liquid fuel for firing the boilers. It has 89 square feet of heating surface, with a working pressure of 200 pounds per square inch. There is a small feed pump placed below the engine frame used to supply water to the boiler. This

water, before entering the boiler, is passed through a feed-water heater which raises its temperature from 50° to 180° F. Under the driver's seat is another pump of the Worthington type, which is used to feed the boiler when the machine is standing. All the working parts run in a dust-proof oil bath.

The driving gear is arranged to give two rates of speed with the engine running at the same speed, one of five miles per hour and the other of three miles.

The placing of the driving mechanism under the platform leaves the maximum amount of space for merchandise, and for a wagon capable of carrying a load such as it is designed for, its lines are anything but awkward looking, but rather graceful.

It is claimed that wagons of this type carrying a full load can cover a distance of fifty miles in a day of twelve hours.

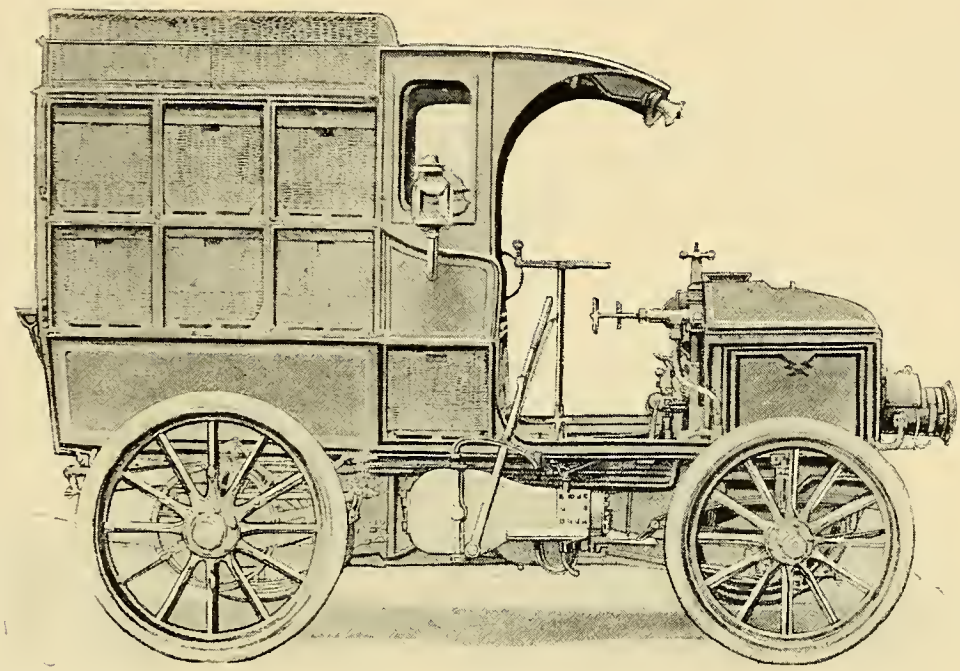
The Chaboche Steam Wagon

RECENT trials in Paris demonstrated the practical features of the steam wagon of M. E. Chaboche of that city, who has been experimenting with that type of motor for some time.

The feature of the car lies, of course, in the boiler, which is of the instantaneous type. It is composed of two concentric shells constituting the steam area, and the inside shell incloses coils of steel tubes of circular section. Care has been taken to construct the boiler with as few joints as possible, and the maker guarantees that they will resist a pressure of 735 pounds.

The boiler is fed from a reservoir with a capacity of 5.3 gallons. This reservoir, or "feeding bottle," as it is called by the maker, is half full of water, and the rest contains compressed air at the pressure at which the generator is required to work. The pressure in the bottle can be varied between 200 and 400 pounds per square inch by means of a regulator placed under the seat of the driver. Thus, at ordinary pressures, the boiler can be fed from the reservoir without the intervention of the plunger pump, but this is used when it is necessary to get higher pressures in the generator. One of the advantages of this system is that when the car is at a standstill there need be no pressure in the boiler, and it can be started without pumping water into the boiler by means of the hand lever, because the pressure in the bottle will allow of an equal pressure being attained in the generator. The

car may be left to itself for several hours by taking care to replenish the fuel from time to time, and it can then be got ready for starting again in five minutes. The fuel used is coal, which is prepared in paper bags containing about twelve pounds, and is dropped in at the top the same as in the De Dion boiler. The employment of bituminous coal would seem to suggest the possibility of a large escape of smoke, but from what we have seen of the running of the vehicle this is scarcely noticeable. The steam



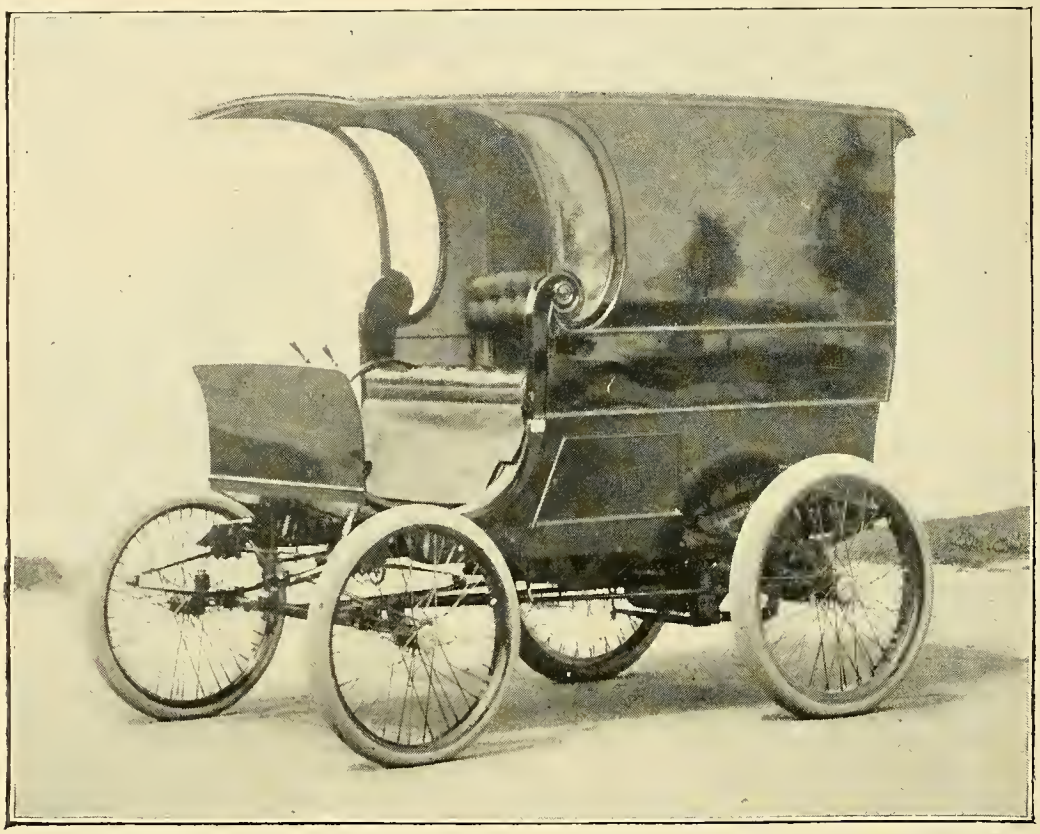
The Chaboche Steam Wagon

exhaust is carried away by a pipe underneath. When the car is starting, or the boiler is working at a high pressure in order to overcome any special resistance, there is a small volume of exhaust, but, under ordinary conditions, there is little or no exhaust observable. From the description of the boiler given above, the question naturally arises whether there is not a danger of the tubes burning, but it will be seen that the tubes play only a small part in the economy of the generator.

A Winton Delivery Wagon

WE present herewith illustration of one of the latest styles of delivery wagon turned out from the factory of the Winton Motor Carriage Company, Cleveland. This wagon is fitted with the regular standard "Winton" motor, which is, together with all working parts, concealed in the body of carriage, amply protected from all dust and dirt.

It is of the single cylinder type, operated with hydro-carbon gas generated from gasoline vapor and air, which elements are



Winton Delivery Wagon

admitted automatically and mixed in a carbureter. Satisfactory combustion is insured by this arrangement, resulting in absence of a great deal of the odor from the exhaust.

By a simple arrangement the motor is under perfect control. A small button placed beneath the right foot, by the pressure applied, varies the speed of motor from 100 to 800 revolutions per minute.

The style of wagon shown is light and is becoming very popular with store proprietors.

The vehicle will run about fifteen miles per hour with a load of from six to eight hundred pounds over fair roads.

Resistance of Road Vehicles to Traction

AT a meeting of the British Association, held September 7, Prof. Hele-Shaw, of Liverpool University, presented a paper on the "Resistance of Road Vehicles to Traction." It is not practicable to produce the paper in full, but below is given a summary. He pointed out that gradual increase in speed of motor vehicles along the common roads, which gradually led to the necessity of having a fairly complete knowledge of the resistance of common roads of various kinds upon different classes of vehicles.

Reference was made to the effect pneumatic tires had, not only upon the life of the vehicle, but upon its resistance also, this being so much the case that efforts have frequently been made to introduce the use of India rubber tires upon traction engines.

The speed indicator used in carrying out the experiments was a Schaffer and Budenburg tachometer, to which a temporary wooden wheel was attached, and a special dial was made, so that instead of indicating revolutions per minute the miles per hour at which the vehicle was traveling were at once made visible. A rope about 20 feet long was attached to the voiturette and connected with the dynamometer, the dial of which an observer was able to read. At the same time a second observer called out the actual speed of the vehicle at that instant and the nature of the road which was being passed over, which were recorded by the first observer in his note-book, together with the pull on the dynamometer.

The net result of the experiments showed that even on apparently the smoothest road, the variation in the pull was so considerable that nothing but appliances which would record autographically both the pull and velocity at the same instant and indicate also the distance traveled, so as to identify the exact piece of road corresponding to the record, would be of any value. Moreover, it was evident that some autographic record of the nature of the road, as well as some instrument for recording the vibration of the vehicle which was being towed, were necessary in order to form some estimate of the effect of vibration upon the resistance. With such appliances the pull on wagons, lurries, ordinary vehicles with iron rims, pneumatic and India rubber tires, could be investigated for any speed, and it is not too much to hope that some definite idea of the laws concerning traction might be found, with the effect of springs, tires and the surface of the road taken into account.

Ideas of Inventors

(Copies of patents mentioned herein can be obtained from the Patent Office in Washington for 5 cents each.)

Among the recent patents we find a spring motor vehicle, in which, as indicated by the name, the motive power is the stored energy of a spring. It is rather surprising that this should be even attempted, as it is safe to say this is one of the most unsatisfactory methods of driving that can be imagined. If the spring is wound by an engine or motor at home it has all the drawbacks of an electric vehicle and none of its advantages. If it is intended to be wound by hand, the whole thing is an absurdity, for it would be easier to propel the car direct, as with a railroad handcar, than to wind a spring which is to unwind and give out its stored energy. (Patent No. 659189, October 2, 1900.)

Steam motor designers are busy, and one of the latest patents is a compound engine with cylinders at an angle of ninety degrees, both driving one shaft. The design appears to be complicated, but may have advantages not apparent from the patent drawings. (Patent No. 659162, October 2, 1900.)

Mr. Charles A. Lindstrom, of the Hewitt-Lindstrom Motor Company, has patented a supporting frame for motors of electric vehicles which seems to have several good points. The proper suspension of motors of all kinds is a problem that needs more attention than it often receives. On this, to a great extent, depends the easy riding of the carriage and the life of the motor. (Patent No. 659080, October 2, 1900.)

A plan for giving the passenger of a motor cab or other similar vehicle the power of stopping the vehicle regardless of the operator is shown in another patent. While there might be instances where this would be of advantage, it does not seem generally desirable. The passenger only sees ahead, and might be seized with a desire to stop at a moment when the operator was keeping out of the way of something behind. It is not a good plan to have the control of a vehicle divided between two people any more than it would be desirable to drive a horse with one person holding each rein. (Patent No. 659121, October 2, 1900.)

The Final Automobile

Hugh Dolnar

I. Permanent Bearings.

THE automobile of to-day is a thing of shreds and patches, a mere aggregation of a vast number of not wholly satisfactory solutions of the multitude of exacting problems of mechanical construction which must be perfectly answered before the automobile stands forth as a perfected whole, and banishes the beautiful but filthy and feeble-witted horse from his present position of tyranizing mastery over the human race. Humanity is so weak physically and so burdened with heavy loads to

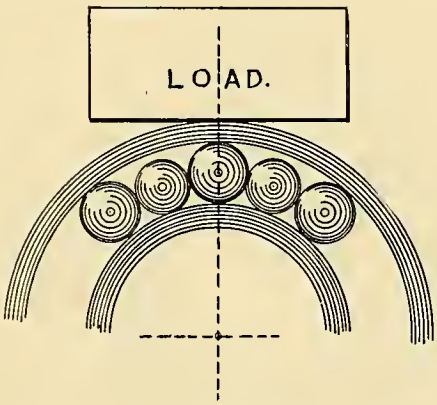


Fig. 1. One Large Ball in Load-line and doing all the Work

carry, that it has been forced to accept the horse, to endure the vile odors arising from this noble brute, the daily homicides caused by his senseless panics of fear, and the never ending toil of cleaning streets which never can be clean so long as the horse defiles them in a thousand places every instant of the day, and repairing the rough pavements which cannot be made smooth and durable, because if the pavements were made smooth the horse would have no foothold, and because no rough pavements have been found which can efficiently resist the millions of heavy blows from iron-shod hoofs which fall in thunderous succession continuously on every city street. All of this mankind endures from the horse, best friend of the farmer—worst enemy and most oppressive tyrant of city life.

To-day we have rediscovered the great truth so fully demonstrated seventy years ago by Dr. Gurney, by Hancock and by

Dance, that loads can be carried on common roads more rapidly and at less cost by mechanically driven wagons than by horse traction, and we see a possible ending of the reign of the horse. We see the possibility of clean and silent city streets, we see an end to the daily loss of human life caused by horses crazed with fear, whose first instinct is to run from all unfamiliar objects, and we accept with joyous welcome every automobile, no matter how clumsy its construction or how serious its defects in performance may be, because it is at least a harbinger of ideal city living, and city life is the natural and most acceptable form of human existence.

These six papers, dealing with the primal mechanical requirements of the mechanically driven road wagon, will assume without discussion the unfitness of the storage battery as a reservoir of power for road wagon driving in general, and will regard it as

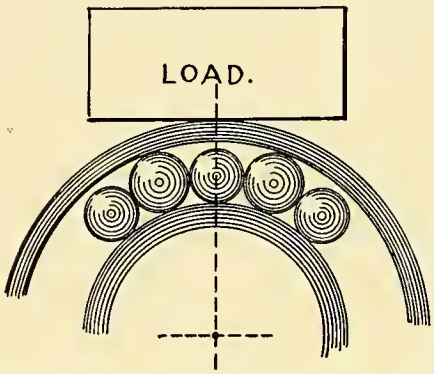


Fig. 2. One Large Ball each side of Small Ball in Load-line

fully proven that the final type of road wagon will be driven by internal combustion heat motors working on the Otto cycle. Steam engine driven road wagons are now the easiest to manage of any automobiles offered, but they are wasteful of fuel, must carry great loads of water, which must be constantly renewed, and demand such a bulk of machinery and tankage that they are certain to be discarded in the near future, because the fired cylinder motor needs no water supply renewals, burns the less fuel and is the lighter, simpler, cheaper and, if perfected, will be the more easily managed. These inherent advantages of the gas engine will certainly lead to its perfection and development into the motor finally accepted as more suitable than anything else for road wagon driving, unless some wholly new prime mover is discovered.

The first requisite of any machine is the permanent retention of all its parts, whether relatively moving or stationary, in very

closely fixed locations with respect to each other. Hence the framing of the final road wagon motor will be rigid, and the bearings which support the moving parts will be so constructed as to work for long periods of time, several months at least, and perhaps for as much as a year, or even more, without detrimental change of form or dimensions, without lubrication, and without attention from the wagon driver. The mere fact that no such bearing is now known, and that the wisest of engineers deny the possibility of constructing such a bearing, is of no importance or significance whatever. The final automobile will have permanent bearings, because it needs them, and because mechanical traction on common roads is cheaper than animal traction, and is the most important mechanical problem now before the world, and

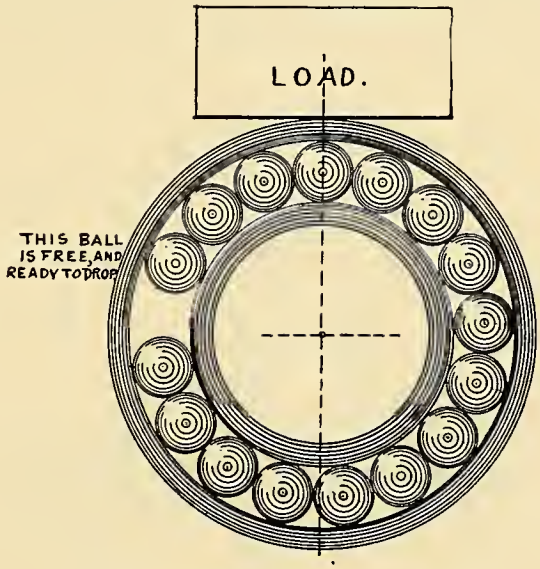


Fig. 3. Slack Filled Ball Circle

is engaging the closest attention of thousands of inventive minds, and therefore the permanent bearing is certain to appear.

No material, except possibly the diamond, is known which will endure sliding friction under even such light loads as are imposed by the moving parts of road wagons, for a year without change of form. It is possible that some of the cheaper and more common forms of crystalized carbon like the black diamond might be so applied as to form sliding bearings which would be permanent for a twelve month at a time without attention, but it seems probable that such carbon bearings would be costly, and it appears now that instead of searching for a material indestructible under sliding friction, the shorter road to the permanent bearing will be found in those interposed elements, located between the moving and supporting parts of a machine bearing,

which convert sliding into rolling friction. Bicycle ball-bearings have very clearly shown that permanent bearings may be had within certain load limits. This is not to say that any bicycle ball-bearings now known are permanent for a year of constant work under maximum load. Bicycle bearings have so far been made with screw adjustments, and it is, as yet, and probably always will be, an extremely difficult matter to make really good screws of any kind or sort whatever.

In general terms it may be said that no ball-bearing depending on screw adjustments can be so accurately made as to be called permanent. Roller bearings, now so much used in automobile work, are of necessity imperfect, since it is impossible to so support the rollers that they are in perfect alignment with the shaft and journal surfaces. This charge of imperfection is clearly proved by the fact that all roller bearings require oil lubrication,

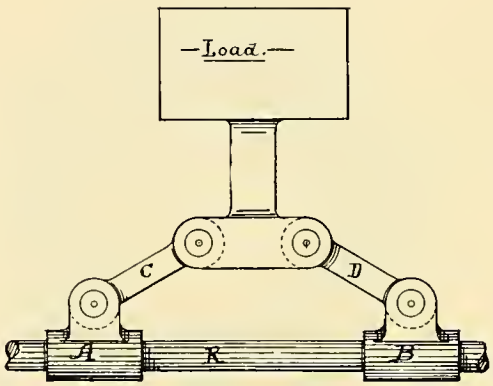


Fig. 4. Toggle Joint. End Thrust Position

which would not be needed if the rollers were round, of nearly equal diameter, straight, and associated with truly cylindrical shafts and journal boxes. The ball-bearing has inherent advantages of construction which seem to make it more likely to give the permanent bearing demanded by the automobile than anything else, and it is here assumed, without discussion, that the final automobile will have all of its constantly moving members supported in ball-bearings.

First, as to the balls. All ball grinding machines are subject to such conditions of construction that they produce three forms of solids, the spheres which they are intended to produce, ovoids, and that three-cornered solid which is not a sphere although having everywhere constant diameters. The only way to obtain real balls of pretty nearly the same diameter to fill a ball-bearing, is to take at least six micrometer readings of six different hand

applied diameter gaugings. A fairly satisfactory bearing can be had with balls varying a quarter of a thousandth of an inch in diameter, but for really good bearings the ball diameter in any one ball circle should not vary more than one ten-thousandth of an inch. One American bicycle maker gauges the balls for every bearing to within the eighth of a thousandth of an inch, using stationary micrometer gauges manipulated by girls, these girls requiring careful selection, and working very short daily hours, as the work is extremely trying.

Assuming round balls, nearly of one size, as the best bearing lubricant for the automobile, the ball supporting ways remain to be considered. The limits of this paper do not permit so full a presentment of bearing ball support forms as might be profitable, but it is enough, perhaps, to assert and clearly show that the two-point ball-bearing most commonly used in bicycle work has

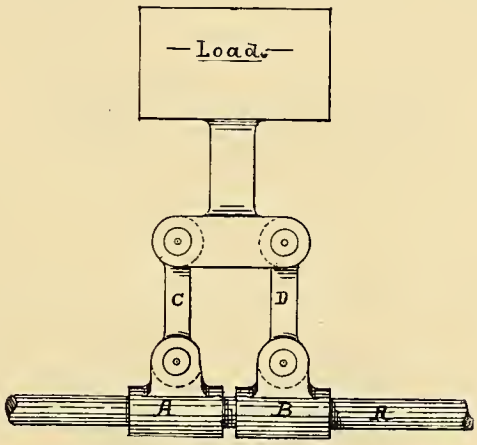


Fig. 5. Same Leverage. Direct Load Support.

grave inherent faults, and that the four-point ball-bearing is more promising of success than any other.

Before exhibiting the faults of the two-point bearing, some space should be given to a brief consideration of the action of the balls of a ball-bearing in work, on each other.

Large as is the present use of ball-bearings in the bicycle and the automobile, very few persons have a correct and clear conception of the movements and functions of a circle of balls moving under a load and supported and confined by cones and cups of ordinary forms, and there has been and still is a vast amount of talking and writing and printing based upon wholly incorrect assumptions of the action of the balls, and hence wholly erroneous in the conclusions deduced.

These wrongful conceptions of the action of balls in ball-bearings have not stopped at mere current print, but have often been

carried into the Patent Office, and in many instances these patents, conceived in entire error, have been made the basis of factory operations, sometimes, as in the case of the "Comet" bearings, with great resultant losses, and sometimes with the merely negative results of entailing a lot of work which served no useful purpose, but yet did no particular harm, and so continued to be produced.

The two more prevalent delusions in regard to the action of balls in ball-bearings are, first, that a considerable number of the balls in a ball-bearing in work are under load at the same instant of time, and, second, that a spinning or gyratory movement of the balls, leading to a highly objectionable grinding action between the ball surface and the supporting members is set up by certain forms of ball cone and ball cup, thus causing a very objectionable increase in friction and consequent wear.

Both of these beliefs are wholly erroneous.

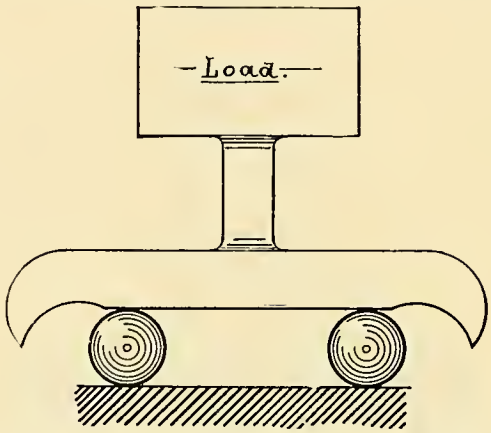


Fig. 6. Direct Load Support on Balls.

The belief that a considerable number of the balls in a bearing are under load simultaneously leads at once to the conclusion that these loaded balls crowd against each other, with the result, since their meeting surfaces run in opposite directions, of causing a great surface friction between the balls themselves, wholly independent of the ball contact with the cone and cup surfaces, and hence silly patents on parts interposed between the balls to obviate this inter-ball friction have been issued in shoals, these needless parts being manufactured in quantities, and loudly heralded as the long sought remedy for the hard rubbing of ball-bearing balls against each other as they travel in the bearings under work. Some of the exhibitors at cycle shows have presented models of ball-bearings in partly transparent enclosures, so that the movements of the balls at work could be plainly seen. In such exhibits the cone and cup circles are always made of the correct diameter,

so that the balls seem to touch each other as they travel, and it is really a difficult matter for the observer of such an exhibit to avoid the conclusion that, say, perhaps one-third of all the balls in the bearing are actually carrying load at the same time, because they appear to the eye to all touch each other, and to all have perfect contact with the cone and cup.

In point of fact, however, there are precisely two cases in ball load-bearing action; no more and no less. These two cases are,

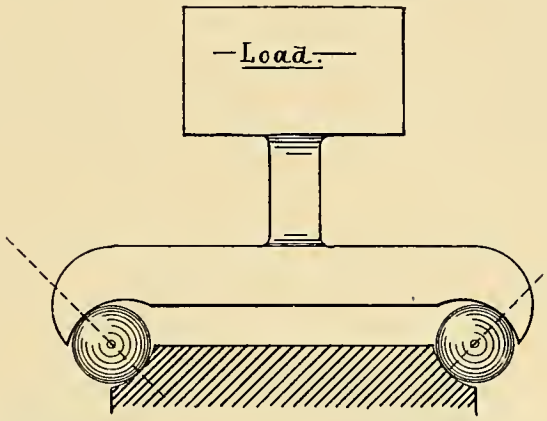


Fig. 7. Angular Load Support, Increasing Ball Crushing Stress

first, where a small diameter ball is located between two larger balls, and, second, where two balls of the same diameter touch each other or are separated by others of smaller diameter. These two cases are shown in Figs. 1 and 2, Fig. 1 showing a large ball

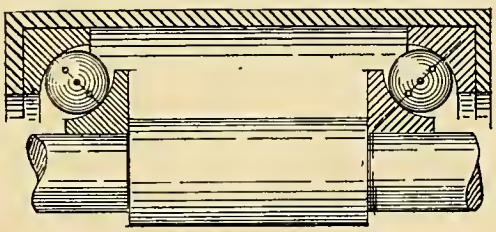


Fig. 8. Two-point Ball-bearing; Angle of Support, 45 Degrees

in work between two small balls, the small balls of necessity carrying no load, because they do not touch the ball cup surface, the entire load borne by the bearing being thus, for the instant, carried by the single large ball as it passes the line of load pressure. In Fig. 1 one single ball is doing all the actual load bearing, all the other balls in the bearing acting simply as guides, leaders and steadiments to keep the bearing parts in their correct relative positions, and so under some small incidental load, of course, but

this incidental load is so very small as to be of no importance whatever. Very clearly, then, in Fig. 1, there is only one single ball supporting the load, and doing all the work done by the bearing in the way of actual load carrying. All of the other balls in the bearing are comparatively free, and unless the bearing is constructed with a degree of accuracy never reached in commercial work, all the balls except the one load bearing ball are actually free to drop by their own weight, and do so drop, as will be conclusively shown later.

In the second case, as shown by Fig. 2, where two balls of larger diameter are separated by a single ball of smaller diameter, it is quite clear that at the instant of passing under the load the two larger balls are in work, and at one point of travel are equally loaded.

These two cases of the location of balls of different diameters in a bearing are all the cases possible. There must be either a large ball between two small balls, in which case one ball only

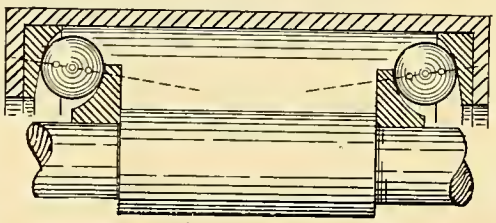


Fig. 9. An Extreme Case; Angle of Support, about 15 Degrees

carries the load, or there must be a small ball between two large balls, in which case the two large balls may be, for an instant, equally loaded. There is, it is true, a third possible case, in which two balls of precisely the same diameter are adjacent, but in this case the load carrying action is the same as if these two balls of equal diameter were separated by a smaller ball, and for an instant both of these adjacent balls of equal diameter bear equal parts of the load. The theoretically possible fourth case, in which all of the balls are of exactly the same diameter, and are supported in cups and on cones which precisely fit these balls, and are also absolutely rigid and so suffer no deformation in work, cannot possibly be produced and never occurs in practice and needs no consideration here.

Because of all this there are always in any ball-bearing either one ball or two balls in work, one or the other, no more and no less, and all of the other balls are, for the instant, mere guides or else actual idlers, and hence even in ball-bearings of very ordinary construction there is no considerable friction caused by the rub-

bing of the balls against each other at the points where they touch, and there is no useful effect to be gained by the introduction of any fourth element, beyond the cones, the balls and ball cups, in a ball-bearing.

These conclusions and assertions will be pronounced erroneous by a large majority of ball-bearing constructors, but for all that they are correct.

A complete support of these conclusions can be had in any cycle factory at no expense whatever, and is also perfectly familiar to all cycle makers, many of whom, however, have totally failed to grasp the very simple and obvious lessons taught by the mechanism shown in Fig. 3, which represents a ball-bearing filled with less than a full circle of balls. All cycle makers are perfectly aware that a slack-filled ball circle will make as many small audible clicks during a revolution as there are balls in the bearing. There is only one possible way in which this little click can be produced, and that is by each ball dropping with a perfectly clear

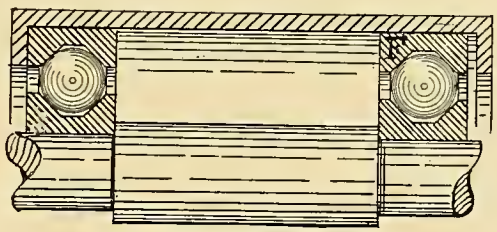


Fig. 10. Four-point Bearing

and unobstructed fall from a higher position, in which the weight of the ball is supported against dropping by cone and cup friction, to a lower position fixed by the striking of the falling ball against the next ball below it. All cycle makers are aware of this click, and so try to fill the ball circle as exactly as may be, so that there will be only a very small clearance possible between any two balls, and hence no considerable possible extent of drop from one ball position to another. Cycle ball-bearing balls weigh only a little, and a very slight surface friction would prevent any ball from making any drop whatever. Since this clicking noise caused by the dropping of the ball in a slack-filled bearing always occurs, it follows that at one point in every ball-bearing each ball is absolutely free from all restraint, and can and does fall by its own weight a certain distance. A moment's reflection makes it perfectly clear that if the balls are all free at one point of their travel they must of necessity be free at many other points, because the cones and cups are nearly round. The actual travel and work of the balls in a loaded ball-bearing having a slack-filled circle of

balls, is as follows: either one or two balls in the line of load support carry all the load, and are firmly held in their instantaneous locations by the load pressure, and could not slide away from that position without great friction. All of the other balls in the bearing are very nearly free. If the balls are nearly of one diameter, and the ball tracks are nearly true circles, then the balls closely adjacent to the one or two load carrying balls are held in position by a very slight friction, constantly and rapidly decreasing as the ball position is removed from the load carrying balls, and very quickly reaching a location where the balls are free to drop, and do drop and make the click.

This clicking of balls in a slack-filled bearing is a very small and seemingly unimportant matter, but it could not possibly occur if the action of the balls in load carrying were not, as here asserted, confined wholly to the one or two balls which are at the instant passing the line of load pressure.

The two-point ball-bearing, now almost exclusively used in bicycle construction, cannot be expected to give satisfactory results under very much more than ordinary bicycle loads, because of an increase of ball crushing pressure due to the form given to the two-point bearing to obtain a ready adjustment.

Fig. 4 is a diagram of that arrangement of jointed levers known as the toggle joint, which is much used where heavy pressures acting through short ranges are desired.

The load is shown in Fig. 4 as supported by two links, *C* and *D*, jointed to the two sleeves, *A*, *B*, which are free to slide on the supporting and guiding rod *R*. As the load descends *A* and *B* are forced apart at a constantly decreasing speed and with constantly increasing power, so that when the links, *C*, *D*, take a nearly horizontal position the sleeves, *A*, *B*, are forced apart by a strain vastly exceeding the weight of the load, all as is perfectly well understood. Precisely this condition of affairs exists in the two-point ball-bearing, except that in the two-point ball-bearing, owing to the disposition of parts, the members corresponding to the sleeves, *A*, *B*, tend to move toward each other.

Fig. 5 shows the parts shown in Fig. 4 in different positions; the links, *C*, *D*, stand upright, and the load cannot exert a separating influence on the sleeves, *A*, *B*, which each have simply to support half the weight of the load and linkage above them. In Fig. 4 the sleeves *A*, *B*, are moved away from each other by a very powerful impulse, far in excess of the simple weight of the load, while in Fig. 5 the same load and parts exercise no separating influence whatever on the sleeves *A*, *B*. As Fig. 4 correctly

shows the loads and stresses imposed by the two-point ball-bearing, so Fig. 5 correctly shows how the load is carried in a four-point bearing.

To make this clear, Figs. 6 and 7 are given, in which balls take the place of the links *C, D,* and the sleeves *A, B,* Figs. 4 and 5.

In Fig. 6 the disposition of the parts is the same as in Fig. 5, and it is obvious that each of the two balls in the positions shown must carry half the weight of the load above them, no more and no less, and that the load on each of the four bearing points of the two balls is exactly the same; that is, the half of the weight of the mass above them. When it is remembered that the durability of a ball-bearing depends wholly upon the crushing load in pounds resisted by the ball, the importance of such an arrangement of parts as will give the balls only that crushing load due to the actual weight of the mass carried above the balls becomes apparent.

In Fig. 7 different positions of the same parts shown in Fig. 6 give diagonal lines of load support through the ball centres, thus introducing exactly the conditions shown in the toggle linkage, Fig. 4, and very greatly increasing the crushing load on the balls over that normally due to the load in pounds carried above the balls.

Fig. 8 shows no adjusting mechanism, but is otherwise a correct exhibit of the regular practice of one of the largest American cycle factories. In this Fig. 8 the angle of support is 45 degrees, same as in Fig. 7, and the balls are subjected to a much greater crushing effect than the actual weight in pounds of the load carried. It is not needful to know exactly the excess of load imposed by the angular line of load support on the balls. It is enough for the designer to know that one plan of construction is very much more favorable to durability of parts than another, and he can then work understandingly.

As shown in Fig. 8 the ball load is not increased to its limit, by any means. Fig. 9 shows an extreme case, probably never met in practice, the angle of support being reduced to about 15 degrees. Inspection at once shows the mechanical reader the very great tendency of the parts in this Fig. 9 to push the hub flanges outward and to force the tops of the cones inward toward each other, with, of course, a corresponding increase of ball crushing pressure; the action here is exactly the same as in Fig. 4, in case the links *C* and *D* were brought down well toward a horizontal position, the direction of strain being reversed, of course, outward in Fig. 4, instead of inward and outward both in Fig. 9.

Fig. 10 shows a four-point bearing, 45 degrees cup and cone angles, the right-hand ball cup being free to slide. This form of bearing reduces the crushing load on the balls to much less than one-half that existing with the two-point bearing, loads the same.

This highly favorable result comes, first, from doubling the points of load support on each ball. This at once reduces the ball crushing load at each point of support by one-half. Again, the angle of support is zero, and hence the balls cannot have an increase of crushing load beyond that of the actual load in pounds applied to them. Where the load is supported by normal lines of resistance, as in Fig. 5 and Fig. 10, there is no possibility of the angular load support action shown in Figs. 4 and 7, and in an extreme case in Fig. 9, where the crushing effect on the balls and the strain tending to force each cup away from its coacting cone is many times greater in pounds than the actual weight of the load carried by the bearing.

In a bicycle the side thrust on the wheel is nothing on an unobstructed roadway, either on a straight or curved course, because the rider is forced to keep the plane of the cycle load at the normal load angle to preserve his equilibrium. When a bicycle wheel rubs sidewise against an obstacle a side thrust is, of course, created, but this is not a thing in the regular course of bicycle use, which does not call upon the balls to resist side strains to any noteworthy extent.

The case of the tricycle or quadricycle is wholly different, heavy side thrusts being of constant occurrence on curves, and from meeting obstacles. In this case the four-point bearing has twice as many points of resistance as the two-point bearing has, which is of the highest importance, because a ball and its cup and cone may obviously carry a certain side thrust successfully and without damage, and yet be "cut" and so ruined by a side strain twice as great. It seems not unlikely that this single point of side thrust resistance has been the principal cause of the failure of the two-point ball-bearing in road wagons in so many instances, and of the generally current belief among automobile constructors that ball-bearings are not suitable for use in any except the very lightest types of vehicles.

The four-point bearing will carry comparatively large loads without deformation or wear, and hence is permanent if so fitted in the first instance as to need no adjustment. If the ball cup is in one piece, and the ball cones are ground accurately to length so that they meet, and are supported rigidly against end motion, then the four-point bearing, as here shown and described, can carry

the loads imposed by automobile requirements for a long period without attention, and may fairly be termed a permanent bearing.

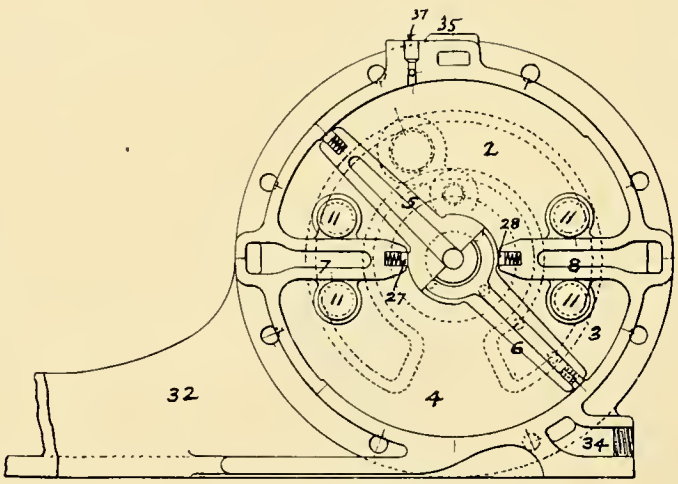
There can be no doubt that such a bearing, supplied with vaseline when filled with the balls and perfectly dust proof, is capable of carrying a certain load during a comparatively long period of continuous action, without additional lubrication or attention of any sort. A wagon fitted throughout with such bearings would be perfectly clean, so far as all revolving surfaces were concerned, and hence permanent bearings of some kind will undoubtedly appear in the final automobile, which certainly will not make the driver a slave to the oil can, nor demand that he be clad in greasy leather clothing.

The Lepper-Dial Gasoline Motor

THE engine shown by the accompanying drawings is a radical departure from regular practice, possessing the two features of lightness and freedom from vibration to an extent practically unknown in any of the designs now upon the market.

Capable of construction upon a weight of thirty to thirty-five pounds per horse-power, it offers great advantages over the well-known single engines for automobile work. Small space and flexibility of design, with reference to surrounding details, may be also numbered among its advantages.

The basis of the above claims is made apparent by a careful reference to the drawings, in which Figures 1, 2, 3 and 5 show



— FIG. 1 —

the engine as originally designed; Figures 8, 9 and 10 the same with a mitre and spiral gear drive for the cams; also the governor details in the design, which are regarded as superior to the original.

Referring to the figures, the casting, 32, is circular at the large end, forming the cylinder and carrying the frame, with bearings, 33, at opposite end.

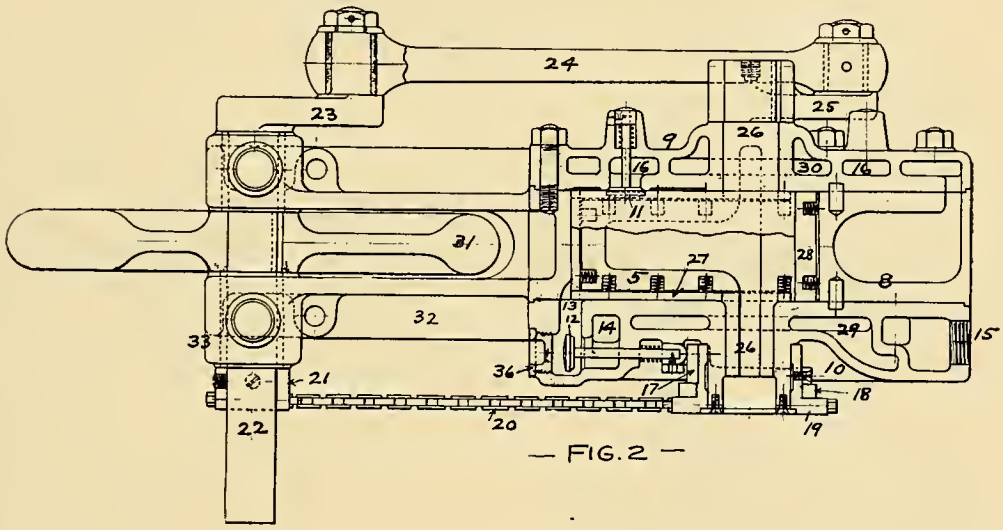
The cylinder is partially divided by the fixed partitions 7 and 8, and the division is completed by the hub of the piston at 26—see Figure 2.

The cylinder is enclosed at the sides by removable heads, 9 and 10; one containing the inlet and the other the exhaust valves and passages.

The piston consists of hub, 26, and two blades, 5 and 6 (preferably hollow); these blades, together with the partitions, 7 and 8, dividing the cylinder into four exploding chambers; each acting on the well-known four-cycle principle.

The piston oscillates through a right angle (the centre of its motion being a vertical line through the trunnions), and, through hub 26 actuates the swinging arm 25; thus reciprocating the connecting rod 24 and rotating the crank shaft 22.

The air and vapor mixture enters at the opening 16, and, gaining access to all of the check valves, 11, enters each in its turn; is compressed, ignited by electric device, to be described;



— FIG. 2 —

drives the piston forward, and is exhausted during the return stroke of piston through each passage, 13, and exhaust valve, 12, in its turn; through passage 14 and to the atmosphere or muffler at 15.

Thus there are four inlet valves actuated by suction, and four exhaust valves operated by mechanism to be described; and the explosions take place in proper order, from right to left or the reverse, according to the shaping of the cams for exhaust and ignition.

In the figures mentioned above the mechanism used for driving the cams consists of "two-to-one" sprocket wheels, 19 and 21, and chain 20; but the preferred method consists of mitre-wheels, shaft and "two-to-one" spiral gears, 52 and 53; in either case the cams making one-fourth of a revolution while the engine is making one stroke.

The sprocket 19 is loosely mounted upon the hub of cylinder head, and is free to revolve in the proper direction. It carries the exhaust cam 17 rigidly fastened to its hub, and the igniter

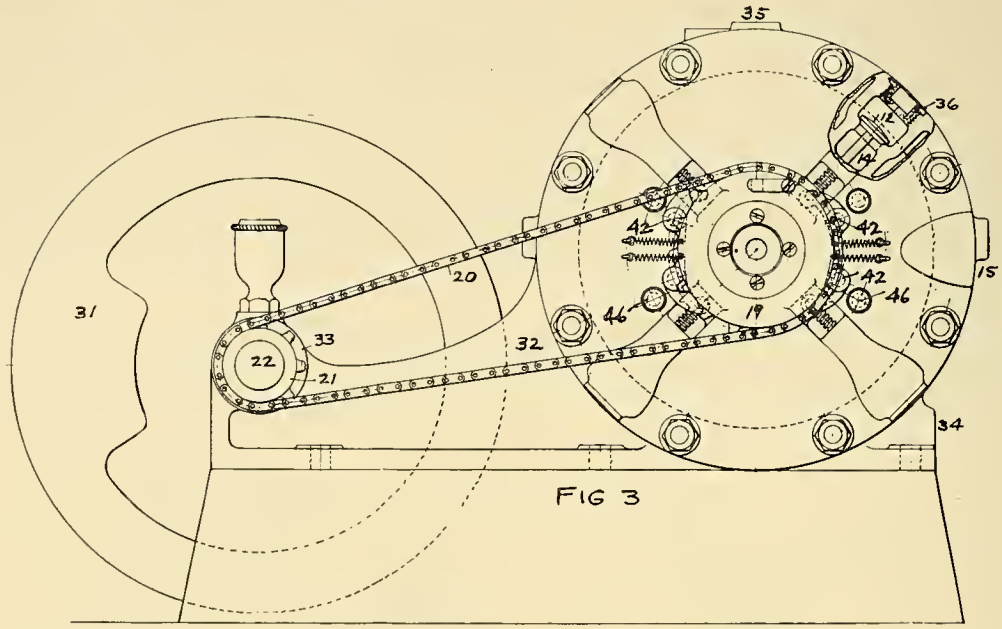
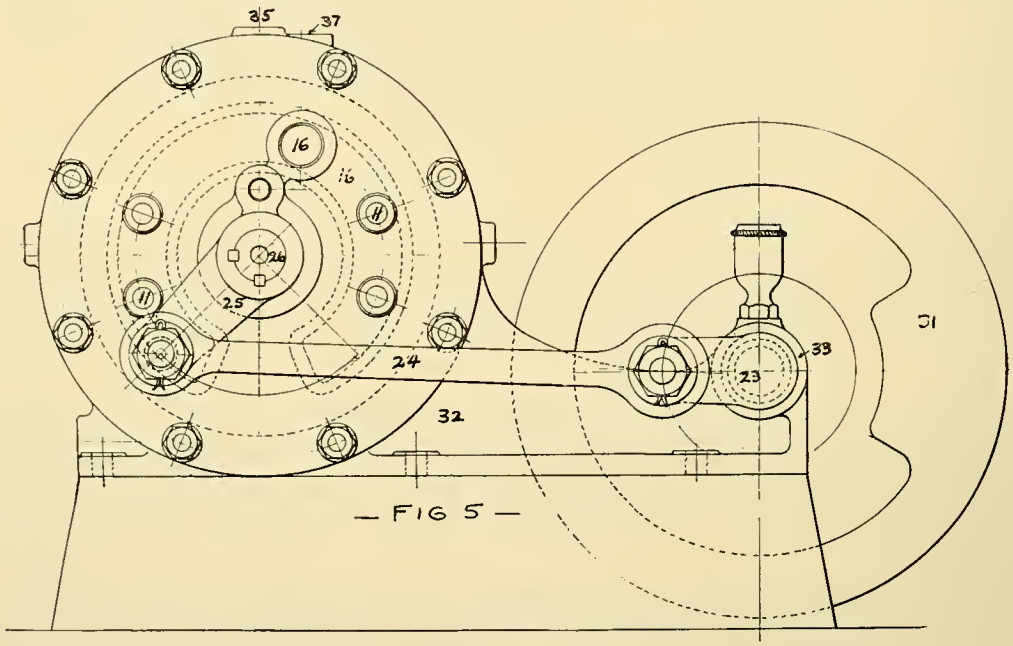


FIG 3

cam 18 loosely mounted and free to revolve backward, but driven forward by spring pin 38; thus preventing damage if the engine starts in wrong direction.



— FIG 5 —

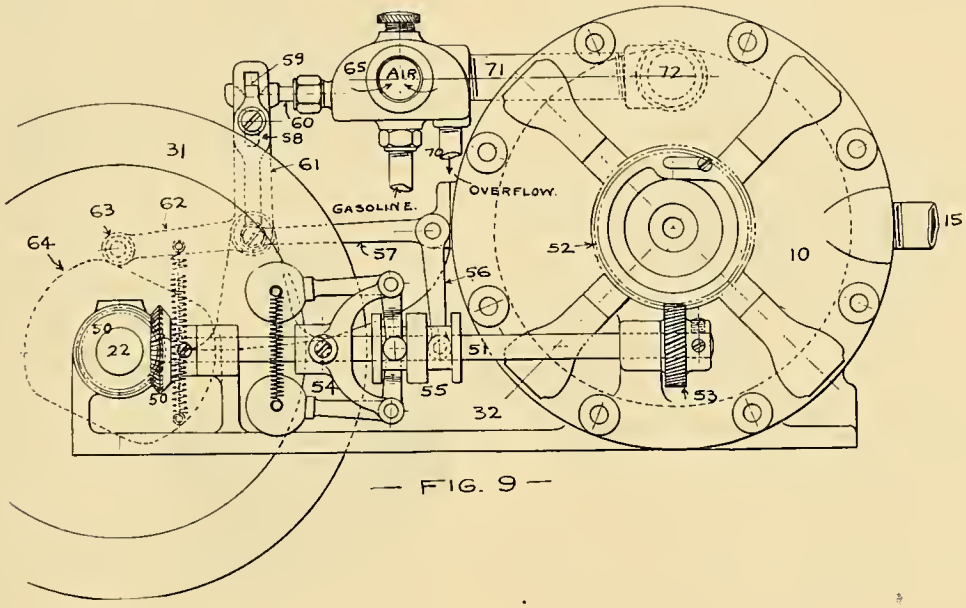
There are, necessarily, four complete mechanisms of this character, and these are operated, in their proper sequence, by the cam. The piston is packed by spring strips 27, as shown, and is hollow to allow for circulation of air or water for cooling.

The cylinder heads and valves are similarly cooled; the circulating water entering at 34 and leaving the casing at 35.

It will be seen that the partitions 7 and 8 are also hollow and cooled with water.

The exhaust valves are made accessible by plugs, 36, and the inlet valves may be similarly arranged.

The cycle of operations is as follows: Supposing the piston to be in the position shown in Figure 1; then the charge in compartment 1 is just igniting; that in 4 has been drawn in; that in 3 has been completely exhausted, and in 2 has been fired and expanded to its limit. As charge 1 expands charge 4 will be compressed; 3 will be drawn in and 2 will be exhausting.



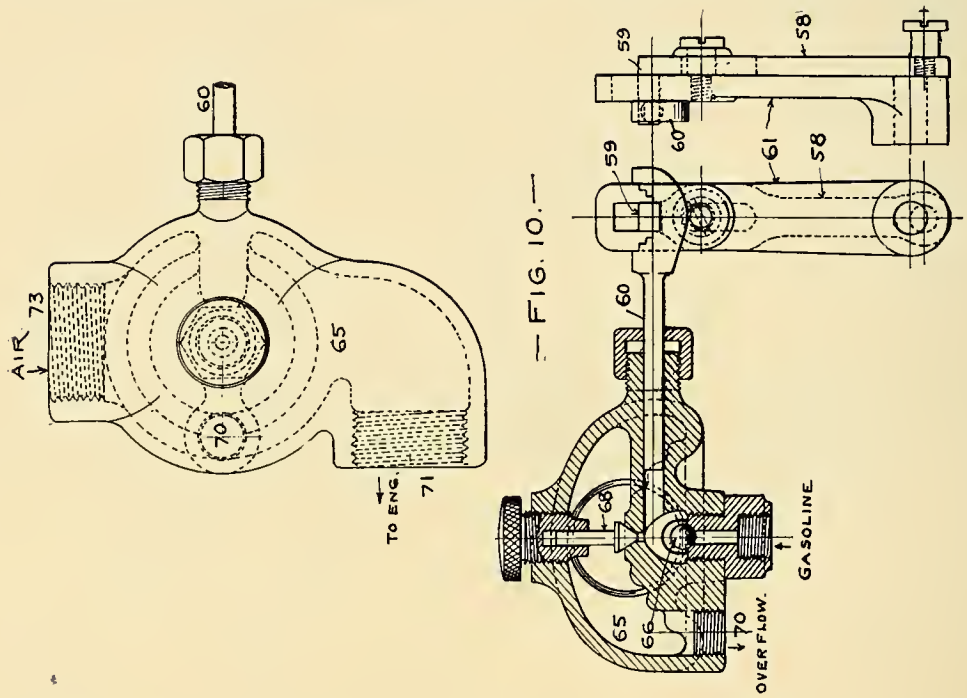
— FIG. 9 —

The preferred method of mitre and spiral gearing makes it possible to apply the governor mechanism as shown in Figures 8, 9 and 10.

Its operation is as follows: The gasoline pumps plunger 60 (Figure 10) is operated by the slotted lever 61 through the end, 59, of link 58, engaging in the stepped end of the plunger. When the link is down, as shown, the pump operates through its entire stroke, produced by the cam 64 (Figures 8 and 9), roll 63 and arms 62 and 61; but, if the speed is increased, the governor, 54, draws the collar, 55, to the left, operating, through levers, 56 and 57, to raise the end, 59; and allow a portion of the throw of the lever, 61, to be used before striking the steps shown. If the link is lifted to the highest notch, the whole stroke will be lost, and the pump fail to act.

The vaporizer consists of a casting, 65, with corrugated surface shown; pump, 60, and valves 66 and 68; the outward stroke of the pump lifting the charge of gasoline through the ball valve 66, and the in-stroke forcing it up through the adjustable spray valve 68, and allowing it to spread upon the corrugations. The air drawn through the opening 73, passing over the surface, becoming charged with vapor, and passing through pipe 71 meets the auxiliary air supply at 72, and is drawn into the engine.

By this description it is seen that, while securing the known advantages of the four-cycle engine within the cylinder, the inventors have at the same time quadrupled the rapidity of its



action, and doubled that peculiar to the two-cycle form, obtaining the same cycle at the crank pin as in the double-acting steam-engine, viz.: An impulse at each stroke of the piston. Thus, with a crank shaft running at five hundred revolutions, the single four-cycle engine receives two hundred and fifty impulses per minute, while the engine described receives one thousand.

This motor is the subject of letters-patent recently issued to J. G. Lepper and W. F. Dial, of Bridgeport, Conn., and a one and a half horse-power model has been operating at Bridgeport for a few months past, giving excellent results for such an entirely new departure.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Automobiles—

New electric carriage, called a New York Trap, made by the National Automobile and Electric Company, Indianapolis, Ind., 2½ horse-power motor. "Motor Vehicle Review" (American), September 13, 1900.

Electric vehicle, five styles; runabout weighs 550 pounds. Baker Motor Vehicle Company, Cleveland, O. "Motor Vehicle Review" (American), September 13, 1900.

Automobiles, Gasoline—

An illustrated article by William Baxter, Jr., in which he goes into the principles of gasoline engine operation. "Appleton's Popular Science Monthly," New York, October, 1900.

Carburetter—

An illustrated article describing the Remington motor and carburetter. "The Motor Vehicle Review," Chicago, October 4, 1900.

Carburetter, Self-Governing—

A French invention by M. Charly, and tested by Messrs. Burford & Van Toll, of the New Orleans Motor Works, Twickenham. It is said to have governed so well that the mixture lever is done away with and only the throttle and sparking levers are retained. "The Autocar," London, September 15, 1900.

Compressed Air Motors—

By H. D. Cooke. Outlines the history of the use of compressed air for power and motive power purposes. "Street Railway Journal," New York, September 29, 1900.

Cycle Motors—

A number of interesting machines are shown and described in the "Cycle and Automobile Trade Journal" for September 1, 1900.

Loosening of Screw Nuts—

Dwelling on the necessity for keeping the nuts of automobile and bicycle parts tightly screwed up. "Cycle and Automobile Industrials," Paris, September 16, 1900.

Motor, Petroleum-spirit—

An illustrated description of a novel form of motor invented by M. Paul Nicolas. The engine comprises four cylinders, placed at angles of 90 degrees around the crank chamber, the single crank shaft passing through centre of chamber. "The Motor-car Journal" (English), September 22, 1900.

Motor-car, Capel's—

An illustrated description of a motor vehicle of new design. Article contains ten illustrations. "The Automotor Journal," London, August, 1900.

Motor, The Kaing—

Description, with illustrations, of motor used on the voiturette bearing the same name. "Motor-car Journal," London, September 29, 1900.

Sparking Plug—

The Dulait-Baras sparking plug, which takes care of the expansion and contraction of the porcelain, is shown in "The Motor-Car Journal," London, of September 8, 1900.

Speed Changing Device—

A novel device which is being put on the market by the Niles Tool Works, Hamilton, O. "Motor Age," Chicago, September 6, 1900.

The Manufacture of Automobiles in Great Britain—

Account of the agitation in favor of extending the French market for automobiles into the British Isles. "La Locomotion Automobile," Paris, September 20, 1900.

Thousand-miles Automobile Trials—

By W. Worby Beaumont. Illustrated description of numerous motor vehicles. "The Engineering Magazine," New York, October, 1900.

Tricycles-Motor—

Air-cooled motor-tricycles, by Simpson & Strickland, of Plymouth, England. A sensible looking machine for practical use. "The Autocar," England, September 8, 1900.

Tricycle, Rochet Motor—

An illustrated article descriptive of a tricycle which has proved quite successful in the international competition at the Paris Exposition. "The Automotor Journal," London, August, 1900.

Tubes, Lampless Ignition—

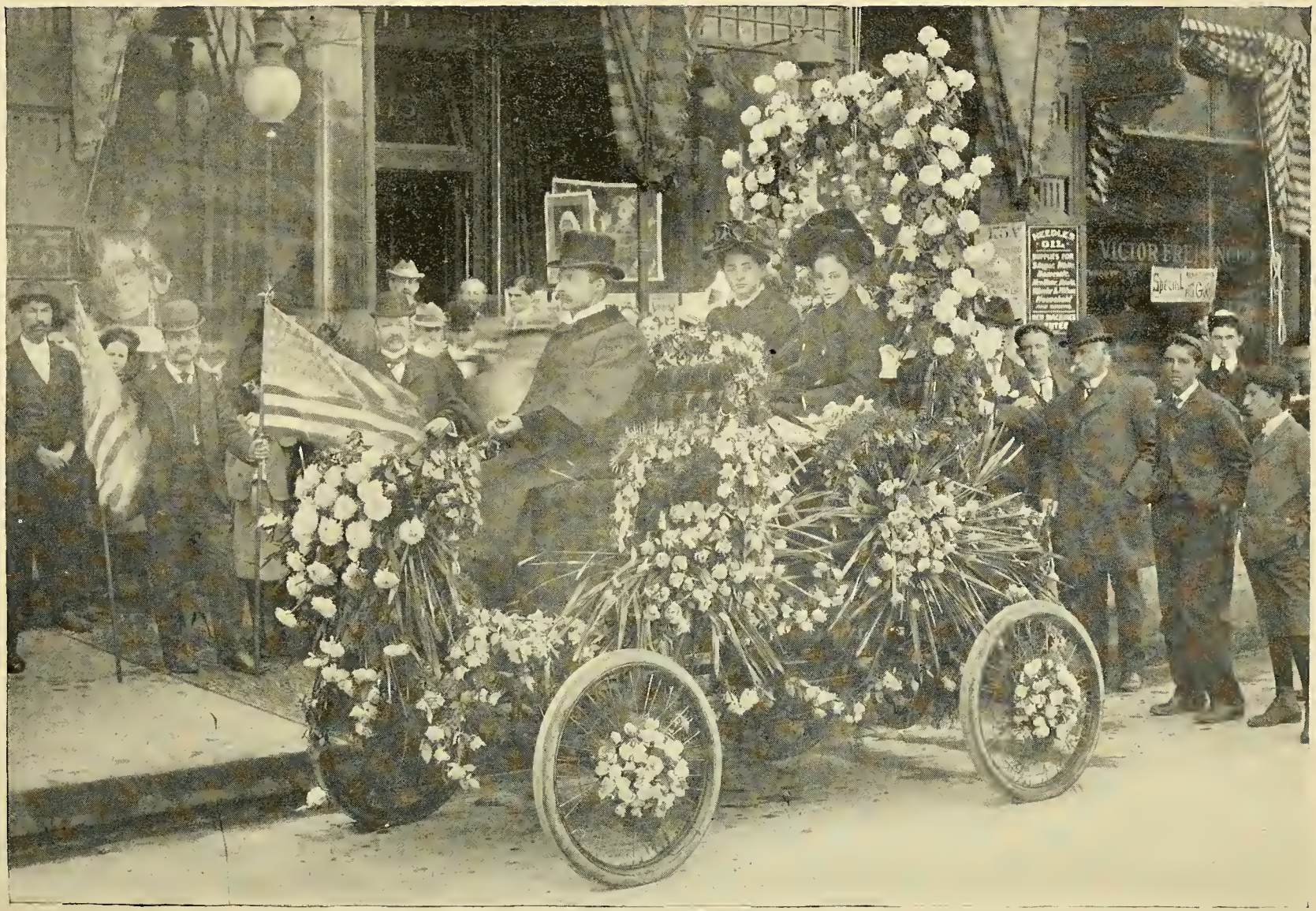
This article, which is illustrated, describes a new form of tubes, invented by Anton C. von Fahnenfeld and E. Stadler von Wolfersgrün, in which spongy platinum is used which remains incandescent in an atmosphere of hydrogen gas and air. "The Automotor Journal," London, September, 1900.

Voiturette, The Henroid—

An illustrated article describing a new style of machine. In general appearance it resembles the De Dion vehicle, but the general arrangement of motor and transmission gear is entirely different. "The Motor-car Journal," London, September 29, 1900.

Wiring of Electric Vehicles—

Plans of wiring used in the Waverly automobiles is shown and described in the "Motor Age" of September 6, 1900.



Mr. B. F. Keith's Decorated Carriage, Automobile Parade, Boston

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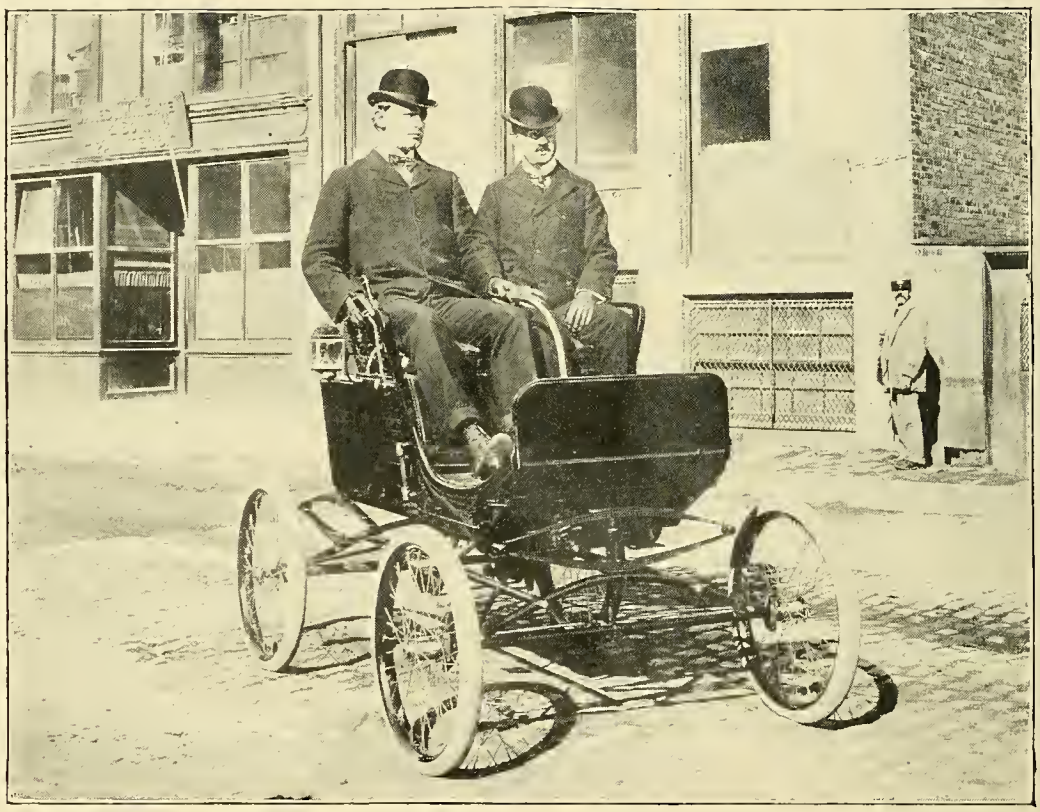
Parade of Automobiles in Boston

(By Our Special Correspondent, Mr. O. L. Stevens)

DESPITE its bad pavements, its crooked streets, and a hill or two in troublesome places, Boston is proving itself friendly to automobiles. It had its second automobile parade on the morning of Monday, October 15, and not only did it provide a clear path, without which the display would have been flat and ineffective in the crowded streets, but hundreds of people turned out who were willing to wait some time along the sidewalks for a chance to witness it. Its Mayor turned out in state, escorted by City Messenger Leary and his staff of office, and stood in the cleared space in front of City Hall to watch the automobiles as they passed. Where the route lay through the downtown streets the number of people who were ready to snatch a few minutes from business to get a look at the procession made crowd enough to swell out from the sidewalks to the pavements in an unbroken mass, choking travel at every corner, and giving each squad of police enough to attend to.

This second parade owed little to the first one, for that was merely the turn-out of about thirty big electric delivery wagons one morning early in the summer, when an enterprising department store adopted electricity for its retail delivery system in place of horses, and it lacked the police co-operation necessary to make it much of a spectacle. This last parade fell far short of what it was planned to be. It had been announced that a big automobile tallyho would lead off, carrying a band of music; that

one of Boston's two horseless fire-engines would probably be in line, and that a heavy steam van which is being perfected by a company of promoters formed here some months ago would be a feature. All this talk was only what was to be expected when it was remembered that the parade was instituted as an adjunct of the industrial fair or exposition which was recently held in Mechanics' Building, and which had an automobile department as one of its features. These prominent novelties all failed to appear, however. So did the electric delivery wagons from the news company, milk contractors and mercantile houses, which are together using about sixty-five of them daily in the city. On the Saturday morning previous to the parade day it looked as if the chances were against having more than a score of vehicles in line.



Messrs. John Brisben Walker, Jr., and Homer W. Hedge, Leaders of the Parade

There were just forty-three vehicles in the parade. The line was to have been formed on Huntington avenue, in front of the Exposition Building, at nine o'clock. When that time arrived, however, there were but three handsome little electric delivery wagons drawn up by the curb outside the building, and nothing else in sight to show that anything of a horseless nature was in contemplation. The avenue was as quiet as a Sabbath morning,

and half a dozen men and boys beside the waiting wagons were the only semblance of a crowd. But what a change took place in the following half hour! Soon horseless carriages of all types were in evidence.

The parade was late in starting. Mr. Harry Fosdick, local manager for the Mobile Company of America, in one of their runabouts, acted as marshal.

When the procession finally did get under way, at seven minutes past ten o'clock, it was led by Mr. John Brisben Walker, Jr., in a steam mobile runabout, with Mr. Homer W. Hedge, of the Automobile Club of America, New York, beside him. Behind, in a Columbia electric stanhope, was Mr. Knight Neftel, manager of the New England Electric Vehicle Transportation Company, with Mr. C. E. A. Merrow, one of the agents of the Mechanics' Building Exposition. Then came Mr. Joseph L. French, who made a run over the road from his city to Chicago this summer, driving, as on that trip, a gasoline carriage of the St. Louis Motor Carriage Company's make. After him came a line of twelve mobiles, some driven by representatives of the manufacturers and others driven by their owners. Among these were Dr. M. E. Stevenson, Mr. Paul Goodrich and Mr. Philip Gokey, of Allston; Dr. W. E. Chase, Professor Morse, of the Cambridge Manual Training School, and Mr. Fred. Ellis, eastern agent of the Mobile Company. One or two of these carriages had tops, but the majority were of the runabout pattern and without any decoration whatever.

A line of miscellaneous styles and types of pleasure vehicles followed. Lieutenant Philip McBryan, from Police Division 14, was on hand in the canopy-top Locomobile which has been described in the Boston newspapers from time to time and which once had the distinction of running away with its driver. He had Sergeant Murphy of his own division with him, and the pair attracted considerable attention from many who recognized them along the line.

So many of these carriages were of the steam runabout pattern that it was somewhat of a relief to see three electric stanhopes of the Edison Electric Illuminating Company in the line. They are finished in plain black, with wire wheels. A little novelty, too, was furnished by the carriages put in by the Boston branch of the Woods Electric Vehicle Company. There was a handsome stanhope, the body finished in black and gilt, with red running gear; an open runabout driven by J. W. Cushman, superintendent of the company's station here; while Mr. C. E. Humphreys, the local manager, drove a top runabout.

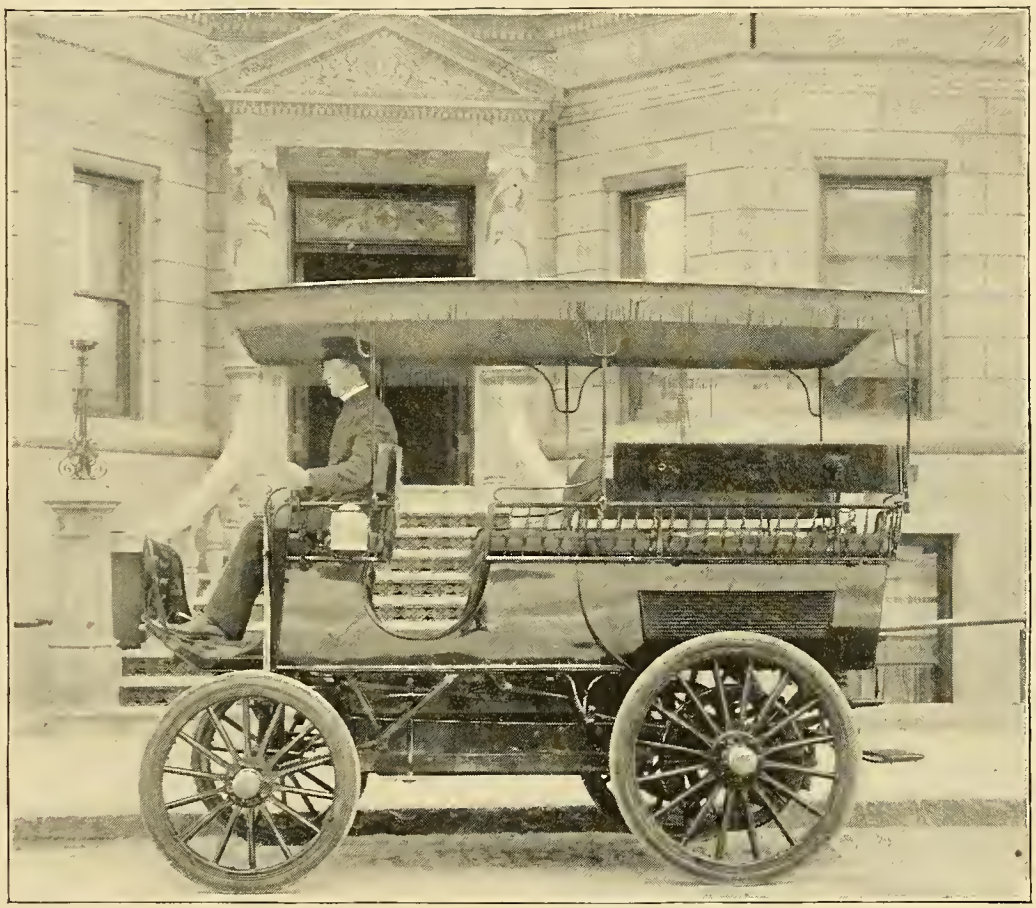
A carriage of the Milwaukee Steam Motor Company next came along, driven by Mr. L. J. Phelps, of Melrose Highlands, senior member of the firm of Phelps & Taylor, Eastern agents for

Woods Electric Cab

the carriage at East Somerville, Mass. This carriage had a clever device for reading the gauges and water glass at night. A small incandescent electric lamp was placed just under each

gauge, and another just behind the water glass, all being connected with a dry battery so that whenever it was desired to take a reading the operator had but to touch a button in the base of the seat and the lamp would show light as long as the button was pressed.

Of the business vehicles which formed the second division the most interesting in appearance was the Locomobile surrey entered by Mr. B. F. Keith. It showed no advertising whatever, but was a mass of flowers, mostly roses and chrysanthemums,



Wagonette of the New England Electric Vehicle Transportation Company

while in a bower built around the rear seat sat Miss Catherine McNally, of Dorchester, and Miss Evelyn Crosby, of Brookline. Mr. W. B. Thompson acted as *chauffeur*. The photograph of this carriage shows it standing on Tremont street just before entering the parade, with Mr. Keith himself in the background.

Interesting in another way was the sombre electric delivery wagon of Cobb, Aldrich & Company, one of Boston's big grocery firms. This was the first automobile delivery vehicle used in this city, and was made by Colonel A. A. Pope's company before that

company was merged into the electric vehicle combine. Then came three Riker electrics of the R. H. White Company, one of which was bright green, another rich blue, and the third deep crimson; then the Woods electric vehicle of A. Shuman & Company. All the carriages named are handsome vehicles. One of White's wagons was the second to be introduced in Boston for business uses, following that of Cobb, Aldrich & Company.

Few vehicles that could carry more than three or four persons at a time have so far been seen in Boston, in spite of the agitation for automobile omnibus lines, and perhaps that was one reason why the electric wagonette, which had been in use some days previous as a station wagon to carry prospective customers of a well-known clothing house to and from trains, was conspicuous in the line. It was covered with advertising matter, but there were passengers enough inside to show that twelve-seated wagons are practicable, even when operated by electricity. It, like the National Biscuit Company's wagon, and several others in line, were of the type leased from the New England Vehicle Company. That company did not enter any carriages directly, though five of the regulation type of cabs brought up the rear filled with newspaper reporters. Just preceding them was a Woods cab. These six were the only public carriages in the parade.

When this aggregation was once in motion, though in decoration and variety of type it might have been more striking, perhaps, its progress was more creditable than might have been expected. Heavy rains of the preceding few days had left the pavements slippery and the macadam surfaces thick with wet mud. The route took them first up Huntington avenue; then along on Massachusetts avenue, past the new Symphony Hall; then down Beacon street until Beacon Hill was reached. In dry weather this long, steady slope is taken easily by all kinds of passenger automobiles, but in the slime of that morning there was a chance that some of the heavy electrics would falter. However, there was not one but what took the rise, slime and all, without a quaver. It was probably about six or seven miles an hour for the whole route. Leaving the hill, the path lay through the business streets, with their Belgian block pavement; through State street, and around by Summer and Washington streets uptown again; thence through Massachusetts and Huntington avenues back to the Mechanics' Building. It took until 11.20 o'clock to cover the route, and it was accomplished without delay or serious accident.

The Use of Alcohol in Operating Automobiles

ONE who has done much experimenting along the line of substituting alcohol for petrol in the propulsion of motor vehicles is M. C. Henriod, a French automobilist of some repute.

In a recent issue of the *Autocar* there was published a translation of an article by M. Henriod on the subject, and as it is one which should interest all who are interested in the new pastime we give extracts below:

It may be said that all makers of motors and automobiles have recognized the advantages which would accrue from the possibility of employing alcohol in lieu of petrol. M. Henriod suggests that many manufacturers have experimented with alcohol in this regard, have succeeded in a greater or lesser degree, have found that alcohol gives greater power in the proportion of one to two per cent. per horse-power, but after some hours' work have also discovered that their engines required thoroughly cleaning, owing to the green copper obliged to be introduced into alcohol by the excise authorities. This substance is a carbonate of copper, which frequently crystalizes, so that the difficulty of dealing with a peculiarly detrimental foreign substance is added to those of the evaporation of the alcohol, the lubrication, and the oxides of copper rapidly deposited on the inner surfaces of cylinder, carbureter, etc. This objectionable substance deposits in the small tubes and orifices, and chokes them. Thus the use of commercial alcohol in motors suffers considerably from the presence of this substance, which resists carburation and renders lubrication most difficult. The lubrication of the cylinders of motors driven by alcohol requires the most careful attention, as even pure alcohol destroys the lubricants. With regard to the exhaust gases, these have so great an affinity for water that they disperse without odor. Thus in order to obtain as good results with alcohol as with petrol, it is necessary to combat the action of the green copper and the destruction of the lubricating substances by the alcohol itself. After several years of study and experiment, M. Henriod asserts that he has succeeded entirely as to this, not by precipitating the green copper, which would only have increased the evil, but by his method of carburation and the position of the carbureter with regard to the motor. The debased or denatured French alcohol is dearer than petrol, as methylene, a carburet of

hydrogen, the price of which is 150 francs per hectolitre, is present in such proportions as to augment its price considerably.

"Happily," says M. Henriod, "I have been able to reduce the price of alcohol considerably by carbureting it with other products sixty per cent. cheaper, and which can be sold at 45 francs per hectolitre.

"The consumption per horse-power per hour is about the same as that of petrol, being 350 to 450 grammes with petrol at 700 grammes, and 450 to 500 grammes with alcohol carbureted at 820 grammes.

"It should not be forgotten that the output of petrol is limited, that it is a necessarily diminishing product, and that, by reason of the fact that use of petroleum as a locomotive fuel is on the increase, petrol will thereby be made scarcer. On the other hand, the production of alcohol is unlimited, as it is capable of distillation from many descriptions of vegetable matter and refuse. By my latest patented methods, patented in France and Germany," continues M. Henriod, "I make possible the profitable use of debased or denatured alcohol in all motor systems, with alteration to their present form of construction." Notwithstanding his success with the *debased* alcohol and its coppery annoyances, M. Henriod trusts that the Ministers of the Interior and of Agriculture will retain their present disposition to rescind the regulations which oblige the use of *green copper* and methylene for the purpose of rendering alcohol nauseous as a commercial product.

Blimton Buys an Automobile

By Isaac R. Rich

MARIA, I'm going to buy an automobile. I've got tired of having a horse laid up with a spavin and pink eye, and besides I want to be up-to-date. Horses ain't in it nowadays, Maria, and we'll show those Newburgs we can keep up with the procession as well as they. Got the machine all picked out and it'll be up here to-morrow. Don't try to run it till I get home—it might balk, you know," and Blimton smiled serenely at his little joke on the timid Mrs. B.

"Are you sure you'll like it, Henry—you know you're very fond of old Dolly and always said you didn't want any better roadster. Then, you know, I'm a little timid about any kind of machinery, and——

"There you go, Maria, trying to throw cold water on my attempts to be modern. But I won't be held back or kept back. I'm no old fossil if I am fifty-two years old. And I'll sell Dolly to-morrow—see if I don't. Good roadster, eh—why she can't do over ten miles an hour to save her from the glue factory, while my new carriage will do forty. Wait till you see Henry Blimton the most-talked-of man in Orange County. To-morrow we'll try the new horse."

Blimton went downtown to business and Mrs. B. drove over to see her father.

"Father, I want you to come over to-night and buy Dolly—for a few days. Henry has another scheme on hand. Bought an automobile to-day and is going to sell Dolly right away. Has the up-to-date fever bad this time. Thinks I'm a fossil, etc., because I didn't enthuse, but I remember too many other plans to get up much enthusiasm now. But don't fail to come and buy Dolly. He'll want her back in a week and she's the safest horse he can have."

That afternoon Blimton came home early and Mrs. B. prepared for a circus—she had been there before.

"Now we'll have a ride as is a ride—where's the auto, Maria? In the stable, I suppose.

"Now, then, we'll try her; jump in, Maria—what's that—rather wait till you see me perform. Perform, is it? Well, there won't be any performing to it. I'll show you how gracefully an auto runs. Skims like a bird and dosn't get tired or go lame."

"Didn't you get any instructions, Henry? Seems to me they ought to send a man with you to show you how till you get used to it."

"Instructions nothing. Don't want any teacher round me showing me which is my right hand. You seem to forget that I'm a mechanic. Don't remember the time I used to work in the shop, eh—in overalls, too, Maria. Well, I haven't forgotten and I'll show you the practical advantages of it now.

"These machines are simplicity itself. Just turn on the oil, start your motor and away you go. Now I turn on the oil—so—and start the—What in blazes did he do next? Oh, yes; get your cylinder right so it will start—get a confession he called it, I think, but how did he do it?

"This handle, Maria, goes here; now I give a turn, so, and the motor starts—Don't hear it, eh—well, I don't myself; guess I better try it again—now.

"What's the matter, anyhow; Maria, have you fooled with this any? No—well, what ails it, then. Instructions, eh—con-

found the instructions—the thing won't start, that's all. Instructions are all right, but when a motor won't start it won't, and that's all there is to it.

"What's this little button here? Why, the sparker, of course, and I forgot to turn it on. Now, we'll try again. Ha! she starts! she moves—Maria, behold, the motor motes and I mount the modern vehicle of conveyance. I'll be back in time for tea—whoa, there, Dol—what ails the thing, anyhow," for he was sailing down the road at a great rate, having grabbed the high speed lever and stepped on the regulating button thinking it was the gong.

He soon slipped off of this and threw himself back, applying the brake and nearly going over the dashboard, while Mrs. B. looked on with fear and trembling. He finally got the thing slowed down, after running over two dogs and just missing a baby carriage; but he wasn't happy, and wanted to go home. How to do it was the question.

He didn't trust himself to try and run it backwards, and he couldn't turn it around in the road. So he finally threw out all the levers and let the motor run. Then he climbed down, and after much pushing, pulling and sweating, he succeeded in aiming it the right way, while the small boy made sundry and divers remarks on the beauties of having an auto and pushing it yourselves. Small boys have a way of making interesting remarks of this kind at inopportune times.

After careful manipulation he finally reached home, and Mrs. B. was so glad he wasn't killed that she suppressed the great desire to "I told you so," at Mr. B.'s expense. Mr. B., however, forgot to enlarge on the beauties of automobilism, and devoted most of his remarks to the state of the weather and other equally interesting topics.

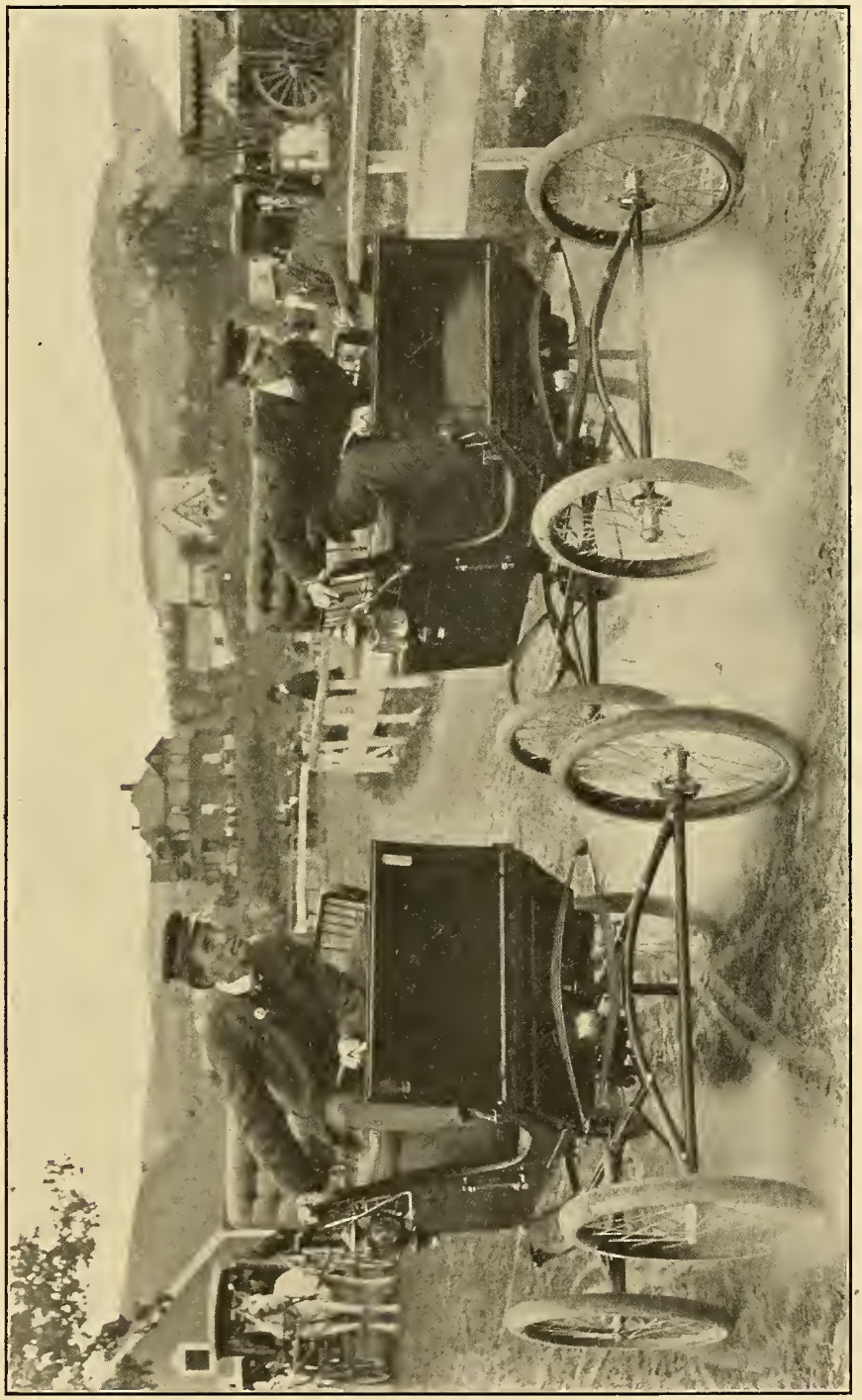
I haven't heard when he expects to give it another whirl, but shall try to be around when he does.

Locomobile Races at Binghamton, N. Y., Industrial Exposition

THE races between two Locomobiles at the above-named exhibition, held October 6, proved quite a drawing card, and was the first occasion which the Binghamton public had had of witnessing such an event. It was one of the most interesting features of the exposition.

Locomobile Races at Binghamton, N. Y.

The contestants were, respectively, Mr. Roy W. Whipple and Louis R. Clinton, both residents of Binghamton, and both have Locomobiles.



Roy W. Whipple and Louis R. Clinton, Racing their Locomobiles

The following account is taken from the Binghamton *Chronicle:*

The gentlemen named have raced at a number of fairs in

various parts of the State. The following are the times made at various places by the two men:

Owego, N. Y., September 4 to 6. First day—One mile; time, 2.14; won by Whipple. One mile; time, 2.13½; won by Clinton. Second day—One mile; time, 2.12; Louis Clinton. One-half mile; time, .57; Louis Clinton. Third day—One mile; no official time; Whipple.

Oneonta, N. Y., September 11 to 14. First day—One mile; time, 2.12; Louis Clinton. One mile; no official time; Whipple. Third day—One mile; time, 2.12½; Whipple.

Afton, N. Y., September 18 to 21. First day—One mile; time, 2.07; Louis Clinton. Second day—One mile; time, 2.07½; Whipple. Third day—One mile; time, 2.07; Clinton.

Sherburne, N. Y., September 25 to 28. First day—One-half mile; time, .56½; Whipple. Second day—One mile; time, 2.07⅖; Whipple. Third day—One mile; time, 2.04; Whipple.

Status of the Automobile in European Countries

THE Department of State, upon the request of one of the large American firms interested in the manufacture of vehicles to procure statistical information regarding the vehicle industry in Europe, sent a circular letter to certain of the consuls asking for information on the subject.

The replies relate to all classes of vehicles, and while, of course, it wauld not be possible to give the whole contents of these letters, we give such of them as relate to the auto mobile, the number in use and general information regarding the popularity of the new mode of conveyance and the common opinion as to its future. Below are given facts taken from the replies of the various consuls:

Beginning with Austria we find that the automobile trade, although still in its infancy, is developing rapidly. Two years ago automobiles were little known in that country, but since that time they have been manufactured there. In 1870 Herr Siegfried Marcus, of Vienna, drove a benzine motor car.

Thanks to the former prime minister, Count Badeni, who was convinced of the value of automobiles by Mr. J. Lohner, the way was made easy for them, as far as the police and magistrates were concerned. In twenty-four hours after the matter was laid be-

fore him, the necessary permission for their use in the streets of Vienna was given. This was some four years ago, and now they are allowed everywhere, even in the Prater, the great park of Vienna. The press has come to the help of the automobiles, giving a separate column to them, and the second automobile race was held in Vienna in May, this year. There is, however, one great hindrance to the use of the automobile in the provinces, for benzine is not much used, as in France, and, besides, the sale of it is in control of the police, who are very strict in regard to it, so it can rarely be bought in sufficient quantities except at high retail prices. But efforts are being made, and will probably be successful, to enable purchases of benzine to be made at convenient places and at moderate cost.

BELGIUM

Here, as is the case pretty much everywhere, the automobile has already been introduced and is rapidly becoming popular, although its comparatively high cost renders it at present rather an object of luxury than of general use.

It is estimated that in Brussels alone there are owned about 300 machines of different makes, and already one or two large retail establishments have auto delivery wagons running. There are quite a number of establishments engaged in the manufacture of this style of vehicle and there seems to be a growing tendency to found new ones.

The largest manufacturing establishment in this country engaged in this branch of industry, according to the best information obtainable, is the Fabrique Nationale d'Armes de Guerre, at Herstal, near Liege, which has successively added to the object for which the company was formed (the manufacture of firearms), that of bicycles and lately that of automobiles. It is stated that this firm alone on the 1st of April had orders for the building of 100 carriages of different sorts.

FRANCE

This branch of the vehicle industry is increasing enormously. It is estimated that 30,000 are in circulation at the present time in the Paris consular district.

The most popular are petroleum automobiles, because fuel can be obtained everywhere. The "Voiturettes," a very light automobile with two or four seats, sold at from $400 to $1,000, are at present most in use.

GERMANY

It has already been stated in the report of this series describing the International Motor Carriage Exposition held at Berlin in

September of last year, that although nearly all hydrocarbon motors, including the Daimler machine and all variations of the Otto gas engine, are substantially German inventions, automobilism and the manufacture of motor vehicles has developed much more slowly in this country than in France, Belgium, or even England. It was not until the exposition of last year was organized that the motor carriage appeared on the streets of Berlin, and even now there are only twenty-four registered for use by private individuals. Besides these, however, there are as many more driven for advertising purposes by agents of motor-carriage makers located there and in other cities. There are twenty electrical omnibuses in service in Berlin, and more are being built as rapidly as possible, and perhaps a hundred electrical and hydrocarbon motor drays, delivery wagons and business vehicles of various types.

There were represented at the exposition of 1899 thirty-two makers of motor vehicles in Germany, nearly all of whom, except the Daimler Company, at Cannstadt, and the Benz Motor Wagon Company, of Mannheim, had been previously manufacturers of bicycles, wagons and carriages, or electrical machinery.

ITALY

The motor-car industry in this country is still in its infancy. Two concerns of importance have started works in Milan, viz., Prinetti Stucchi, having a very large plant in connection with their carriage and bicycle works, and C. Bianchi. There is also one establishment for automobiles in Rome, but it is of recent creation and has not reached any importance. A certain number of automobiles of foreign make have been introduced into this country and have met with public favor, which should be encouraging for the future development of that industry in Italy.

GREECE

No automobiles are manufactured in Greece, and thus far but two have been imported, both into Athens; but it is said that many Athenians wish to purchase such vehicles, and it is expected that quite a number will be imported in the near future.

NETHERLANDS

Automobiles have thus far not been very popular in the Netherlands, and will probably not become so until the prices at which they are sold ($600 to $1,200) have gone down considerably. With the smooth, level roads of this country there would probably be a very good field for them here if the cost were less.

In regard to American vehicles in the Netherlands, I think there would be a good opening for them.

Tabulated Data Regarding the Hill-Climbing Contests in Great Britain

IN April and May of this year the Automobile Club of Great Britain conducted a number of hill-climbing tests. The results of these have been put in tabular form by W. Worby Beaumont, who is well known to automobilists. This table we reproduce from the *Autocar,* of London, and while it is, to a great extent, self-explanatory, we print the remarks of Mr. Beaumont regarding it. He says:

"In a large number of instances the power of the motor as stated by the exhibitor is misleading, as it is the maximum power given by the motor for a very short time on the brake—a power which cannot be realized for a long time, more especially with the air-cooled motors.

"On the other hand, some few of the exhibitors understated the power of the motors as used. In many cases the power given is correct, as that of the motor at its normal speed as controlled by the governor, but when the latter is cut out by the accelerator, the power may rise in proportion to the increase in speed for at least a considerable increase, and hence a 12 horse-power may give 16 horse-power, a 5½ horse-power may give 6½ horse-power, and a 3 horse-power may give 3½ horse-power. It is, therefore, necessary to take into consideration the particular speed which may have been in gear when hill climbing, and know at least approximately the full speed of the motor when running on the accelerator with that gear.

"In the calculations, the results of which are given in the table, the road resistance was taken as 45 pounds per ton for pneumatic tires and 55 pounds for the solid tires. For the Birkhill trials a somewhat higher figure was taken, the road surface not being in so good a condition, partly as a consequence of the wet weather. It may be mentioned in this connection that a 5 per cent. error in the assumed road resistance only involves a mean error in the final result of 1 per cent. The importance of exactness on this point is therefore not great. In the last column of the table is given a corrected mechanical efficiency of four of the vehicles which attracted most attention. These results are

Number Class.		Name.	Total Weight Including Passengers.		Horse-power of Engine stated by Maker.	Transmission Gear.
			*cwt.	qrs.		
A.	1	Benz Ideal. Messrs. Hewetson's	13	1	3	Belt, chain
"	2	Benz Ideal. Messrs. Hewetson's	13	0	3	Belt, tooth, chain
"	5	Locomobile Steam Carriage	8	1	2*k*	Chain
"	16	Gladiator Voiturette		0	3 25	Chain, tooth
"	27	New Orleans Car. Messrs. Burford & Van Toll	8	2	3	Belt, tooth
"	28	New Orleans Car. Messrs. Burford & Van Toll	8	2	3	"
"	33	Decauville Car. The Motor Car Co	8	3	3.5	Tooth
"	34	Decauville Car. The Motor Car Co	8	2	3.5	"
"	41	International Victoria	11	0*a*	3	Belt, chain
"	44	International Victoria	10	2*a*	3	"
"	51	Star Voiturette	11	2*a*	3.5	"
"	52	Roots & Venables Car		2*a*	2.87	Chain
B.	14	De Dion Voiturette. Mr. R. Fuller	9	2	3	Tooth
"	15	De Dion Voiturette. The Motor Power Co	9	2	3	"
"	24	Marshall Carriage	15	1	5.0	Belt, chain
"	31	Renault Car. The Motor Car Co	9	0	3.5*c*	Tooth
"	32	Renault Car. The Motor Car Co	9	0	3.5*c*	"
"	40	Wolseley Voiturette	15	2	3*l*	Belt, tooth, chain
"	49	Marshall Carriage	14	3	5	Belt, chain
C.	8	Daimler Phaeton. Motor Manufacturing Co	25	2	6	Tooth, chain
"	9	Daimler Phaeton. Motor Manufacturing Co	25	3	6	"
"	23	Whitney Steam Car. Messrs. Brown Bros	12	2*a*	3.8	Chain
"	26	Peugeot Carriage. Mr. Friswell	19	3	8	Tooth, chain
"	35	Daimler Car. The Daimler Co	21	2	6	"
"	36	Daimler Car The Daimler Co	26	1	6	"
"	37	Daimler Parisian. The Daimler Co	22	0	6	"
"	46	Georges Richard Car	21	0	7	Belt, tooth, chain
"	47	Georges Richard Car	21	0	7	"
D.	22	Lanchester Car. Mr. Millership	16	0*a*	8	Worm
E (*a*).	12	De Dion Tricycle. Motor Manufacturing Co	3	0*a*	2.25	Tooth
"	20	Simms Motor Wheel	4	2*a*	2.75	"
"	39	Century Tandem Tricycle	5	2*a*	3	Chain
E (*b*).	3	Ariel Quadricycle. Mr. J. Stocks	6	2	3.15	Tooth
"	4	Ariel Tricycle with Whippet Trailer	5	2	2.25	"
A.	A25	Benz Ideal. Mrs. Bazalgette	12	2	3	Belt, chain
B.	A24	Mors. Voiturette. Mr. Phillips	13	2	4	Tooth, chain
C.	A2	6 h. p. Panhard. Mr. Butler	21	3	6	"
"	A3	6 h. p. Panhard. Mr. Browne	20	3	6	"
"	A7	6 h. p. Daimler. Mr. Harmsworth	18	2*a*	0	"
"	A10	8 h. p. Napier. Mr. Kennard	26	0	8	"
"	A12	6 h. p. Daimler. Mr. Edmunds	20	2	6	"
"	A21	6 h. p. Daimler Mr. Pitman	24	2*a*	6	"
"	A23	6 h. p. Daimler. Mr. Cordingley	23	3*a*	6.25	"
"	A26	6 h. p. Daimler. Mr. Gregson	25	3	6	"
"	A30	6 h. p. Daimler. Mr. Siddeley	20	2	6	"
"	A31	6 h. p. Daimler. Mr. Johnson	24	2	6	"
"	A4	8 h. p. Panhard. Mr. Mark Mayhew	20	1*a*	8	"
D.	A11	12 h. p. Daimler. Hon. J. Scott Montagu	23	3*a*	12	"
"	A17	12 h. p. Panhard. Hon. C. S. Rolls	26	1	12	"
"	A22	12 h. p. Daimler. Mr. J. A. Holder	30	1	12	"
"	A29	7 h. p. Peugeot. Mr. Mark Mayhew	19	2*a*	7	"
E (*a*).	A16	Ariel Tricycle. Mr. A. J. Wilson	3	2*a*	2.25	Tooth
"	A20	Empress Tricycle. Mr. H. Ashby	3	2*b*	2.75	"
E (*b*).	A28	Enfield Quadricycle. Mr. E. M. Iliffe	6	2*b*	2.25	"

a Weight based on maker's statement
b Estimated.
c The De Dion water-cooled engine used in this car is generally stated to give 3 h. p., and this figure has been taken in calculating the efficiency.
d Both passengers off temporarily.
e One passenger off temporarily.
f Two passengers off temporarily.

Hill-Climbing Contests in Great Britain

Taddington Hill.		Shap Fell. (1).		Shap Fell. (2).		Dunmail Raise.		Birkhill.		Apparent Mechanical Efficiency of Vehicle.	Corrected Mechanical Efficiency of Vehicle.
Average speed in mls. per hour on rise of 651 ft. in 13,320 ft.	Average actual h. p. at driving road wheels.	Average speed in mls. per hour on rise of 840 ft. in 38,300 ft.	Average actual h. p. at driving road wheels.	Average speed in mls. per hour on rise of 500 ft. in 7,338 ft.	Average actual h. p. at driving road wheels.	Average speed in mls. per hour on rise of 450 ft. in 9,040 ft.	Average actual h. p. at driving road wheels.	Average speed in mls. per hour on rise of 460 ft. in 10,560 ft.	Average actual h. p. at driving road wheels.	per cent.	
5.39	1.56	....	....	....	....	5.01	1.47	6.0*d*	1.57	51.	
7.18	2.06	11.5	2.07	4.8	1.76	6.64	1.92	6.6*d*	1.65	61.5	
9.76	1.86	6.0	....	6.64	1.61	9.79	1.89	10.9	1.98	61. *k*	
8.17	1.24	....	....	....	....	7.67*e*	1.185	7.5*d*	0.995	32.6	
6.3	1.125	....	....	4.42	0.88	6.22*d*	0.985	7.7	1.28	35.7	
6.05	1.10	....	....	....	....	4.74	0.80	....	....	31.6	
6.7	1.20	....	....	....	....	5.13	0.84	....	....	34.0	
6.3	1.10	....	....	....	....	6.84	1.21	8.6*e*	1.23	39.4	
5.29	1.26	....	....	....	....	5.55	1.35	....	....	43 5	
6.17	1.43	....	....	....	....	6.04*e*	1.33	4.1	....	46.	
9.15	2.30	....	....	....	....	....	....	8.0	1.76	54.4	
5.8	1.205	....	....	....	....	....	....	....	....	42.	
....	....	13.5	1.612	7.24	1.79	9.79	1.94	10.9	2.04	61.5	
10.08	1.975	14.5	1.735	7.58	1.885	....	....	8.0*e*	1.41	58.3	
....	....	11.5	2.20	4.42	1.81	....	....	....	....	41.	
9.45	1.76	....	....	....	....	9.33	1.75	9.6	1.70	58.	
7.56	1.41	....	....	....	....	7.33	1.37	....	....	46.3	
10.08	3.21	13.0	2.52	6.37	2.59	7.9	2.55	8.6	2.62	89.5*l*	68.5
4.94	1.49	10.5	1.94	4.54	1.75	6.04	1.85	6.3	1.83	35.5	
5.29	2.785	10.5	3.37	5.14	3.47	5.86	3.13	6.5	3.26	53.5	
5.49	3.09	10.5	3.75	4.42	2.84	5.13	2.93	6.3*e*	3.26	52.8	
4.56	....	....	....	....	....	7.67	....	8.9	2.36	62.	
9.45	3.83	....	....	....	....	9.79	4.03	10.9	4.23	50.5	
6.3	2.94	13.5	3.98	6.37	3.72	7.9	3.70	6.8	3.03	55.7	
6.55	3.58	13.5	4.70	4.42	3.05	6.64*e*	3.72	6.6	3.43	61.6	
9.15	4.12	16.	4.27	....	....	8.92	4.06	8.0	3.45	66.2	
....	....	....	....	....	...	7.67	3.41	7.5	3.09*e*	46.5	
6.43	2.78	....	....	....	....	5.86*f*	1.86	5.0*g*	1.98	31.6	
8.62	3.01	11.5	2.54	4.98	2.22	6.84	2.41	7.7	2.57	31.9	
....	....	....	....	....	....	7.9	0.495	12.6	0.747	27.6	
9.45	0.87	....	....	....	....	....	....	....	....	31.6	
...	....	....	....	....	....	2.1 *d*	....	10.9*d*	1.08	36.2	
15.13*h*	2.03	20.5	1.67	6.64*eh*	0.98	11.41*d*	1.42	13.3*e*	1.51	48.3	
14.4	1.62	20.5	1.41	6.64*dj*	....	8.22*dj*	....	12.6*dj*	....	67.5	
6.7	1.81	....	....	....	....	4.66	1.25	....	....	51.	
8.39	2.33	....	....	....	...	7.67	2.15	7.5	1.98	53.7	
5.69	2.54	10.5	2.86	4.8	2.74	6.22	2.81	5.7	2.43	44.6	
8.17	3.49	13.0	3.20	5.68	2.90	7.9	3.06	8.6	3.49	54.	
....	....	....	....	....	....	4.66	....	6.6*e*	2.62	43.6	
13.74	7.39	19.0	5.71	....	....	13.69	7.24	11.5	5.86	82.	70.5
6.43	2.89	....	....	....	....	7.08	3.1	....	....	49.8	
....	....	11.0	3.67	4.42	3.81	6.22	3.33	4.8	....	60.3	
6.3	....	....	....	....	....	....	....	....	....	....	
5.8	3.26	....	....	....	....	6.84	3.9	4.1*e*	....	59.7	
8.39	2.54	13.0	3.37	4.82	2.61	6.92	2.95	7.0	2.84	47.6	
8.17	3.9	11.5	3.35	5.68	3.43	7.9	3.32	8.2	3.93	59.7	64.
10.08	4.28	12.0	....	5.48	....	....	....	....	....	53.5	
11.19	5.46	....	...	....	....	5.26*f*	....	10.4	4.64	42.	
17.77	9.55	27.5	8.78	17.71	10.9	20.54	11.81	16.0	8.21	82.	65.5
14.4	8.94	....	....	7.24	6 4	10.27	6.44	10.9	6.46	57.6	
7.74	3.13	15.5	3.8	7.97	4.1	9.79	3.99	10.0	3.82	53.7	
18.91	1.35	18.5	0.815	....	....	5.13	....	6.8*j*	....	48.3	
....	....	20.0	0.88	15.94	1.46	17.06	1.25	7.5	....	43.2	
9.15*e*	1.11	....	....	....	....	9.33*e*	1.13	12.0*eh*	1.83	60.5	

g All off temporarily.
h Pedalling.
j Had to push.
k Brake h. p. of motor taken as 3.1.
l Brake h. p. of motor here understated.
Air resistance is not included in these calculations.
* Cwt., 112 pounds ; qr., 28 pounds.

based on a consideration of the figures obtained on the speed trials, on the air resistance, as well as the hill trials. The air resistance at the lower speeds is small, but as the speed increases to the highest attained, the air resistance rises so rapidly that it exceeds the whole of the other resistances. If the air resistance be considered with reference to some of the tricycles and quadricycles, the mechanical efficiency will be raised, because, although the air resistance surface is small, their motors are not capable of giving off much or any more power than stated. The figures obtained on the 1,000 miles trial are very similar to and confirm those obtained on the Petersham and other tests in this country and abroad. On the whole, it appears that there is a good deal of room for improvement in the average car transmission gear, while the efficiency of some of the best is not only high, but is higher than is obtained in the transmission of the same amount of power in most other branches of machinery construction when the speed differences and changes require similar numbers of parts."

Election of Officers of the Buffalo Automobile Club

THIS club, on the 9th ult., elected an entirely new set of officers. The meeting, which was the first annual one the club has held, took place at the Genesee Hotel. The new officers are: President, Dr. Truman J. Martin; Vice-President, William C. Cornwell; Treasurer, Dr. Lee H. Smith; Secretary, Ellicott Evans; Consulting Engineer, A. F. Brown.

The club, as such, is intending to make a special effort to obtain a greater number of individual owners as members. It is expected that this will speedily be accomplished, and during the Pan-American Exposition, which takes place next year, considerable work will be done by the club in the way of entertainment of automobile owners who may visit Buffalo during the exposition season.

An Automobile Club for Brooklyn

THE necessity for an automobile club in the above-named city has been felt for some time and at last two or three progressive spirits have taken the initiative.

Roughly, the idea of the present promoters is to foster good roads and work in harmony with other good roads' associations; to gain and uphold whatever rights automobiles are entitled to; to arrange for parades, brushes on the roads, etc., thus arousing interest in what must naturally become a popular sport in the near future. It is proposed, if such be the sense of the meeting, to arrange for an automobile parade in the near future, to celebrate the organization and to show its strength.

That the automobile has come to stay and is rapidly gaining in popularity is now an acknowledged fact. Even the most virulent horseman, whose hatred for the new-fangled machine is aired upon every occasion, will admit this, and the level-headed ones are preparing to make the best of it. One horseman, the owner of a particularly high strung pair, even went so far recently as to enlist the services of a friend, who is the owner of an automobile, for training purposes. For two hours he forced his prancing and frightened team to face the machine and stand while it blew off steam. At first it took all his nerve and skill to control his team; after awhile they became quieter and finally so accustomed to the machine that, without trouble, they jogged along beside it, under all sorts of trying circumstances. If more of our horsemen would adopt this policy, instead of spending their breath in useless vituperations, the present strained relations between the two classes of pleasure seekers would the sooner be ended. The same antipathy existed when the bicycle first appeared, but has been successfully overcome. The horse which once shied, balked and ran away at the sight of the bicycle now pays no more attention to it than to any other style of vehicle. This horsemen should be quick to see, and the sooner they decide to accept the inevitable the better. It is a case of history repeating itself. The bicycle is gradually dying out. The automobile is coming to take its place. It is only the matter of a year or so when, like the bicycle, prices will drop, and then they will be nearly as common as the wheel.

Steam Wagon of The Adams Express Company

AT the recent meeting of the American Society of Mechanical Engineers, held at Cincinnati, Mr. Arthur Herschmann, Mechanical Engineer of the Adams Express Company, read a paper entitled "Automobiles for Heavy Transportation," in which he described in detail a steam express wagon designed by him for the company named.

Recently representatives of this publication saw this wagon under steam. As will be seen from the accompanying illustra-

Steam Wagon for Adams Express Company

tion the wagon is of heavy construction, weighing when unloaded about three tons. The motive power is steam, the boiler being placed at the front. A steam pressure of 200 pounds is carried. This boiler is provided with two pressure gauges, both of which are connected.

Steering is done by a hand wheel and rack and pinion movement.

Steam Wagon of Adams Express Company

On the inside of each of the rear wheels is placed an internal gear, to the outside of which are applied band brakes, a groove being cut to receive them. These are applied by a lever placed at the right hand of the driver.

The wheels are of heavy construction, with wooden spokes, and having steel tires.

The engine is of the horizontal type, being placed on one side of the wagon, the cylinders being side by side. The engine, as well as gearing, is encased, thereby preventing dirt and dust from getting into the running parts.

Coke is used as fuel, this being stored in the front of the wagon in a space between the boiler and the front end of wagon.

There are two changes of speed.

Three water tanks are carried, two underneath the wagon at the back and one under the seat of driver. Just below the platform on the left side of the wagon is placed the feed pump.

The wagon is of very substantial construction and is made for carrying heavy loads.

Automobiles on Ferry Boats

THE manner in which the Board of Supervising Inspectors of Steam Vessels have seen fit to interpret and apply Section 4472 of the Revised Statutes of the United States furnishes a flagrant example of the arbitrary and injudicious spirit in which some persons dressed in a little brief authority abuse their power.

It is intended by this section to protect the public against the dangers attendant on the transportation of combustibles, and no one will deny that this is something which should and must be done. There is, however, a right as there is a wrong way of doing everything, and in this particular case the officials charged with the execution of the law have exhibited a gross lack of common sense and of proper consideration for the rights and convenience of the public.

The ferry boats which ply between Philadelphia and Camden are under the jurisdiction of the Steam Vessel Inspectors, and it has been decided that certain dangerous articles, among which are included naphtha, benzine, petroleum and loose hay or straw, shall not be carried on them. That is a wholly unobjectionable regulation. We will go further and say that it is a regulation eminently proper and necessary to be made. What we want to

call attention to and to condemn is the unreasonable and intolerant way in which it is being enforced.

There are many automobiles whose motor power is supplied by the combustion of gasoline. They have to carry a supply of that article with them, and they are wholly dependent upon it for their propulsion. It involves no risk to any one. It is safely stored away beyond the reach and beyond the possibility of destructive ignition. Yet the transportation of automobiles on the Camden ferry boats has been forbidden, if any naphtha or gasoline is concealed within their recesses, and on Sunday last a number of disgusted automobilists were compelled to pour the indispensable motor power into the street before they were allowed to make the passage. That was nothing less than a high-handed outrage for which there can be no justification. It was of benefit to no one, while it inflicted upon the victims the most serious inconvenience. They were unable to replenish their tanks and had much difficulty in reaching their homes.

The manner in which the regulation has been applied involves an arbitrary infringement of private rights, and shows that the officials responsible for it are in need of instruction in the true nature of their relations to the public. Their proper attitude toward the community is not that of master, but of servant, and their actions should be governed accordingly.

If the persons who held the automobiles up exceeded their authority they should be duly reprimanded. If they were only doing their duty according to the instructions of their official superiors, then those instructions need to be radically revised.—*Philadelphia Inquirer.*

"Ideal" Electric Runabout

A POPULAR style of motor vehicle is the runabout, and we illustrate herewith one which is operated by electricity. It is fitted with what is known as the "Ideal" bat-

"Ideal" Electric Runabout

tery, having thirty-six 12-plate cells, weighing 380 pounds. The motor, which weighs 150 pounds, possesses a new feature in that

the field and armature revolve in reverse directions. It is 6 horsepower.

The total weight of the machine is 800 pounds, and on asphalt roads it can run for 45 miles on one charge, while on ordinary country roads it will cover 30 miles without being recharged.

The vehicle shown has had one set of batteries in continuous use for more than fourteen months.

The wheels have tangent bicycle spokes and pneumatic tires, and altogether the vehicle has a very neat and compact appearance. The United States and French patents are under the control of Charles Cadmus, Hamilton, Ont.

Efforts are being made to form an automobile club in the city of Pittsburg. Among those who are owners of automobiles there are the following, and it is probable that most of them will become members: Glen Braden, Dr. J. C. Boggs, W. H. Minick, Wilson Arbuthnot, D. H. Hostetter, J. M. Lockhart, Robert Pitcairn, Jr., D. M. Glemson, James Gayley C. M. Schwab, W. L. Smith, R. B. King, F. C. Perkins, George Lauder, H. L. Goehring, C. B. McVoy, Thomas Hartley, R. W. Bailey, T. Alderdice, S. Jarvis Adams, S. Gayley, A. L. McMurtry, Florence O'Neil, J. M. Schoonmaker, W. L. Mellon, E. P. Mellon, Reuben Miller, W. Y. Humphreys, Dr. E. C. Huselton, W. M. Murray, J. H. Reed, C. F. Holdship, F. L. Stephenson and D. N. Seely.

It is said that Emperor William of Germany has announced that he will give prizes of 50,000 francs ($10,000) for a Paris-Berlin automobile road race. Comte de Talleyrand-Perigord, Vice-President of the German Automobile Club, has been appointed to work in conjunction with the Automobile Club of France to arrange details.

A rather inspiring cartoon, the ludicrous side of which was apparent at a glance, appeared recently in a German periodical. It depicted a field scene with an automobile just disappearing several hundred yards away from where the troops were following on the double quick time march. In fact the double quick time was so well exemplified that there seemed to be general chaos in the scramble to keep near the machine, which was stirring up enough dust to make its great speed seem obvious. On the driver's seat was a German General with helmet and a profile not unlike that of the German Emperor. His right hand was on the steering wheel and with his left he was beckoning to his men with his half face turned toward them. The caption read: "Follow me, men, if you can."

Comparative Tests of Electric Automobiles for City Service

NOW that the automobile industry is assuming such proportions some facts upon the commercial aspect of it ought to prove extremely valuable. These Mr. R. A. Fliess gives in a very exhaustive article published in the *Electrical World and Engineer* entitled, "The Electric Automobile from a Commercial Point of View." Mr. Fliess confines his attention to the electric vehicle, and we present herewith abstracts of the article referred to. In introducing his subject the writer says:

"Owing to the rapid changes and great improvements constantly being made in this new department of industry, the results obtained in an inquiry of this nature cannot of necessity be considered final. In fact, they must be looked upon as merely indicating the present state of development that has been reached in this branch of the horseless vehicle industry.

That the successful solution, from a commercial point of view, of the problems connected with mechanically propelled vehicles on common roads is not far off seems almost certain. But that there are many hard questions still left to be settled before the advent of 'the horseless age,' is recognized by all who have given close attention and thought to this subject.

We are living in an age of progress—of wonderful progress—and the present generation has become so accustomed to hearing of and seeing the results of great inventions that it has come to look upon all things as possible, and is very apt to underestimate and depreciate the difficulties which confront the inventors, engineers and manufacturers who are attempting to place the civilization of our globe upon a higher plane. That, in the case of the horseless vehicle problem, the difficulties to be surmounted are very great, does not seem to be generally recognized. That the workers in this field have been confronted from the beginning with what would seem to have been almost unsurmountable obstacles is, nevertheless, a fact, and that they have so far surmounted all barriers as to bring the horseless vehicle on common roads to its present state of development is a cause for general congratulation and a ground for just pride in the growth of the art.

That the electric automobile has reached a point in its development where it has begun seriously to enter into the daily com-

mercial life of such a city as New York is evidenced by the greatly increased number of such vehicles now operating upon its streets. It would seem, therefore, as though an inquiry as to its relative commercial value, compared with that of one of the horse systems with which it has entered into competition, would be of interest and benefit.

Owing to the nature of the problem which presents itself when an attempt is made to compare the two systems of locomotion from a commercial point of view, the most accurate and therefore the most valuable results can be obtained at present from a comparison of the electric automobiles used in light delivery service with horses and wagons engaged in the same class of service. For this reason light horse delivery service has been selected as a basis of comparison.

To facilitate the presentation of the data in hand this report, which is the result of an extended investigation, has been divided into three sections. In the first and present part, some tests on electric automobiles in the Borough of Manhattan are recorded. In the second the nature and amount of work required of horses and wagons engaged in light horse delivery service in the borough is considered, and its cost. In the third the results obtained in sections one and two will be compared.

It may be well to remark that all the data incorporated in this paper was obtained at first hands by the writer and is published here for the first time, and that all the results and conclusions reached are based entirely upon this independently collected data.

The tests were made in the Borough of Manhattan, New York City, and the conclusions reached are based on tests which covered over 250 miles on its streets with 10 vehicles of six different makes.

The object of the tests was to obtain data for the determination of the present commercial position of electric vehicles, and the greatest care was taken to insure accurate results. The number of vehicles tested, and the fact that they represent some of the best makes in the United States, adds to the value of the data that have been obtained.

The reasons for making these tests and the methods employed in obtaining the results to be presented need a few words of explanation.

For comparative purposes, from a commercial point of view, it is desirable to know how far an electric vehicle may be expected to travel on one charge of its battery in regular routine service over the streets of the locality in which it is expected to operate. This is to determine whether an electric vehicle can successfully

travel on one charge of its battery a distance equal to that required on one trip of vehicles drawn by horses engaged in the class of service with which a comparison is desired. Also the average amount of energy required by well-designed and properly-cared-for electric vehicles to propel them over the streets of the locality in which they are to operate under the various conditions of weather and pavement with which they are likely to meet throughout the year while fulfilling the functions for which they are intended, must be known.

The average speed which electric vehicles may be expected to maintain when in motion while engaged in actual service under the ordinary traffic conditions with which they will probably be confronted must also be known before a just comparison can be made, as well as their ability to overcome successfully all the obstacles which the horse-drawn vehicle, of the class with which the comparison is to be made, is obliged to "negotiate."

To determine these points, for the Borough of Manhattan, a number of electric vehicles of different makes and of several varieties were tested over the streets of the borough under ordinary traffic conditions until enough tests had been made to eliminate any chance of error that might have arisen had only one vehicle of any particular make been employed.

The method followed in collecting the data sought was to measure the distance covered on each test on a cyclometer which was tested several times against a known standard and was found to be accurate, while the amount of energy used on each test was obtained by means of a Thomson recording watt-hour meter which was calibrated several times during the period over which this investigation extended against the standard instruments of the Electrical Engineering Department of Columbia University. The instantaneous rate of power consumption was noted on a Whitney voltmeter and ammeter which were also calibrated several times against the standard instruments of the Electrical Engineering Department of Columbia University. The weight of the vehicle tested was obtained at the time of test on a pair of balanced Fairbanks coal scales—the same scales were used each time, to eliminate any chance of error which might have crept in from a change in scales. The speed at any moment during a trip was noted on a tachometer which was tested several times during the course of the investigation. The grades at the points where readings of the instantaneous rate of power consumption were taken were measured, so that in each case any variation in the rate of power consumption might be traced to its source. The elapsed time was noted at many points during each trip; also the

voltage on open circuit, and the distance traveled to the point, as well as the reading of the watt-hour meter. Therefore, at the end of each test a complete analysis of it was possible.

On account of the care that was taken to keep all the instruments used accurately calibrated and as free as possible from injurious shocks and jars which might affect them, it is thought that the tests presented in the following tables may be taken as representative of what may be required of electric vehicles in general to-day under similar circumstances.

Owing to the fact that many comparisons are made between the several vehicles of different makes noted in this section, it is thought desirable not to designate any of the vehicles by means of their makers' names, but rather to give to each vehicle noted in this section a designating letter. The object of this paper was not to compare different makes of electric vehicles, but to present original data of a sufficiently representative kind to make its comparison with data collected from tests on one of the several horse systems, with which the electric vehicle is now competing, of value.

Table I. gives in detail a complete analysis of a run of 31.5 miles made on one charge of battery by an electric delivery wagon designed for use in light delivery service. The conditions under which this test was made were perfectly normal. The streets over which the vehicle traveled were very crowded, and the route selected for the test included about as many hills as a vehicle may be expected to be called upon to go up and down in an average day's work under service conditions. The test is given in detail, to illustrate the method employed in all the tests made. The other tests presented are very much more condensed.

TABLE I.

[*Vehicle A.*]

Weight of vehicle	3,085 lbs.
Weight of passengers and instruments	305 lbs.
Weight of load carried	....
Total weight causing drawbar pull on test	3,390 lbs.
Battery equipment	44 cells
Weight of battery	1,120 lbs.
Per cent. of battery weight to total weight of vehicle	36.3%
Per cent. of battery weight to total weight causing drawbar pull	33. %

Weather clear; no wind. Streets in good condition.

Principal ground covered on test: Fifth avenue, from Twentieth street to One Hundred and Tenth street ; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Tenth street, from Fifth avenue to Eighth avenue: Eighth avenue, from Fifty-ninth street to One Hundred and Tenth street; Eighth avenue, from Twenty-first street to Forty-second street; Twenty-first street, from Fifth avenue to Eighth avenue.

Tests of Electric Automobiles for City Service

Total distance covered during test.....31.51 miles
Total time in motion during test.....3 hr. 23 min. 35 sec.
Average speed while in motion.....9.28 miles per hr.
Total watt-hours used on trip..... 4,892.8
Average watt hours used per car-mile.....155.27
Average watt-hours used per ton-mile.....91.6

For a distance of.....1.44 miles
Time in motion was.....11 min.
Average speed while in motion.....7.85 miles per hr.
Number of watt-hours used.....216
Average watt-hours used per car-mile.....150
Average watt-hours used per ton-mile..... 88.49

For a distance of.....2.55 miles
Time in motion was.....14 min.
Average speed while in motion.....10.93 miles per hr.
Number of watt-hours used.....328
Average watt-hours used per car-mile.....128.62
Average watt-hours used per ton-mile..... 75.88

For a distance of.....3.12 miles
Time in motion was.....18 min. 50 sec.
Average speed while in motion.....9.94 miles per hr.
Number of watt-hours used.....568
Average watt-hours used per car-mile.....182.05
Average watt-hours used per ton-mile.....107.4

For a distance of.....0 59 mile
Time in motion was.....4 min.
Average speed while in motion..... 8.85 miles per hr.
Number of watt-hours used..... 62.4
Average watt-hours used per car-mile.....105.76
Average watt-hours used per ton-mile..... 62.39

For a distance of.....3.2 miles
Time in motion was.....21 min.
Average speed while in motion..... 9.14 miles per hr.
Number of watt-hours used.....476.8
Average watt-hours used per car-mile.....149
Average watt-hours used per ton-mile.....87.9

For a distance of.....3.04 miles
Time in motion was.....17 min. 30 sec.
Average speed while in motion.....10.42 miles per hr.
Number of watt-hours used.....484.8
Average watt-hours used per car-mile.....159.47
Average watt-hours used per ton-mile.....94.08

For a distance of.....2.55 miles
Time in motion was.....14 min. 50 sec.
Average speed while in motion.....10.31 miles per hr.
Number of watt-hours used.....339.2
Average watt-hours used per car-mile.....133.02
Average watt-hours used per ton-mile.....78.41

For a distance of.....3.12 miles
Time in motion was.....19 min 30 sec.
Average speed while in motion.....9.6 miles per hr.
Number of watt-hours used.....550.4
Average watt-hours used per car-mile..... 176.41
Average watt-hours used per ton-mile..... 104.07

For a distance of ..... 0.61 mile
Time in motion was ..... 5 min.
Average speed while in motion ..... 7.32 miles per hr.
Number of watt-hours used 64
Average watt-hours used per car-mile 104.92
Average watt-hours used per ton-mile 61.9

For a distance of ..... 2.54 miles
Time in motion was ..... 15 min. 30 sec.
Average speed while in motion ..... 9.83 miles per hr.
Number of watt-hours used 353.6
Average watt-hours used per car-mile 139.22
Average watt-hours used per ton-mile 82.13

For a distance of ..... 3.12 miles
Time in motion was ..... 21 min. 30 sec.
Average speed while in motion ..... 8.7 miles per hr.
Number of watt-hours used 548.8
Average watt-hours used per car-mile 175.89
Average watt-hours used per ton-mile 103.77

For a distance of ..... 0.61 mile
Time in motion was ..... 4 min.
Average speed while in motion ..... 9.15 miles per hr.
Number of watt-hours used 72
Average watt-hours used per car-mile 118.03
Average watt-hours used per ton-mile 69.63

For a distance of ..... 1.44 miles
Time in motion was ..... 10 min.
Average speed while in motion ..... 8.64 miles per hr.
Numbe of watt-hours used 224
Average watt-hours used per car mile 155.55
Average watt-hours used per ton-mile 91.77

For a distance of ..... 1.53 miles
Time in motion was ..... 13 min. 25 sec.
Average speed while in motion ..... 6.84 miles per hr.
Number of watt-hours used 230.4
Average watt-hours used per car-mile 150.58
Average wait-hours used per ton-mile 88.83

For a distance of ..... 2.04 miles
Time in motion was ..... 13 min.
Average speed while in motion ..... 9.42 miles per hr.
Number of watt-hours used 374.4
Average watt-hours used per car-mile 183.53
Average watt-hours used per ton-mile 108.27

Open-circuit voltage at beginning of run ..... 95 volts
Open-circuit voltage at end of run ..... 82.5 volts

Drop in 31.51 miles ..... 12.5 volts

Running voltage at beginning of run ..... 90 volts
Running voltage at end of run ..... 76 volts

Drop in 31.51 miles ..... 14 volts

Charging Battery After Run.

Charged for 3 hours at	20 amperes
Charged for 2 hours at	15 amperes
Ampere-hours put in during charge	90
Battery boiling hard at end of charge.	
Watt-hours put in battery during charge	7124.52
Watt-hours taken out of battery during run	4892.8
Open-circuit voltage before run	95 volts
Open-circuit voltage before charging	95 volts
Efficiency of battery	68.67%

A consideration of Table I. shows that vehicle *A*, with a load due to two persons and the instruments used, covered over 31.5 miles at an average speed of over 9.2 miles an hour, and that having traveled this distance its running voltage was still above 1.72 volts per cell, and its open circuit voltage still over 1.87 volts per cell, that the total average rate of power consumption was less than 92 watt-hours per ton mile, and that the maximum rate of power consumption noted was less than 108.5 watt-hours per ton mile.

As will be noticed, the total distance covered on this run was divided into 15 sections. On each section the time while in motion was observed, and from it and the distance recorded the average speed while in motion was calculated. In the notes taken while making the test, all momentary stops were noted and have been deducted from the time which elapsed while the vehicle was covering the distance given. Hence, the speed recorded in each section for the vehicle while in motion, it is thought, closely represents the best average speed which it would be possible to keep up on each section under ordinary traffic conditions. Thus, for instance, the first section includes a very crowded district for the greater part of its length. The second section, on the other hand, is never as crowded as the first, while the third section is usually a little more crowded than section two, but is seldom as crowded as section one. This condition is reflected by the average speeds recorded in the sections. It may also be interesting to note how the energy required on different sections varies. For example, in section two the vehicle was going down grade more than it was going up, while in section three it was going up hill more than it was going down. Thus the general contour of the ground over which the vehicle was traveling may be followed quite plainly.

A little over 25 miles of this test were covered while making four complete circles around the outside of Central Park. Table II. shows in a concise form the results obtained during this part of the test. Table II. is compiled from Table I., and affords a convenient means of comparing vehicle *A* with other vehicles traveling over the same ground.

TABLE II.

[*Vehicle A.*]

Once around Central Park—North on Fifth avenue, south on Eighth avenue.

For a distance of ..... 6.26 miles
Time in motion was ..... 36 min. 50 sec.
Average speed while in motion ..... 10.19 miles per hr.
Number of watt-hours used 958.04
Average watt-hours used per car-mile 153.9
Average watt-hours used per ton-mile 90.31

For a distance of ..... 6.27 miles
Time in motion was ..... 41 min.
Average speed while in motion ..... 9.17 miles per hr.
Number of watt-hours used 974.4
Average watt-hours used per car-mile 155.4
Average watt-hours used per ton-mile 91.68

For a distance of ..... 6.28 miles
Time in motion was ..... 39 min. 20 sec.
Average speed while in motion ..... 9.58 miles per hr.
Number of watt-hours used 953.6
Average watt-hours used per car-mile 151.84
Average watt-hours used per ton-mile 89.58

Once around Central Park—North on Eighth avenue, south on Fifth avenue.

For a distance of ..... 6.24 mile.
Time in motion was ..... 38 min. 30 sec.
Average speed while in motion ..... 9.78 miles per hr.
Number of watt-hours used 961.6
Average watt-hours used per car-mile 154.24
Average watt-hours used per ton-mile 90.99

Three times around Central Park—North on Fifth avenue, south on Eighth avenues

For a distance of ..... 18.81 miles
Time in motion was ..... 1 hr. 56 min. 10 sec.
Average speed while iu motion ..... 9.72 miles per hr.
Number of watt-hours used 2,886.4
Average watt-hours used per car-mile 153.45
Average watt-hours used per ton-mile 90.53

READINGS OF INSTANTANEOUS RATE OF POWER CONSUMPTION AT DIFFERENT POINTS EN ROUTE.

Location of Vehicle When Reading was Taken.	Voltmeter Reading.	Ammeter Reading.	Speed in Miles Per Hour.	Kind of Pavement Traveling Over.	Per Cent. Grade at Point of Reading
62d st. and 5th ave ..... Going N	90	22	9.75	A	.....
65th st. and 5th ave ..... " "	90	21	10.3	"	.....
68th st. and 5th ave ..... " "	90	32	7	"	2.5
Passing Lenox Library ..... " "	90	25	9	"	.....
Passing Synagogue door ..... " "	90	21	10	"	.....
83d st. and 5th ave ..... " "	90	24	9.5	"	.....

Location of Vehicle When Reading was Taken.			Voltmeter Reading.	Ammeter Reading.	Speed in Miles Per Hour.	Kind of Pavement Traveling Over.	Per Cent. Grade at Point of Reading.
87th st. and 5th ave.	Going	N	90	32	7	A	2.5
88th st. and 5th ave.	"	"	90	28	7.3	"	2.5
110th st., bet. Lenox and 7th aves.	"	W	90	27	7.5	M	slight up
108th st. and 8th ave	"	S	90	32	6.5	A	2.6
106th st. and 8th ave.	"	"	90	30	7.5	"	2.4
101st st. and 8th ave.	"	"	90	19	11.8	"	slight down
96th st. and 8th ave.	"	"	90	27	8	"	2.5
94th st. and 8th ave.	"	"	90	26	8.5	"	2.5
77th st. and 8th ave	"	"	90	20	12	"	slight down
Passing San Remo door.	"	"	90	20	11.9	"	.....
Passing East End Spanish flats.	"	W	90	32	7.5	"	3.5
67th st. and 8th ave.	"	N	90	25	9	"	.....
73d st. and 8th ave.	"	"	90	20	11.4	"	.....
Passing San Remo door.	"	"	90	20	11	"	. .
82d st. and 8th ave.	"	"	90	28	8	"	.....
90th st. and 8th ave.	"	"	90	22	9.6	"	.....
103d st. and 8th ave	"	"	90	20	11.3	"	.....
110th st., bet. Lenox and 7th aves.	"	E	90	18	15	M	slight down
106th st. and 5th ave.	"	S	90	25	8.9	A	2.25
104th st. and 5th ave.	"	"	90	30	7.5	"	2.25
103d st. and 5th ave	"	"	90	32	7	"	2.25
101st st. and 5th ave.	"	"	90	30	7.5	"	1.5
99th st. and 5th ave.	"	"	90	30	7.5	"	1.5
97th st. and 5th ave.	"	"	90	31	7	"	1.75
94th st. and 5th ave.	"	"	89.5	35	6.4	"	2.75
82d st. and 5th ave.	"	"	92	16	14	"	.....
Passing Synagogue door.	"	"	92	16	13.8	"	.....
65th st. and 5th ave	"	N	90	22	10	"	.....
67th st. and 5th ave	"	"	89.5	26	8.5	"	2
69th st. and 5th ave	"	"	89	32	7	"	2
Passing Lenox Library.	"	"	90	24	9.8	"	.....
Passing Synagogue door.	"	"	90	22	9.5	"	.....
82d st. and 5th ave.	"	"	90	23	10	"	.....
87th st. and 5th ave	"	"	89	32	7	"	2.5
110th st., bet. Lenox and 7th aves.	"	W	90	27	7	M	slight up
107th st. and 8th ave	"	S	89.5	32	7	A	2.5
106th st. and 8th ave	"	"	89.5	31	7.2	"	2.4
98th st. and 8th ave	"	"	90	27	8.3	"	2.5
96th st. and 8th ave	"	"	90	27	8.3	"	2.5
93d st. and 8th ave.	"	"	90	26	8.3	"	2.5
77th st. and 8th ave	"	"	90	20	12	"	slight down
65th st. and 5th ave	"	N	90	22	10	"	.....
Voltage began to drop here. Ground covered to here a little over 20 miles. Time in motion a little over 2 hrs.							
68th st. and 5th ave	Going	N	86	32	6.2	"	2.5
Passing Lenox Library.	"	"	87	24	8.5	"	.....
Passing Synagogue door.	"	"	87	25	8.5	"	.....
79th st. and 5th ave	"	"	87	24	8.5	"	.....
84th st. and 5th ave	"	"	87	24	9	"	.....
87th st. and 5th ave	"	"	86	36	6.6	"	2.5
110th st., bet. Lenox and 7th aves.	"	W	87	28	7	M	slight up

Location of Vehicle Waen Reading was Taken.			Voltmeter Reading.	Ammeter Reading.	Speed in Miles Per Hour.	Kind of Pavement Traveling Over.	Per Cent Grade at Point of Reading.
98th st. and 8th ave	"	S	87	26	6.8	A	2.5
95th st. and 8th ave	"	"	87	26	8.2	"	2.5
87th st. and 8th ave	"	"	89	18	10	"	slight down
76th st. and 8th ave	"	"	88	19	11.4	"	.....
Passing San Remo.	"	"	88	19.5	11.4	"	.....
65th st. and 8th ave	"	"	89	16	14.2	"	slight down
55th st. and 5th ave	"	"	87	27	7.8	"	1
53d st. and 5th ave	"	"	87	26	7.8	"	1
40th st. and 5th ave	"	"	87	20	9.8	"	.....
Ground covered to here, little over 27 miles. Time in motion a little over 2.8 hrs.							

(*To be continued.*)

REFLECTIONS OF AN AUTOMOBILE

I am the automobile,
And I run
My never tiring course
Along the roadways
Of the world,
And leave no hoofprints
In the sands of time.
I am the horse's Juggernaut,
Likewise the mule's,
And over their recumbent necks
My whirling wheels
Pass to an era
Not for them.
They mark a step in progress
Through six thousand years;
I leap the bounds
Of all the past
And whiz into the future with
A swish that marks me here
This instant and the next
A thousand years ahead.
I stand, a pioneer,
Upon the lofty ridge
Between the new and old,
And backward down the Kismet path
I hear the slow, increasing tread
Of hoofbeats moving to the field
Of desuetude.
I look before and see
A million multiples of me
Subserving man
In all his moving needs,
A ministrant of motion that
Is measureless as are
Its master's wants.
By night and day I stand and wait,
And at the master's beck
I go.
I have no tired eyelids for
The hand of Sleep
To lay its fingers on;
No hunger gnaws my vitals out;
No muscles, overstrained and sore,
Plead silently for me to rest.
In my new lexicon
There's no such word as rest;
And tireless as may be
The energies of man,
My service meets them everywhere,
And tireless as they,
And makes cessation cowardice.
I am the movement
Of the time to come;
And in me motion finds
Its rhythm and its poesy,
Its "get there"
And its best activity.
I am The Thing;
The It of passage and
The master servant of the master man;
Through the splendor of the future,
In every land and clime,
I will lead the grand procession
Up the corridors of time.
In the niche of transportation
In Pantheon of Fame,
God among the gods of motion,
I shall set my seal and name.

—*William J. Lampton, in New York Sun.*

Correspondence

(Desiring to make this department of real value, we invite contributions from men who are interested in both the construction and operation of automobiles.)

ABOUT KEROSENE OIL

An interesting contribution to the fund of information concerning oil and oil engines was made at a recent meeting of the New York Railway Club by Mr. John A. Secor. While this was not discussed from the automobile point of view, there were many points of interest to those who are working on the motor problem. Among other things he said:

"Considered solely as a source of power for general use kerosene oil is without a rival. It is obtainable everywhere, at low cost, is safe and possesses the highest thermodynamic value. One pound of ordinary illuminating oil contains three hundred times the energy of one pound of storage battery, is fifty times more powerful than liquid air, and its potential energy is ten times greater than dynamite. As a reservoir of power, one gallon of oil is superior to one ton of storage battery. Ordinary domestic kerosene of 120 degrees Fahr. flash and 150 degrees Fahr. fire test has a specific gravity of about .785, so that a gallon weighs 6.54 pounds and has 135,357 heat units, while an equivalent weight of pure carbon only has 94,830 heat units." Seems like an ideal fuel, doesn't it?

I presume, however, there are objections which will be brought out by the advocates of other sources of power, but the safety and cheapness are certainly two points in its favor.

FRANK C. HUDSON.

Troy, N. Y.

A number of well-known Massachusetts automobilists met in Boston to discuss the formation of a club. It was suggested that the name of the club should be the Automobile Club of Massachusetts. The idea of covering the whole State would give the club much greater influence in the securing of necessary legislation in the improvement of roads and other matters of vital interest to automobile users than if it were simply a local organization. Nothing definite was done, however, in the way of regular organization, although it was fully decided that the club should be formed.

College Automobile Clubs

THERE seems to be a growing desire among students owning automobiles in our larger universities and colleges to form clubs. Columbia College was the first to have such an organization.

Things have proceeded so far as to justify the discussion of an effort to arrange an inter-collegiate automobile meet, in which several of the universities where automobile clubs have been formed will take part. New machines are appearing each day.

Columbia was the first university automobile club to suggest a series of races in which the several universities might enter machines. Considerable difficulty was encountered in securing the sort of track desired, and the scheme has been abandoned for the present season.

The Columbia Automobile Club was formed last January by six undergraduates—W. B. Shoemaker, H. R. Worthington, L. Iselin, C. A. Dana, H. W. Shoemaker and E. L. Tinker. The club at present has twenty-five members, including Professor F. Remsen Hutton and T. F. Kemp, of the Columbia Engineering Department. All members of the club are expected to own or be part owners of a motor vehicle. There are twelve gasoline and ten electric machines owned by the members of the club.

In case the scheme to have a university automobile meet is carried out Columbia will ask the clubs recently formed at Harvard, Yale, Princeton and the University of Chicago to co-operate and make the affair a success. The Columbia Club members have been responsible for the erection of supply stations along the Boston Post Road and at several points along the Jersey coast where the good roads attract owners of automobiles.

Automobilism in Europe

A STATEMENT is made in a consular report that 30,000 automobiles are owned in the Paris consular district. It will be noticed from a perusal of the reports printed elsewhere in this issue that the progress of the automobile in Germany and England is distinctly slower than in France. Probably this is less to be wondered at in the case of England than of Britisher which is peculiarly averse to radically new departures, and as the more general introduction of the automobile over there

would mean the disappearance of the much-liked dray horse, it is not heralded with much favor. This same spirit is true to a greater or lesser extent of a great many of the older nations.

It is rather significant that, according to the reports printed, some of the European countries are waiting the time when America will produce the final automobile and bring it to the same degree of excellence that it did the bicycle.

Starting Motors

THE following, taken from a letter addressed to *La France Automobile*, may interest some of our readers: "I wish to describe a simple method of starting a tube-ignited motor. The inconvenience of doing this with an engine having high compression and the danger of personal damage from occasional back firing are too well known for me to dwell upon here. Having in view the easy starting of motors fitted with electric ignition when the spark is retarded, I have endeavored to apply this principle to motors provided with tube ignition, and have obtained excellent results by two methods. The first, which is more theoretical than practical, consists in moving the burners so that they will only heat the extreme ends of the platinum tubes and so retard the firing. The second method, which is much simpler and quite practical, is by closing the petrol tap governing the supply of petrol to the burners to such an extent that the tubes are only brought to a dull red by the flame, which equally brings about late firing. With the tubes in this condition the motor will start at the first revolution of the starting handle without back firing. No variation of the carburation is required to start a motor under the last-mentioned conditions. The exact heat of the tubes under which the motor will start best is easily discovered after a few experiments. It will be found to vary with the compression."

Change of Name of the Essex County Automobile Club

AT a meeting held at the residence of Winthrop Scaritt, No. 44 Munn avenue, East Orange, October 18, the name of the Essex County Automobile Club, organized at the

residence of Kirk Brown, in Montclair, about six weeks ago, was changed to the Automobile Club of New Jersey.

When the club was first organized it had eighteen members. It now has thirty. The officers are: President, Kirk Brown, of Montclair; Vice-President, W. J. Stewart, Newark; Secretary, Dr. Henry Power, of Montclair; Treasurer, H. W. Whipple, of East Orange. Mr. Brown organized the Central Wheelmen of Philadelphia, and he is confident that a strong automobile club can be organized in this section.

The object of the organization is to secure legislation for good roads and to use its influence to prevent any legislation being enacted which would be detrimental to those who ride the horseless vehicles. The club will be connected with the Automobile Club of America as a sort of New Jersey representative, and several of the members of that organization have already signified their intention of becoming associate members of the New Jersey club. The next meeting will be held on Wednesday, November 14.

Annual Meeting of the Automobile Club of America

THE first annual meeting of the Automobile Club of America was held on the evening of Monday, October 22, at its headquarters, Waldorf-Astoria, New York City. Perhaps a brief account of the beginning and subsequent growth of the club may be of interest at this time.

From a start made by three men in May, 1899, which culminated October 16 in an organization with less than 100 members, the rolls now show 262 active members, affiliations with seven foreign organizations, more than $20,000 in the treasury and a record of many events and of much practical work toward improved legislation. The meeting was attended by fifty-six members, that being the total vote cast. The ticket offered by the Nominating Committee had been modified by the submission of a new ticket, in which A. C. Bostwick was named in place of Gen. G. M. Smith for First Vice-President, Jefferson Seligman in place of Winslow E. Buzby, Malcolm W. Ford in place of Whitney Lyon and Sydney Dillon Ripley and J. M. Ceballos in place of A. C. Bostwick and C. P. Doelger for two of the three governors. The head of the ticket, the Second and Third Vice-

Presidents and Dave H. Morris, as a governor, were indorsed by the opposition. The election resulted as follows:

President, Albert R. Shattuck; First Vice-President, Albert C. Bostwick; Second Vice-President, J. Dunbar Wright; Third Vice-President, David Wolfe Bishop; Treasurer, Jefferson Seligman; Secretary, Malcolm W. Ford; Governors, Class of 1903, Dave H. Morris, Sydney Dillon Ripley and J. M. Ceballos.

An amendment to the by-laws, making it possible for members of the Board of Governors to indorse an application for membership, was adopted by a vote of 49 to 7. The report of Secretary Homer W. Hedge showed that there had been 271 members taken in and a number of resignations, leaving 262 active members on the rolls and 14 honorary. The Treasurer's report showed: Receipts, $26,516.27; disbursements, $5,429.30; balance, $21,086.97. The report of the Exposition Committee showed that $19,916, from rental of spaces and programme privileges, would be in hand before the exhibition opened, insuring a profit of more than $2,000, exclusive of gate receipts. The House Committee reported that no new quarters had been selected and that matter will be left to the new Board of Governors.

The Law Committee reported that it had appealed to Secretary of the Treasury Gage for a new construction of the chapter of the United States Revised Statutes that the Inspector-General interpreted as prohibitive of automobiles carrying gasoline going on ferry boats. Secretary Gage recommended the club to go before Congress with an amended statute. It was also recommended by the Law Committee that an effort be made to have all parkways and drives opened to motor vehicles; that an effort be made to secure the repeal of the old statute requiring a signal man to precede a steam carriage by an eighth of a mile, and also that a movement be begun toward a reciprocal law that would make an engineer's license granted in one city good in any other. The sentiment of several committees expressed was against road racing without a special permit and cautionary as to speeding in the streets.

When President Shattuck took the chair he was loudly applauded. He said that he believed in an aggressive policy, including competitions, an improved library, constant work for good roads and new and more commodious club-rooms. The members thought it inconvenient to be compelled to empty their gasoline tanks when going on a ferry boat.

Among some of those present were the following: H. A. Interman, E. V. Macey, G. H. Macy, E. T. Birdsall, F. C. Armstrong, N. J. Studwell, R. T. Gibbs, H. L. Magee, J. R. Wester-

field, M. S. Eustice, S. C. Bowen, F. B. Cochrane, R. N. Niles, A. W. Butler, R. A. C. Smith, C. J. Field, W. A. Hall, J. C. McCoy, T. C. Martin, G. F. Chamberlin, A. R. Hawley, H. W. Hedge, E. C. Chamberlin, J. C. Church, A. C. Bostwick, C. E. Corrigan, J. F. McClean, Whitney Lyon, R. G. Dubois, E. L. Powers, A. L. Riker, G. B. Berckmans, D. Pierson, Dr. S. S. Wheeler, G. B. Smith, A. H. Whiting, A. B. Mohler, J. M. Ceballos, J. Seligman, J. M. Hill, W. H. Johnson, A. R. Shattuck, E. A. Willard, W. E. Buzby, J. R. Hegeman, J. M. Fish, W. K. Bird and J. B. Walker.

National Automobile and Sportsman's Exhibition

THIS exhibition, which is to be opened in Washington, D. C., Monday, December 10, promises to be one of the most interesting features of the centennial celebration of the establishment of the seat of government in the District of Columbia. It will be the first automobile show to be held at the national capital, which city, by reason of its wide streets and miles and miles of asphalt pavement and level highways radiating from the city in all directions, is particularly well adapted to the use of motor-driven vehicles.

The show will continue for one week and will be held in Convention Hall, a massive building containing within its walls 36,000 square feet of space without a single column. This hall, besides being located in the centre of the city and accessible by various lines of transportation, is admirably adapted to the purposes of an exhibition. It will be so divided as to provide for one hundred and ten exhibition spaces, and an eight-lap track, 16 feet in width, will also be constructed in the building for the purpose of demonstrating the advantages of the various vehicles on exhibition. The exhibition spaces will be located both inside and outside the track, which will also be used for a series of races each evening of the exhibition.

The proposed exhibition will give intending purchasers an opportunity to examine and compare side by side motor vehicles of all types, to see them tested in competition with each other, and enable them to secure reliable and trustworthy information on the various points connected with the operation and maintenance of an automobile.

Notes from London

By Our Special Correspondent, Louis J. Oates

London, October 13, 1900.

LONDON is beginning to recover from the turmoil of a general election, in which the automobile in one shape or another has played a very interesting part. It is no exaggeration to state that fully 50 per cent. of the candidates in the metropolis have availed themselves of its use. Every description of car has been seen out, from the very lightest build up to the heavy dray. Indeed, in Battersea, a purely working class constituency, scores of hardy toilers drove to the polling booths in an immense motor wagon, which had been placed at the disposal of Mr. Garton, the Conservative candidate, by one of his supporters. They seemed to relish the novelty, and the competition for this method of traveling was keen. Further afield, Mr. Leicester Harmsworth, who was returned for Caithness (Scotland), made good use of his 12 horse-power Daimler, and on the last day of his election traveled no less than 160 miles. His car is said to be one of the fastest in England, and can attain a speed of 40 miles an hour. Mr. Harmsworth considers that his success in a great measure has been owing to the ease in which he has been able to canvass scattered districts, and there is no doubt that the automobile has revolutionized canvassing in this remote part of Scotland.

Mr. Joseph Pennell, whose enthusiasm for motor bicycling is well known to all of us, contributes a very interesting article to the *Daily Chronicle,* from which I append a few extracts. He says:

"I have driven my motor bicycle at the rate of 4 or 5 miles an hour through Piccadilly, Pall Mall, Hyde Park Corner and Charing Cross, on a busy afternoon, with a feeling of greater security than on an ordinary safety, because I could put my feet on the ground. The bicycle parts, though extremely strong, are not of the best quality and finish, and the pedals and cranks are far too near the ground. Several times I have hit stones. But all motor bicycles should be built like the Werner—so low that the driver can put his feet on the ground in case of an emergency. The rider of a motor bicycle must also be a good rider of a cycle. The power to steer, to keep one's head when driving at a high rate of speed, to avoid obstructions in the road, will only come naturally to a good cyclist. On the other hand there is some disadvantage, because the experienced cyclist tries to put on the

brake and back-pedal instead of switching off the electric current. But whatever your training as a cyclist, you must understand these motors, while endless patience is required to drive them. Once you have mastered the details, however, the fascination of driving this almost human thing is intense, and a few weeks' practice should enable anyone to do what I have done, and to make longer journeys. On other forms of motors I have been troubled with vibration, owing to the motor being behind or under me. On this machine I have experienced nothing of the sort. The only physical drawback is the number of burns, blisters, scratches and bruises on my hands, from which, like any other person who works with machinery, I seem to suffer. If you are willing to study the motor bicycle I see absolutely no reason why you should not learn to drive it. But it is a very different thing from riding an ordinary safety. Within three or four years I am certain that some sort of motor will be affixed to every bicycle, if only to be used uphill, against the wind, and when the rider is tired. I am perfectly prepared, however, to find the makers of all motor cars, tricycles and quadricycles in opposition to me. But then, scarcely any of the owners of these machines have driven a motor bicycle, and as for the makers—well, a 3 horse-power voiturette may cost £200 ($1,000), while a 2½ horse-power bicycle, which is now being made in England, may cost £50 ($250); but this, of course, has nothing to do with the prejudice of the manufacturers of motor cars against motor bicycles. The motor bicycle is as sure of setting the fashion as the Rover safety was, and it will add as much to the pleasure and comfort of the world as the development of the safety and the pneumatic tire."

You will no doubt remember the recent charge made against the Earl of Carnarvon for furious driving. The evidence would suggest that autocarists have nothing to hope from the prejudices of policemen, who manufacture a case, apparently, after many rehearsals. In the present instance the solicitor for the defence made a point that the evidence was trumped up, and he had strong grounds, for the Police Superintendent admitted that he had given instructions for the police to disguise themselves in plain clothes and post themselves at certain points likely to be passed by his lordship. It also came out in the evidence that the times said to have been noted by the officers, and upon which the speed of the car was determined, were taken upon ordinary watches, none of which were stop watches, or possessed of a centre second hand—altogether unsuitable and useless for such a purpose. Moreover, the course selected for the test was a narrow, hilly

country lane, with several sharp turnings, which the Superintendent admitted could not be taken safely at more than 6 miles an hour on a bicycle without dashing into the hedge. Yet he stated, and the wiseacres on the bench believed him, that the Earl drove his car safely round these bends at four times that speed! It is to be noted further that the timing was done from a bicycle saddle as the car passed a point at a considerable distance from the time-taking policeman. What would the experienced timekeepers of the Automobile Club or the National Cyclists' Union say to this? Nor are the above facts quite the worst in this glaring travesty of justice. Kingsclere, where the occurrence took place, is a very small country town, having no railway station and a small population, and after the case had been decided, it was discovered that a statement to the effect that Lord Carnarvon's car had covered a mile in two and a half minutes had been widely circulated. This report appears to have reached everybody's ears, and long before the case came on for hearing it was common talk, and there can be no doubt that the magistrates who tried the case were somewhat affected by it. The sooner the law of the land is administered by legally-trained stipendiaries, and not country justices, the better. The police, primed with the idea that the Earl had been driving his car at over 12 miles an hour, and having no direct evidence, straightaway set to work to ensnare him. The case is just as bad as it can be from an automobilist's point of view, or, for that matter, from that of any fair-minded person.

Echoes of the Automobile Club's recent tour still reach me, and the journey was interesting in every respect. Monmouth is an ideal locality and the choice was no doubt popular with every one. Lord Llangaltock was a host in every sense of the word, and everybody enjoyed the outing immensely.

Last Sunday a friend of mine, while strolling in Hyde Park, observed no less than fourteen motor cars. In two cases the drivers were of the fair sex, and they handled their respective charges with the greatest skill and workmanship. Will "motoring" become as popular with the fair sex as cycling?

Just a word about the motor omnibuses which run between Victoria and King's Cross. They strike the average man in the street as being clumsy and altogether too noisy. Why cannot electricity be made the motive power? The success of the new Tube Railway shows at once how popular an electric omnibus would become. We are still waiting in patience in London for some American *philanthropist* to reorganize our underground railway system.

A Providential Encounter

(Permission of Harper & Bros.)

Items of Interest

(Readers will confer a favor upon the editors of this magazine by sending in any interesting item of news suitable for this department.)

A trade union of automobile employees has been formed in France known as the "Federation des Chauffeurs, Conducteurs, Mecaniciens Automobilists de France." The union meets three times per week to discuss things of interest to automobile employees.

Mlle. Marguerite Cassini, niece of the Russian Ambassador to the United States, is about the only woman in the diplomatic corps who manages her own vehicle. She may be seen riding around Washington almost any time of the day.

Rome, Italy, is to have a squad of motor vehicle policemen.

The City Engineer of Chicago, Ill., who is a member of the examining board for automobiles, declares that he has heard of so many cases of lady operators without licenses that he intends to ask the authorities to order his officers to arrest all the lady automobilists who have not the necessary badge.

Messrs. O. W. Ramsay and W. C. Wagner, traveling salesmen for a St. Louis wholesale house, have just returned to that city, having covered 1,000 miles through a mountainous section in an automobile.

The trip, made as an experiment, was so successful that both men have decided to go over their territory in automobiles after this year. They are perhaps the first salesmen in this country to use the automobile instead of the railroad to cover a territory in rural districts, where the roads are so bad that they are impassable for wagons in some places. Certainly they are the first men in Missouri to invade the country towns in the horseless carriage.

Mr. H. M. Brinckerhoff, Secretary of Chicago Automobile Club, informs us that after a number of changes the club has settled down on a substantial basis with a membership of forty-eight. The officers of the club are as follows:

Mr. Arthur J. Eddy, President; Mr. J. Ogden Armour, First Vice-President; Mr. Samuel Insull, Second Vice-President; Mr. F. C. Donald, Third Vice-President; Dr. D. Cottrell, Treasurer; Mr. H. M. Brinckerhoff, Secretary.

In the early days of the bicycle, repair shops sprang up all over the country and filled a great need, especially in country places. It is interesting that scattered here and there, especially in the neighborhood of good roads, one sees the sign "Automobile Machinist." It is probable that they will not be as numerous as bicycle repair shops, but certainly it ought to prove a very successful occupation when run by competent mechanics.

Automobile risks are attracting the attention of underwriters of accident policies in the United States, and the fire hazards are creating considerable interest abroad. Some serious losses have resulted from the destruction of motor carriages. A writer in an insurance journal gives a number of recent instances of considerable loss occasioned by automobile fires.

It is interesting to note in connection with the statements set forth in the above paragraph that the number of fires resulting from careless handling of motor vehicles is gradually decreasing, and will continue to do so as the automobile comes to be more generally used.

While discussing the relative merits of steam, gasoline and electric driven motor vehicles, a well-known automobilist of this city, who is the owner of an electric vehicle, informed a representative of this magazine that he had driven his carriage a distance of twenty-five thousand miles, in covering which distance the vehicle had only once broken down, which happened when just about a quarter of a mile from his home. This speaks well, certainly, for the electric vehicle in question.

C. G. Wridgeway, engineer of the De Dion-Bouton Motorette Company, Brooklyn, N. Y., has recently been awarded, by the Chicago *Inter-Ocean* a special championship gold medal for his run of 1,600 miles with a motorette on a trip from New York to Chicago in record time and without accident.

Automobile Club Directory

Under this heading we shall keep a record of the motor vehicle clubs both of this and other countries, and we hope to have the co-operation of club officers in making it accurate and complete.

Automobile Club of America, Malcolm W. Ford, Secretary, 203 Broadway, New York; representative on International Racing Board, Clarence Grey Dinsmore; Substitute, John H. Flagler.

Automobile Club of Baltimore, W. W. Donaldson. Secretary, 872 Park Avenue, Baltimore.

Automobile Club of Columbus, O., C. M. Chittenden, Secretary, Broad Street.

Chicago Automobile Club, Secretary, H. M. Brinkerhoff, Monadnock Block, Chicago.

Cleveland Automobile Club, L. H. Rogers, Secretary, Cleveland, O.

North Jersey Automobile Club, E. T. Bell, Jr., Secretary, Paterson, N. J.

Automobile Club of Rochester, Frederick Sager, Secretary, 66 East Avenue, Rochester, N. Y.

Philadelphia Automobile Club, Frank C. Lewin, Secretary, Hotel Flanders, Philadelphia, Pa.

San Francisco Automobile Club, B. L. Ryder, Secretary, San Francisco, Cal.

Columbia College Automobile Club, Lewis Iselin, Secretary, Columbia College, New York, N. Y.

Buffalo Automobile Club, George S. Metcalf, Secretary, Buffalo, N. Y.

Western Automobile Association, Chicago, Charles T. Jeffery, Secretary, Monadnock Building.

AUSTRIA.

Budapest—Magyar Automobil Club, 31 Musem Koriil.

Innesbruck—Tiroles Automobil Club, Rudolph-Strasse 3.

Prague—Prager Automobil Club.

BELGIUM.

Antwerp—Automobile Club Anversoir, 34 r. Longue de l'Hopital; President, Baron de Bieberstein.

Brussels—Automobile Club de Belgique, 14 Pl. Royale; Moto-Club de Belgique, 152 Boul. du Nord; Touring Club de Belgique, 11 r. des Vauniers.

Charleroi—Automobile Club de Charleroi, Hotel de Esperance.

Ghent—Automobile Club de Flandres.

Liege—Automobile Club, Liegeois, 2 r. Hamal.

FRANCE.

Amiens—Automobile Club de Picardie, 36 r. de La Hotoie.

Avignon — Automobile Club de Avignon.

Bordeaux—L'Automobile Bordelais.

Dijon—Automobile Club, Bourguignors Cafe Americanie.

Lyon—Bicycle et Automobile Club de Lyon; Motor Club de Lyon, 3 pl. de la Bouise.

Marseilles—Automobile Club de Marseilles, 61 r. St. Fereol.

Nance—Automobile Club, Lorrain, Thiers pl.

Nice—Automobile Velo, Club de Nice, 16 r. Chauvain.

Paris—Automobile Club of France, 6 pl. de la Concorde; Motr-Club de France; Touring Club de France, 5 r. Coq-Héron.

Pau—Automobile Club, Bearnais Ave. de la Pau, President, M. W. K. Thorn.

.Périgueux—Veloce Club, Perigourdin, Hôtel de Commerce.

Toulouse—Automobile Club, Toulousain Café Riche, pl. St. Etienne Société des Chaffeurs du Midi, 25 r. Roquelaine. President, M. Gay.

GERMANY.

Aachen (Aix la Chapelle)—Westdeutscher Automobile Club, Hotel Grand Monarque.

Berlin — Mitteleuropaischer Motor Wagen Verein, I. Universitatstrasse, Herr A. Klose; Deutscher Automobil Club, Luisenstrasse, 43-44.

Dresden—Radfahrer-und Automobilisten Vereinigung; Dresdener Touren Club.

Eisenach—Mitteldeutscher Automobil Club; Motorfahrer Club, Eisenach.

Frankfort am Main — Frankfurter Automobil Club, Restaurant Kaiserhof.

Munich—Bayer. Automobil Club, 33 Findling Strasse.

Stettin—Erster Stettiner Bicycle und Automobil Club.

Strassburg—Strassburger Automobil Club.

Stuttgart — Suddeutscher Automobil Club; Wurtembergischer Motor Wagen Verein.

GREAT BRITAIN.

Birmingham—Motor and Cycle Trades Club, Corporation street.

Edinburgh—Scottish Automobile Club.

Liverpool—Liverpool Self-propelled Traffic Association, Colquitt street. Secretary, E. Shrapnell Smith.

London—Automobile Club of Great Britain and Ireland, 4 Whitehall Court, S. W. Hon. Secretary, C. Harrington Moore.

HOLLAND.

Nimegue—Nederlandsche Automobile Club.

ITALY.

Milan—Club Automobilisti Italiani 6 via Guilini.

Turin—Automobile Club d'Italie Via Vittorio Amedeo II, 26.

RUSSIA.

Moscow—Moskauer Automobile Club, Petrowka, Hauschnow.

St. Petersburg—Automobile Club de Russe, President, M. Delorme.

SPAIN.

Madrid—Automobile Club de Madrid.

SWITZERLAND.

Geneva—Automobile Clu de Suisse, 9 boul. de Theatre.

AN ALMOST PERFECT AUTOMOBILE

Mr. Persimmons McAllister Steele
Built a magnificent automobile;
The seat was as big as a Dutch feather bed,
With pillows a-plenty to hold up his head;
He'd an organ to play, if he felt so inclined,
And a nice little kitchen was hitched on behind,
Where a servant could cook him a pretty fair meal.
" I go in for comfort," said P. McA. Steele.

There were cupboards and closets and boxes and hooks
And a fine cosy corner, where Steele kept his books;
Below was a water tank where he could swim
(For bathing appealed very strongly to him);
He had a roof garden on top of the thing,
Composed of chrysanthemums set in a ring;
And then everybody began for to feel
A sort of contempt for P. McA. Steele.

For when he got in and yelled out, " Clear the track!"
The machine could be moved neither forward nor back;
" I've forgotten," he cried, in a voice full of woe,
" To put in the motor that should cause it to go;
But I really don't care—it is safer by far,
For I cannot run into a wagon or car."
So he happily lives in his automobile,
Does Mr. Persimmons McAllister Steele. —*Exchange.*

Automobile Exhibit at Madison Square Garden

IN point of magnitude, uniqueness and attraction the exhibition held under the auspices of the Automobile Club of America will eclipse everything of a similar nature which has preceded it, and that it will not fail in its object is evidenced by the great interest evinced in it.

So far as size is concerned it may be said that there will be motor vehicles of every kind there. These comprise all makes, styles and prices. It is a collection of the best this country could produce and a picture of American intelligence and genius.

It would be difficult for anyone to walk around viewing the various machines exhibited without feeling justly proud of the intelligent workmanship that rested behind them.

This is all the more creditable when we stop to consider that, in perhaps the majority of cases, the designing of many of the motors and parts was carried on without very much having been done previously. In other words, the designers have proceeded on entirely original lines, the industry being rather too young to afford much to fall back upon.

The contests will be such as to thoroughly bring out the weaknesses of machines in various spots.

The usefulness of the automobile in all kinds of going and under all conditions will be fully tested, and everybody will have an opportunity to see how the experienced *chauffeur* gets out of his troubles. All the contests but those on Friday, November 9, will be for vehicles in the show, and the programme, under the directions of the Technical Committee and the Contests and Exhibition Committee of the Automobile Club of America, of which Mr. Cornelius J. Field is chairman. The contests will be as follows:

Afternoon contests begin at 4 o'clock; evening contests begin at 9 o'clock.

Saturday, November 3—Evening, 45 minutes, obstacle contest for steam vehicles.

Monday, November 5—Afternoon, 45 minutes, brake contest for electric vehicles; evening, 45 minutes, obstacle contest for electric vehicles.

Tuesday, November 6—Afternoon, 45 minutes, brake contest

for gasoline vehicles; evening, 45 minutes, obstacle contest for gasoline vehicles.

Wednesday, November 7—Afternoon, 45 minutes, brake contest for steam vehicles; evening, 45 minutes, obstacle for steam vehicles.

Thursday, November 8—Afternoon, 45 minutes, brake contest for electric vehicles; evening, 45 minutes, obstacle contest for electric vehicles.

Friday, November 9—Afternoon, 45 minutes, obstacle contest between operators of electric cabs for hire, also stopping contest; evening, 45 minutes, competition of electric delivery wagons, obstacle contest and stopping competition.

Saturday, November 10—Afternoon, 45 minutes, championship competition and obstacle contest between winners in steam, electric and gasoline; evening, 45 minutes, championship between winners of stopping competition in steam, electric and gasoline.

It may be of interest to some to know how the contests are to be conducted. In the obstacle races barrels, ten pins, etc., are to be put at certain places, and the vehicle going through them and around them in the fastest time without knocking any over wins. If none succeeds in doing this, then the machine which knocks down the fewest number wins. Should a vehicle knock over a certain number, but covers the distance in fast time, and some other vehicle knocks fewer down in comparatively slower time, they will be pitted against each other.

In the braking contests each vehicle will travel at a certain speed and the one sliding the shortest distance after receiving the word to brake wins. This contest will call for unusually fine judgment to keep the carriage going at sufficient speed to make comparisons valuable. This will be controlled by timers stationed at places toward the end of the distance to be traversed.

The vehicles will be started on the opposite side of the track from where brakes will be applied, and thus be able to gather momentum. When well under way the timer will start his watch and say 100 feet further on another timer will stop his. Then, before the competitor has time to do anything to interfere with the momentum, word will be given him to brake, the judge marking the place where word was given. The finish can, of course, easily be seen.

In addition to the exhibition of new machines there will be a number of foreign carriages shown by members of the Automobile Club of America. A. C. Bostwick will exhibit his new Panhard & Levassor carriage, a very fast machine, having 24 horse-power; D. Wolfe Bishop will show his 16 horse-power

carriage of the same make; S. T. Davis, Jr., a steam racing carriage; A. L. Riker, an electric racing carriage, and Alex. Winton, a gasoline racing carriage. Besides the vehicles on exhibition, the makers will have stored at the east end of the Garden between fifty and seventy-five carriages, which will be run on the track, and it is the intention of the management to have from twenty to twenty-five carriages moving on the track at all times during the show, except when competitions are on.

Some of the makers of the horseless carriage will show as many as a dozen vehicles, ranging in price from $500 to $3,000, and in their finish they will vie with the best carriages ever turned out. The show will give intending purchasers an opportunity to see more styles within a short time than ever before, and it will also give the general public an opportunity to see the coming carriage and convert them to the idea that a means of conveyance has come that is equalled by none other.

The Waltham Manufacturing Company, Waltham, Mass., who will occupy an entire block of space, section "J," at the northeast corner of the Garden, will have an exhibit which will attract more than ordinary attention.

The exhibit is to be a complete and varied one, consisting as it will of motor bicycles, autogos, runabouts and victoriettes. The prices on these range from $280 to $1,500. The motive power of each is the French Aster gasoline motor, for which the company has the American agency, and is prepared to supply complete, with all accessories for attaching to any vehicle.

The Orient autogo, in the three-wheel model, has, during the past season, shown its superiority over French and American racing machines by winning most of the events and making new world's records at the Automobile Exposition at the Fair at St. Louis and at the Chicago tournament. The autogo which made the world's records and which was ridden by Albert Champion, will occupy a place in the exhibit, and is sure to be an object of much interest.

The wonderful work of the tandems and tricycles is sufficient proof, so the Waltham people claim, of the superiority of the French Aster motor combined with the Orient cycle construction, over competition the world over.

The Orient autogo was the first vehicle of this sort to be made in this country, and is the product of French ingenuity linked with the best American mechanism. Easily handled, it represents a style of motor vehicle destined to become popular. The four-wheel Orient autogo provides for companionship by

supporting on the forward wheels an upholstered seat poised on elliptical springs. The speed of the four-wheeler can be governed from 5 to 15 miles an hour, with a speed of 20 miles under the best conditions. The three-wheel Orient autogo can be governed to a speed of from 6 to 20 miles per hour, and, under the best conditions, 25 miles, at an expense of a quarter cent the mile.

The Orient motor bicycle and Orient autogos comprise a line distinct by itself, of interest more particularly, perhaps, to the cycling enthusiast who has graduated from the push and whose

Motor Tricycle of the Waltham Manufacturing Company

enthusiasm has commenced to drift towards the self-propelled vehicle. Apart from these is the line of automobiles for pleasure and business.

Two models will be shown. The Orient runabout, designed for either business man or pleasure seeker, is the medium price automobile of the Orient line, and in the entire show nothing can be seen that is superior for the money. Upholstered in leather or whipcord, fitted with 3¼ horse-power water-cooled motor.

The Orient victoriette is extremely graceful in appearance,

altogether different from the existing ideas in designs. The motive power is ingeniously concealed without resorting to boxy expedients. Its lightness renders high speed and hill climbing easy. It has a double seat, with a substantial covered top. In place of the usual dash is a single auxiliary seat. The running gears are painted bright in contrast with the highly polished black body. It is fitted with a 3½ horse-power Aster motor, with a range of speed from 3 to 18 miles an hour.

We present three illustrations of vehicles exhibited by the Waverley Company, of Indianapolis.

The frames of each of these vehicles are made of cold drawn,

Waltham Manufacturing Company's "Victoriette"

seamless tubing, with forged brayed connections. The front axle also is of tubular construction, the engagement with frame permitting oscillation around ring bolt, and so equalizing on uneven surfaces.

On these machines powerful band brakes are fitted, which are actuated by foot levers. Auxiliary brakes are also fitted for use in sections where the country is hilly.

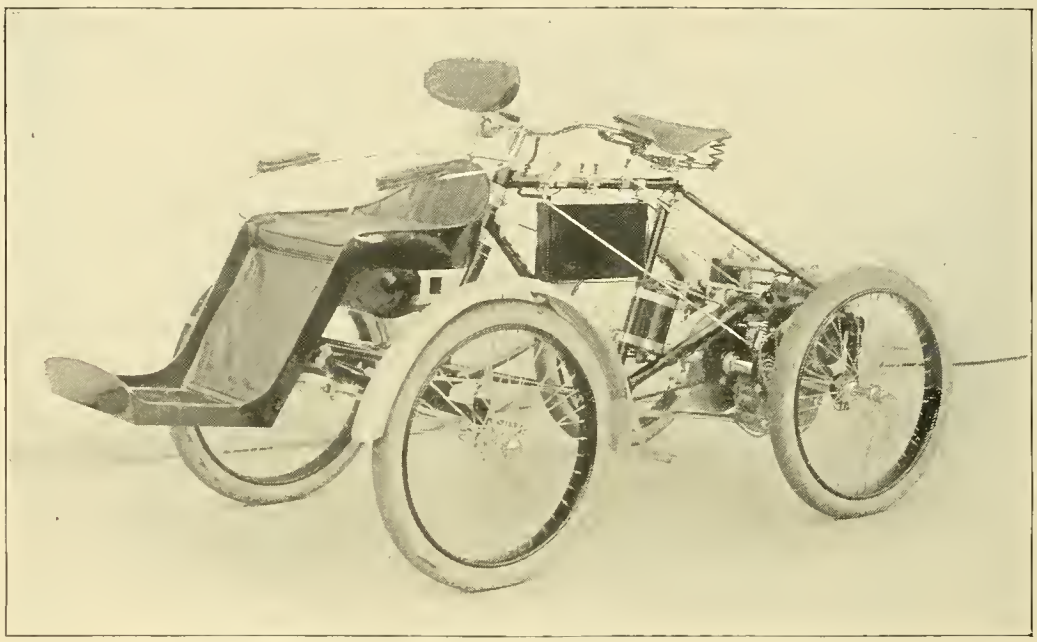
The motor is of the multipolar, ironclad type, being dust-proof and self-oiling. Single reduction gearing connects it with the rear wheels. This gearing is inclosed in a dust-proof case.

Steering is accomplished through a ball-bearing mechanism, a lever for this purpose being placed at the operator's right hand.

It is especially desirable that there be some method of making it impossible for any but the driver to start the machine, as serious accidents might otherwise occur. On the Waverley carriages there is fitted a lock rendering it impossible for anyone but the driver to operate the vehicle.

The delivery wagon is fitted with a special wheel and screw steering system. The bodies of all the carriages present a neat and graceful appearance.

The "Victor" automobile shown is made by the Overman Automobile Company, of Chicopee, Mass. It is a steam machine,



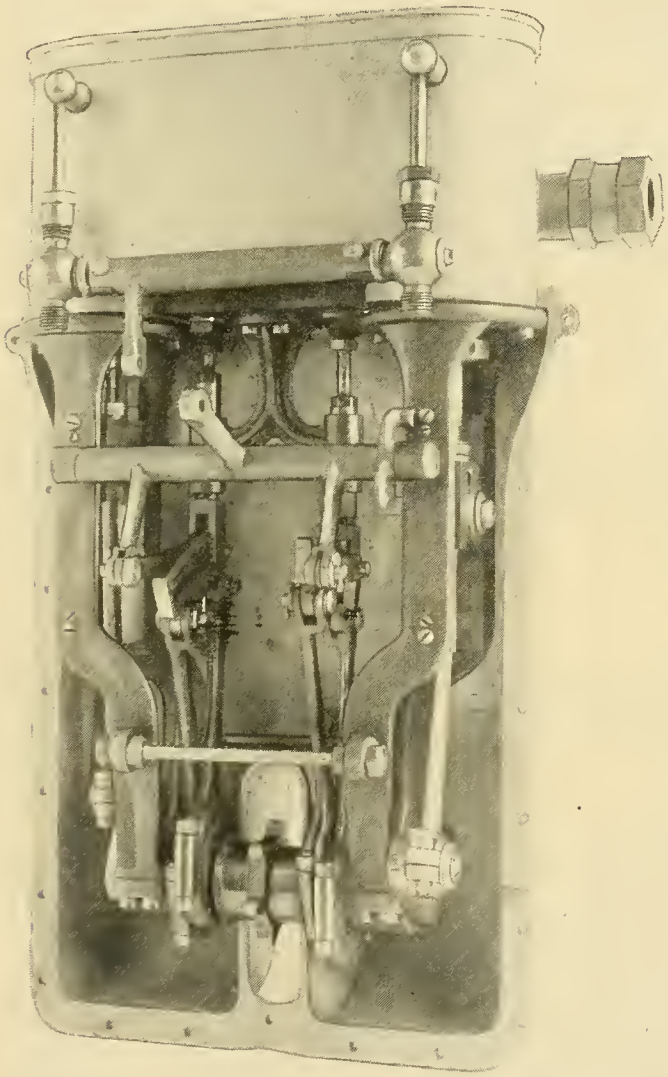
Waltham Manufacturing Company's Quadricycle

with automatic water and fuel feeding arrangements. The depth of water in the boiler is regulated automatically by a device that cannot get out of order, no floats nor similar devices being used. It is so arranged that it will always supply water to the boiler on level ground or when going down hill, and will supply water while the carriage is going up hill if the hill is very long, but it will do it then when needed.

By means of a lock the opening of the throttle when the driver's seat is unoccupied is impossible, and prevents the wagon being started through carelessness or mischief on the part of passersby when the wagon is standing. It practically locks the machine until the driver is seated.

It is claimed by the builders that with cold water in the tank, 150 pounds steam pressure in the boiler is obtained within ten minutes after starting the fire. Every part of the carriage is made of metal except the seat and footboard.

The engine, which is placed in the body of carriage, is inclosed within an aluminum case. This is partly filled with oil.



Engine of the "Victor" Automobile

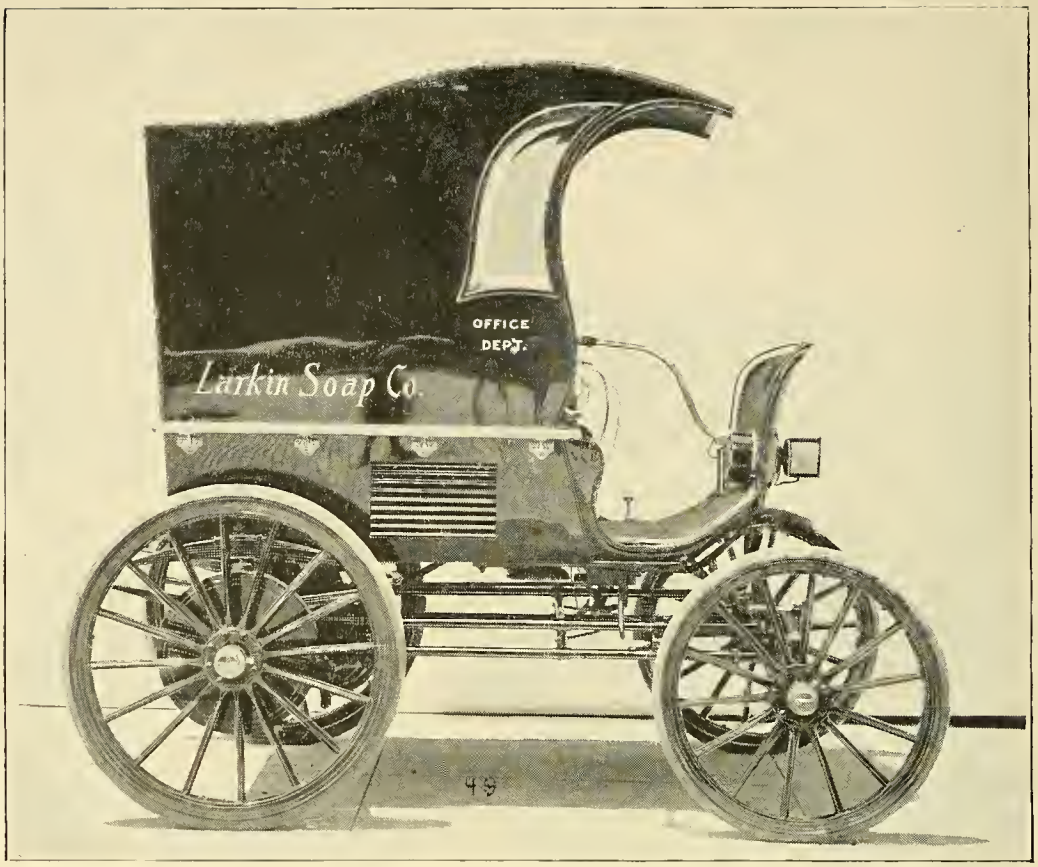
The general arrangement of the working parts will be seen from the accompanying illustration. The case is made of aluminum and is in two pieces. This makes a very compact piece of work and insures entire freedom from the annoyances caused by dirt and dust getting into the working parts. The fuel tank holds a sufficient quantity of gasoline to supply the burner while traveling a distance of from 50 to 60 miles.

John T. Robinson & Co., of Hyde Park, Mass., exhibited two carriages similar to the one illustrated, the other not having any top.

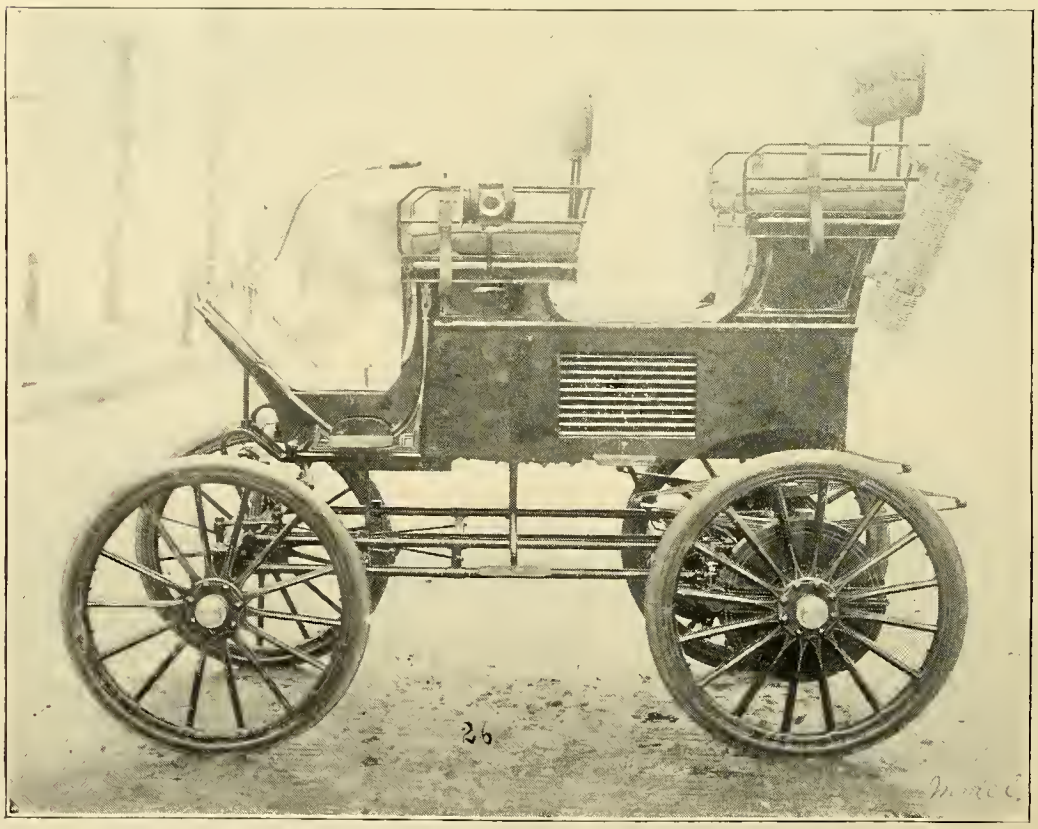
The carriage shown is made to accommodate two persons, including the driver.

The body is hung entirely separate from the engine truck. In these carriages two styles of bodies are furnished—a stanhope with victoria top and open stanhope with spindle seat. As will be seen from pictures, there is ample room provided for the passengers.

The Upton steering gear is used on these vehicles, which is made dust and dirt proof. This gear gives two speeds forward

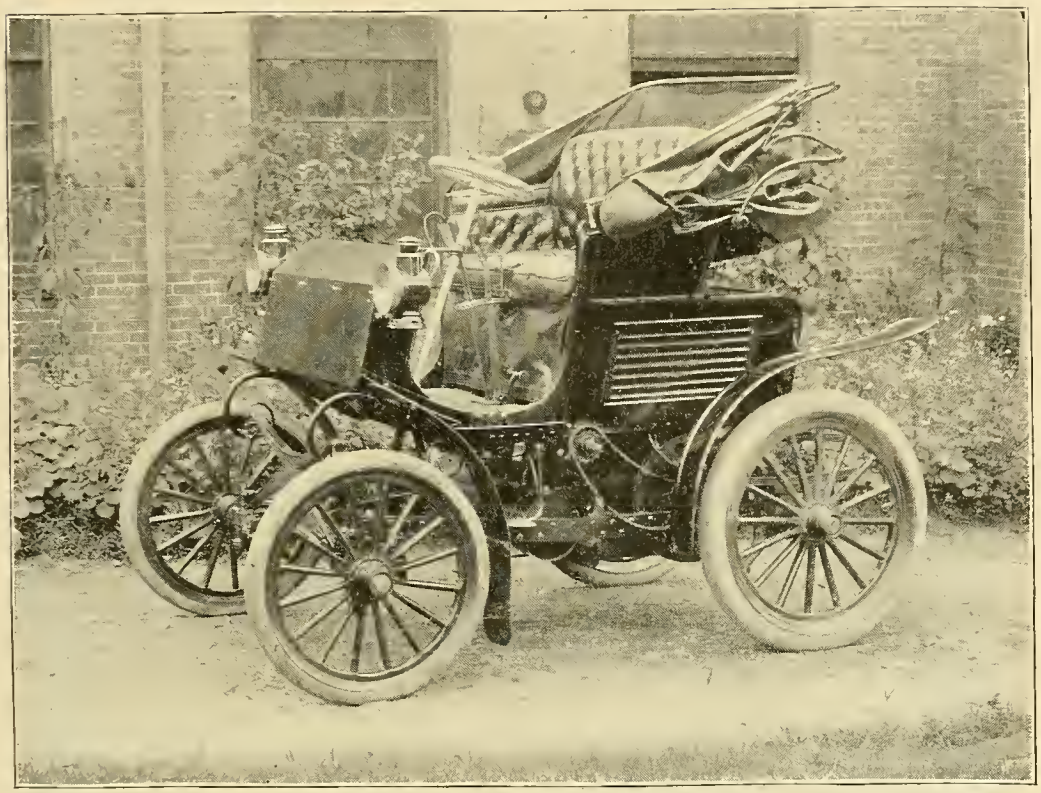


Waverley Delivery Wagon



Waverley Electric Brake

Automobile Exhibit at Madison Square Garden



The Robinson Gasoline Carriage

Stanley Carriage with Canopy Top

and a reverse. Lubrication is effected by means of one grease cup, with capacity for 100 miles.

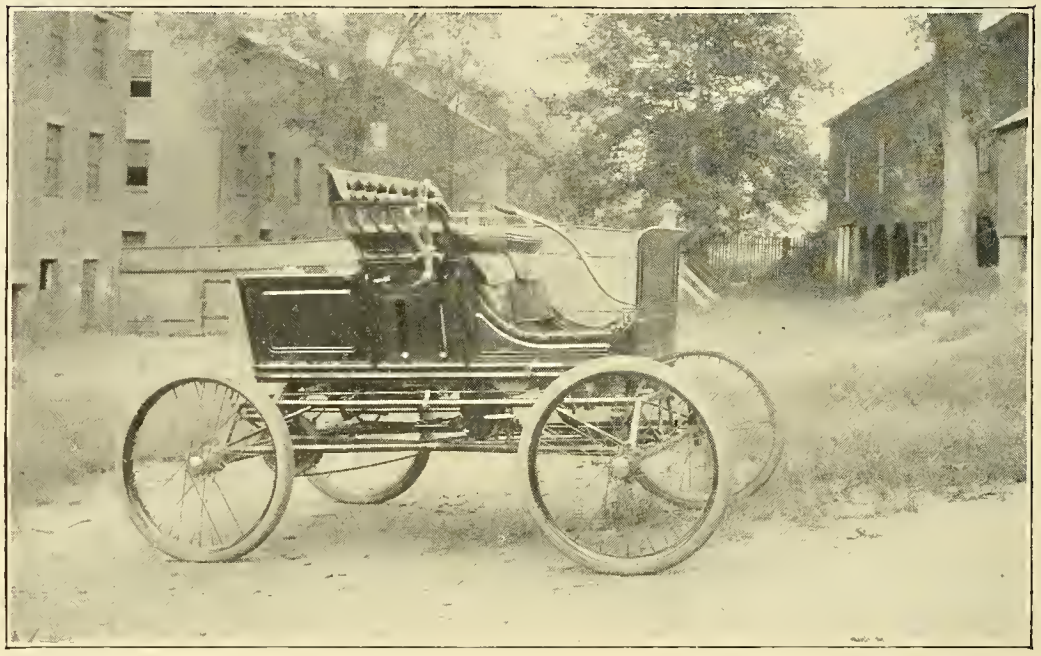
The engine has two cylinders, each of 4-inch by 6-inch stroke, and is so arranged as to make all parts easy of access and readily adjusted.

The wheels are fitted with 3 and 4 inch pneumatic tires. Roller bearings are used throughout.

The tank will carry sufficient gasoline to take the vehicle 100 miles.

The best material has been used throughout its construction.

We present illustration of one of a number of carriages



The "Victor" Automobile

exhibited by the Stanley Manufacturing Company, of Boston, Mass.

This is an open carriage provided with a canopy top.

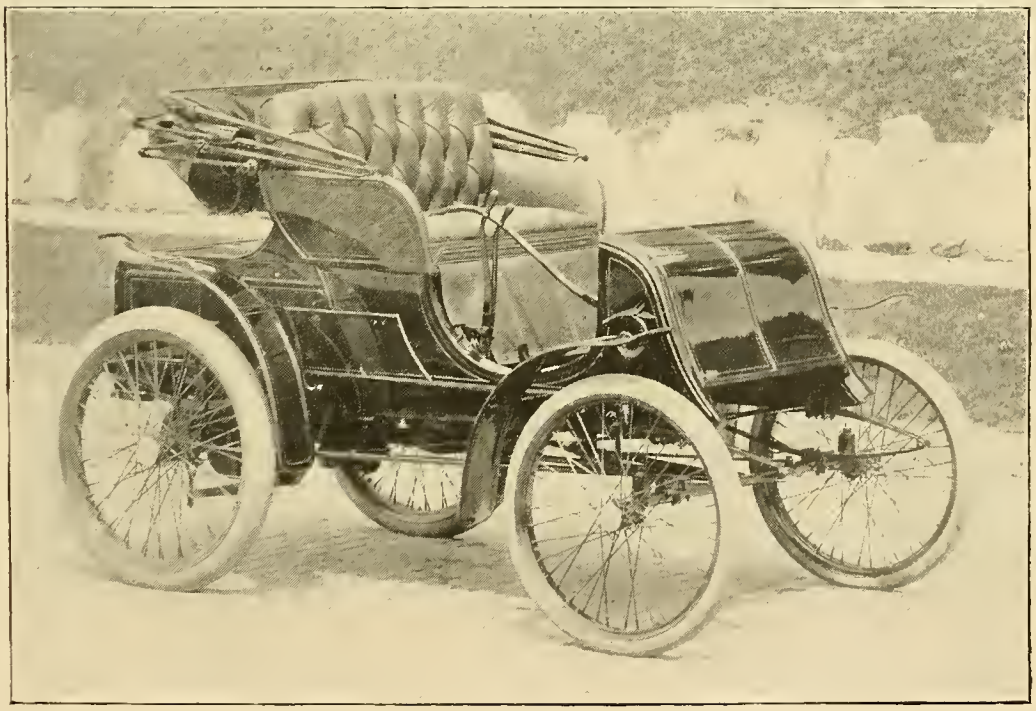
This carriage, when loaded with water and gasoline, weighs about 1,600 pounds.

A tubular boiler is used, the steam being generated by means of a gasoline flame. The engine used is of the compound type, with high and low pressure cylinders, which the builders claim has shown an increase of economy over the single type of engine of from 25 to 30 per cent.

Steering is accomplished by means of a handle bar which is conveniently placed in front of driver. This is moved to the

Automobile Exhibit at Madison Square Garden

Waverley Stanhope



Winton Two Passenger Carriage

right or left in order to guide the carriage in any desired direction.

In order to reverse the engine a lever is placed at the right hand of operator, which moves over a notched quadrant and is fitted with a locking bolt, which holds the lever in the desired position.

The boiler is made of firebox boiler steel, with copper tubes, and is built under the inspection of the Hartford Steam Boiler Inspection and Insurance Company.

Winton Two Seated Surrey

Braking is performed by a double powerful brake.

Ten or twelve miles an hour is the ordinary speed of the carriage.

The exhibit of the Winton Motor Company, of Cleveland, O., was extensive, but we illustrate only two of their styles. The illustrations show respectively their one-seated carriage and two-seated surrey. In these carriages, as in other Winton products, the motor proper and driving mechanism, together with all working parts, are concealed in the body of the carriage and so pro-

tected from dust and dirt. The motor is of single cylinder type and operates with hydro-carbon gas, generated from gasoline vapor and air.

Considerable objection has been raised to the exhaust from gasoline motors. In order to overcome this these vehicles are fitted with a "muffler," which takes proper care of the exhaust. This muffler is used only on Winton vehicles.

The gasoline tank is of sufficient capacity to permit operation from 80 to 100 miles. It will hold 4½ gallons.

The wheels are of bicycle construction, with 3/16-inch steel

The Auto-Car Company's Carriage

spokes, the rear wheel having 56, while the front wheel has 40 spokes respectively. Ball or roller bearings are used.

These vehicles have given great satisfaction, especially to users in hilly districts, where the service has been severe.

The company intends to exhibit a new carriage, however, which while possessing the essential features of the present vehicle will in many respects be much more desirable and have some decidedly new things about it.

The Locomobile Company of America will have a complete exhibit of various styles of carriage, though it was not possible for us to get ready for this article the necessary illustrations. The

space occupied by the company will be the largest individual one in the Garden.

The styles of Locomobile delivery wagons to be shown are as follows: Locomobiles, styles No. 2, No. 02, No. 3, No. 03, No. 003, No. 0003; Locoracer, style No. 4; Locosurrey, styles No. 5 and No. 05; Locodelivery; Locotruck.

All the vehicles shown by the company will be attractively decorated.

The carriages exhibited by the Autocar Company, of Ardmore, Pa., were of types similar to that illustrated.

These vehicles are equipped with a two-cylinder motor, of the "Otto" type, which is rated at 5 horse-power, although by actual brake test these motors are giving as much as 5 8-10 horse-power. The cylinders are horizontal and set opposite each other, the crank shaft being at an angle of 180 degrees. The valves, cylinders and heads are all water-jacketed, water being forced through the cylinders and radiator by means of a centrifugal pump attached to the motor shaft. The speed of the motor is varied from 240 to 1,000 revolutions per minute. Thus it will be seen that a complicated speed mechanism is not necessary. The transmission device is a very compact one, and there are but two gears in mesh at a time. Power is transmitted from the secondary shaft to the rear axle by means of chain and sprocket. The rear sprocket is attached to a small pinion, which in turn drives a larger one, mounted on the compensating gear. The compensating gear and rear axle, as well as the pinion, are all encased, thus keeping out dirt and dust, and run in a bath of oil.

The frame of the vehicle is set very low, and all attachments are mounted on the side bars of the running gear, so that various shapes of bodies can be placed on the standard running gear without interfering in any way with the motor or transmission.

The company is making centre steering and side steering devices for controlling the front wheels. One lever, which is located on the side of the seat, controls the entire mechanism. The transmission device has two speeds forward and one reverse. The slow speed, or low gear of the transmission, will drive this carriage up any ordinary grades at a speed of from 10 to 12 miles per hour. The high speed gear, with the motor running at its maximum speed, will give from 18 to 20 miles per hour, and by simply changing the lever attached to the motor from one notch to another, the speed of the vehicle can be increased up to 30 miles per hour, if necessary.

The radiating system of this carriage is a special feature, inas-

much as two, three to four gallons of water is sufficient to keep the engine cool for an indefinite time. The water is pumped from a small can in the rear of the vehicle through the engine and from the engine through the radiating can, which is placed in such a position under the foot board, or in front of the carriage, where the greatest possible amount of air will be obtained. In this way the water is kept down below the temperature of boiling point. Wire wheels, with pneumatic tires, are employed.

All parts of this vehicle are made interchangeable, by the use of automatic machinery.

The Cunningham Engineering Company, of Boston, makers of steam wagons and power transmission devices, were among the exhibitors. The wagons made by this firm are of three sizes, one to carry 3 tons, another 6 tons, while the largest size is constructed to transport 8 tons.

The Cunningham Company believed that the motive power should be applied to the wheels carrying the greatest burden when the vehicle is light and that power applied to all the wheels will be more effective, because of the increased traction.

As a result of experiments carried on by the company a chain gear transmission device has been designed which is applied to forward and rear axles alike, hydraulic clutches being introduced into both forward and rear connections, enabling the operator to apply or release the power from one or both axles at will.

The brake used on those wagons consist of an upper and lower friction clamp which grips the surfaces of the outer shells of the clutches.

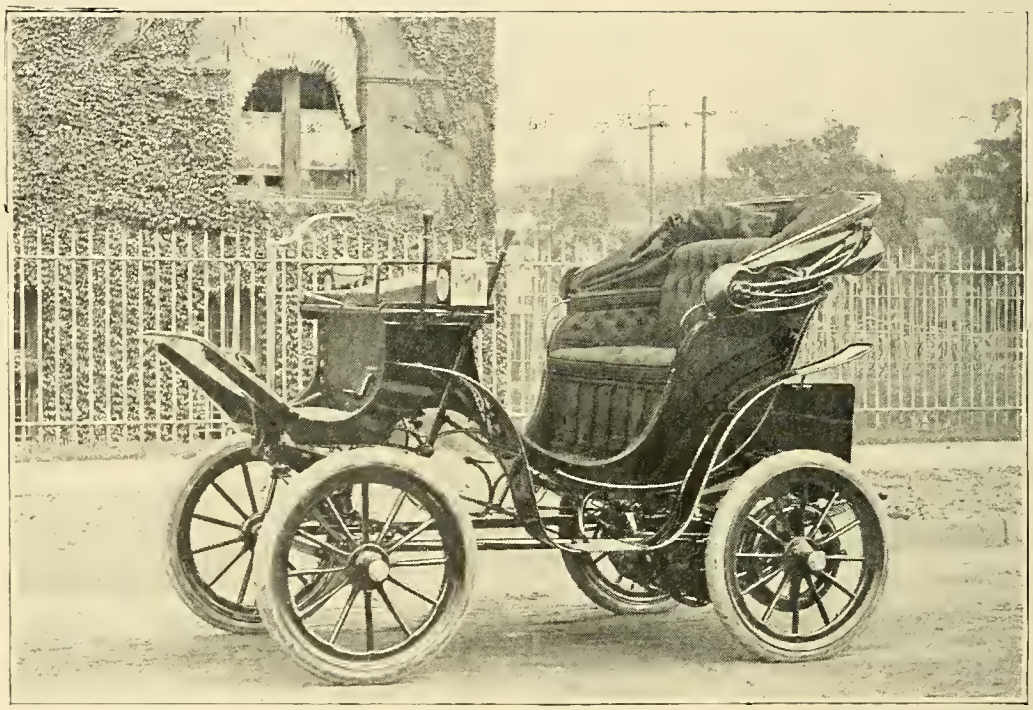
The Electric Vehicle Company's exhibit will include 18 Columbia automobiles showing the different styles of pleasure, transportation and business vehicles, consisting of the following types: Phaeton, tricycles (one with jaunting car seats, one standard), gasoline runabout, eleven-passenger wagonette, delivery wagon, six-passenger omnibus, eight-passenger omnibus, runabout, victorias (one to have English canopy top, one to have hood), straight front brougham, extension front brougham, surrey, Gabriolet, delivery wagon, rear-boot victoria, hansom.

We have not space at our disposal to show all the machines and can only therefore illustrate three of them, while we must confine ourselves to mere descriptions of some of the other exhibits.

The Columbia phaeton is one of the best known and most popular styles of automobiles built by the company. They have delivered to their customers over two hundred, of which number sixty have been shipped to Paris. The finish is in shades of dark

green, and every detail of both finish and trimming is of the highest class obtainable. The wheels are wooden with heavy pneumatic tires and are mounted on ball-bearings, as are the other moving parts. The third seat at the rear, or rumble, makes provision for a groom or other attendant. If desired, however, this seat may be removed and the tail-board shut up. The mileage capacity on one charge of the batteries supplied as standard is thirty. The speeds are three, six and twelve miles per hour.

The runabout has been a great favorite from the time it was first offered. They are in use in all the large eastern cities, and in San Francisco, Denver, St. Louis, Chicago and Mexico. The spring suspension is remarkably easy. The mileage capacity is



Columbia Cabriolet

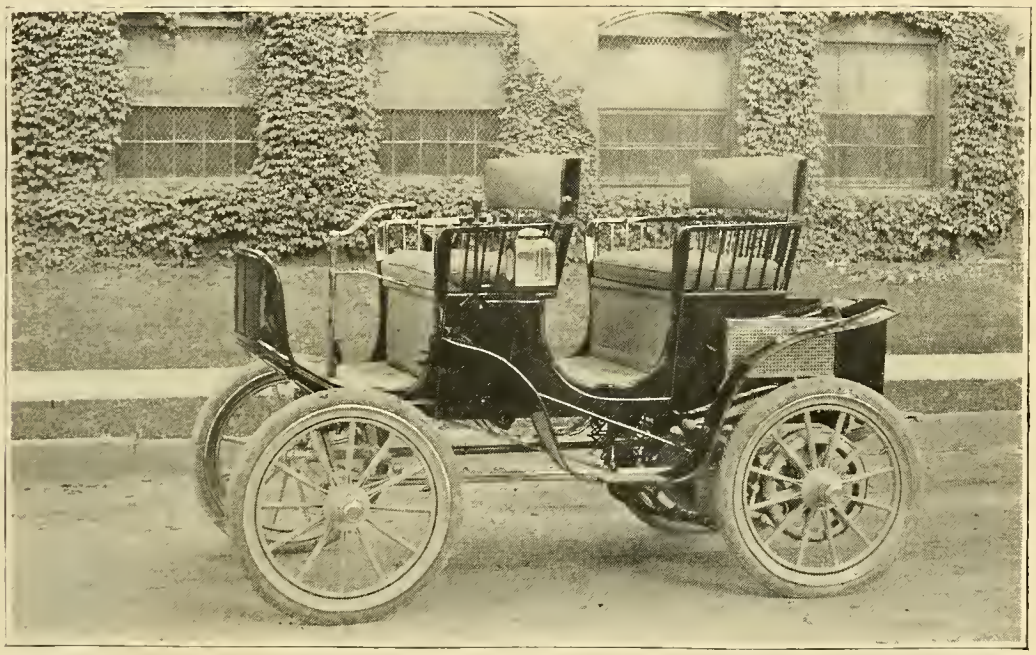
twenty-six on one charge of the batteries, and its speed up to thirteen and one-half miles per hour.

The Columbia Victoria has graceful lines, and the light running qualities of this little vehicle make it an especial favorite. The main side panel is finished in automobile red, the battery compartment being black. It can be furnished with a hood or English canopy top, as an extra, when specified. The long wheel base and easy spring suspension are noteworthy features. Its mileage capacity on one charge is twenty-six, and it gives speeds up to thirteen and one-half miles per hour.

The Columbia Rear-boot Victoria is one of the latest styles

offered by this company. The rear seat provides room for a driver and a "tiger," while the broad passenger seat gives comfortable room for two occupants. The upper panel in the seat is finished in light yellow French cane work, and the lower panel in a dark green, and a remarkably smart effect is the result. The mileage capacity on one charge of the batteries is twenty-five. The speeds are three, six and twelve miles per hour.

The Columbia Cabriolet follows the general lines of the comfortable horse-drawn vehicles of this style, which are so largely used in Paris, and in recent years have become so popular for calling and general driving in this country. On one charge of the batteries its capacity is twenty-five miles and its speed is twelve miles an hour.



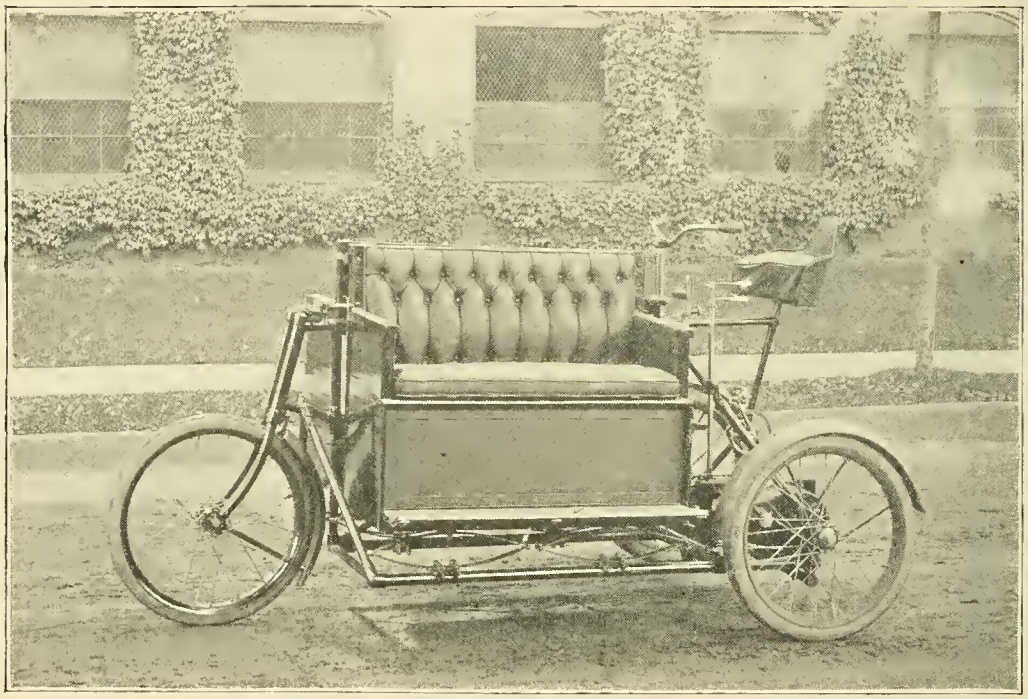
Columbia Surrey

The Columbia Surrey is one of the most recent productions of the Electric Vehicle Company, although a few have been in use since the latter part of August. It comfortably accommodates four occupants, and can be equipped, when specified, as an extra, with a canopy top. Its mileage capacity one one charge of the batteries is twenty-five. Its speeds are three, six and twelve miles per hour.

The Columbia Broughams are built with straight fronts and extension fronts. The former style accommodates two passengers, the latter four, in addition to the driver and attendant on the front seat in each case. For theatre service, for calling and

for physicians' work, they are largely used. They attain a speed of eleven miles an hour and the mileage capacity is twenty-five on one charge.

The Columbia Hansom is one of the earliest types of public automobile vehicles put on the market by the Electric Vehicle Company, and was the first to become a familiar sight in the streets of our large cities. It has the well-known advantages of the horse-drawn hansom, with the added one of having the view from the front of the vehicle entirely unobstructed. It is in steady demand for all public vehicle purposes and more than three hundred are in use. It has a mileage capacity of twenty-five and attains a speed of eleven miles an hour.



Columbia Tricycle with Jaunting Car Seats

The Columbia Six-Passenger Omnibus was designed especially as an opera bus, and has been very well received. Among the many automobiles shown by the Electric Vehicle Company at the Paris 1900 Exposition, this was the subject of especially favorable comment. It will be recalled that the Electric Vehicle Company was placed *hors concours* at Paris on account of its representative being one of the members of the jury. A similar honor was accorded only to one or two of the leading French manufacturers. Its mileage capacity on one charge is twenty-five and its speed ten miles an hour.

Automobile Exhibit at Madison Square Garden

The Columbia Wagonette is the largest automobile, as regards passenger carrying capacity, which has yet been placed on the market in numbers as a standard vehicle by any automobile firm. It takes eleven people besides the driver without any crowding. For public service and pleasure excursions of any nature, they are largely used, and are also giving excellent satisfaction in the former class of work in different cities. One charge suffices for twenty-five miles and a speed of ten miles an hour can be attained.

The Columbia Gasoline Tricycle Carrier has been found to fill an especial demand for a delivery automobile capable of carrying light weights at a high speed over considerable distances. It will take merchandise up to 500 pounds besides the driver, and can be run at a speed of over twelve miles per hour. One charge of the gasoline tank suffices for seventy-five miles, and the water tank needs refilling after each run of twenty. This vehicle can also be equipped with seats running lengthwise, thereby transforming it into a species of jaunting car. It is claimed to be the simplest and most economical gasoline delivery automobile now on the market.

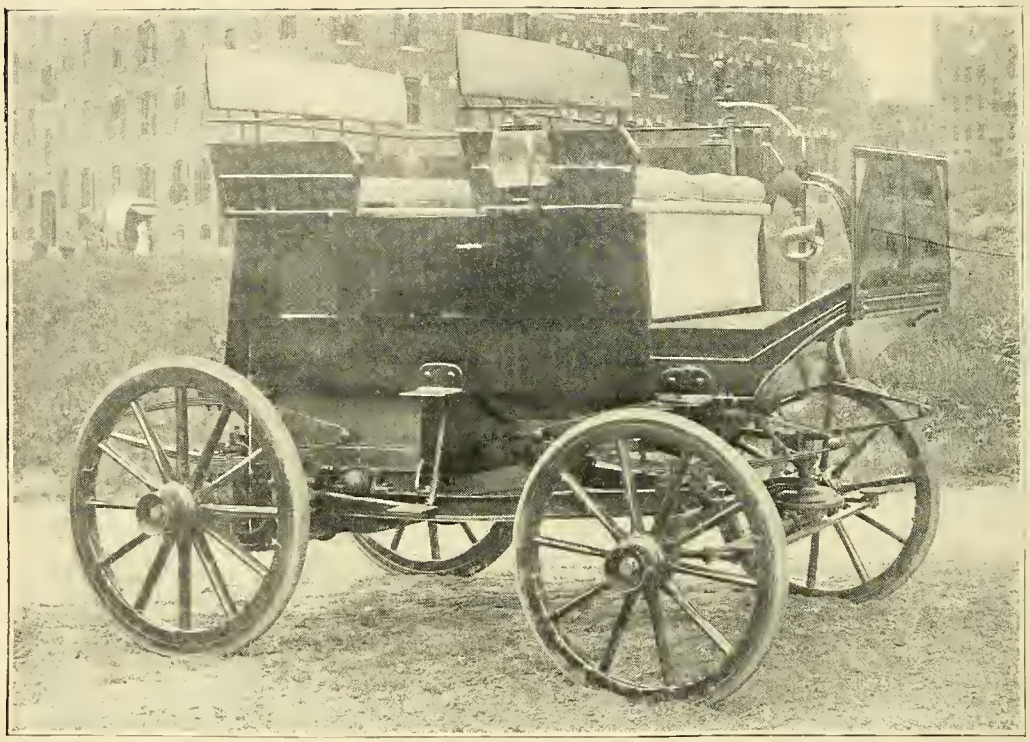
The small Columbia Delivery Wagon has been only recently offered. It will carry a load of 600 pounds besides the driver and attendant, and has ample bulk capacity for florists, laundries and other establishments dealing in merchandise of similar character. It is good for a mileage on one charge of the batteries of twenty-five, and its highest speed is eleven miles per hour.

The other Columbia Delivery Wagon exhibited is the well-known type of electric wagon turned out by the Columbia Company, over ninety of which are now in use in different localities. It will carry up to 1,000 pounds of merchandise, besides two occupants on the front seat. It is good for a mileage on one charge of the batteries of over twenty-five and speeds up to eleven miles per hour.

The Holyoke Automobile Company, whose works are at Holyoke, Mass., will show one of their cross-country touring surreys at the Madison Square Garden Exhibition. The Holyoke carriages are driven by gasoline engines and differ materially in construction from the majority of automobiles. There is no countershaft running and no gearing except for extreme hills. The body of the carriage does not carry any of the machinery.

The running gear of the carriage consists of a frame of heavy channel irons, having pivoted at its forward end a front axle, so that the wheels may follow the inequalities of the road without straining the frame. The rear axle is carried in a pair of bronze yokes, which allow of its removal by unbolting the yoke bars and

break rods and loosening the chains. The engine is carried in its own frame, which is supported on transoms on the running gear. The engine frame carries the clutches and their mechanism so that they may be removed as one piece from the engine by loosening a few bolts. The channel iron frame is supported on the rear axle by coiled springs inside the yokes, so that the engine, which is a two-cyinder vertical one, completely water-jacketed, is spring supported, and the jolting of the road reduced to a minimum. No carbureter is used, but a special mixing device, which is unusually perfect, and does not require adjustment. The ignition is electrical and of the make and break type, the current



Cross Country Touring Surrey of the Holyoke Automobile Company

being supplied by a dynamo driven from the engine, the dynamo also furnishing current for the side lights. A small battery is employed for starting, which is exceedingly easy, a half turn of the crank being usually sufficient; the relief valves on the engine reducing the muscular effort to a minimum by destroying the compression during starting. The clutches are unusually large, being a foot in diameter. They are carried directly on the engine shaft and are contained within the fly wheels, of which they form a part. The high speed gear and the medium speed are both taken directly from the engine shaft by a direct chain drive by means of the two clutches. There is thus no gearing in use the

greater part of the time, as the medium speed will ascend a 10 per cent. grade on a good road. For extreme hills and for backing gearing is employed which is driven from the medium speed clutch. All the gearing is contained on the back axle and is removable with it.

The carriage body is carried directly on the axles by double elliptic springs and has no other connection with the running gear except the clutch and break rods. Two powerful band brakes are applied to the rear axle. They will stop the carriage within 75 feet without shock or jar, going down a 5 per cent. grade at a speed of 25 miles an hour. The steering is done by means of a screw which renders the wheels irreversible and prevents the transmission of heavy shocks from the rod to the steering handle. So perfect is this device that a gutter has been jumped at a speed of 25 miles an hour, with hands off, without altering the course of the carriage in the least.

The company's latest type of body is an all-metal one, designed with the special reference to the accessibility of the machinery and to carrying luggage. The side, front, back and top of the seat are all made removable by the use of a small key. In front is a large, hollow dash board for carrying mackintoshes and other light luggage, while on the phaeton and runabout type there is provided a place in back of the seat for carrying a suit case or two. In the surrey storage space is under the front seat. The only difference between the surrey and phaeton is in the body; the running gears and engines are the same. The bodies are interchangeable. A speed of 25 miles an hour on good, level roads is attained, and 5 miles an hour on 20 per cent. grades. The speed of the engine is controlled with a throttle, by which the speed of the carriage may be varied from 7 to 25 miles an hour, with the high-speed clutch in use. The carriages carry fuel supply for 150 miles of ordinary roads and water sufficient for 50 miles.

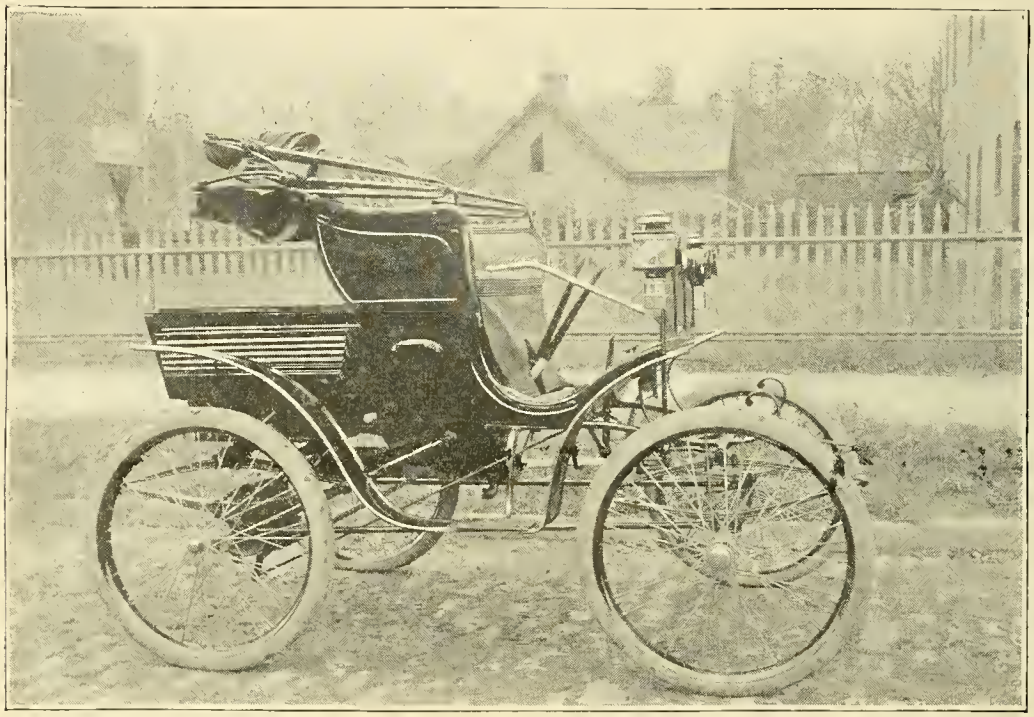
These carriages are essentially for heavy touring work and cross-country runs. They are built more on the lines of a Pullman car than of a light speed wagon, and have been subjected to some severe tests to prove their durability. It is not considered that weight is any objection where needed to gain strength and durability, as the engines are well able to take care of all the load they have to pull.

The St. Louis Motor Carriage Company, St. Louis, Mo., exhibited two vehicles, both of which are illustrated.

The runabout is without the top and sells for $1,000. Is fitted with latest style of single cylinder self-contained motor.

All gearing and speed changes are in the base of the engine, fitted throughout with ring oilers, making frequent attention unnecessary. But one friction clutch is used. The lever which operates this clutch and the lever which operates the speed changes interlock by a patent interlocking system which makes it absolutely impossible to strip the gearings by mishandling. When the vehicle is moving the only thing the operator can do is to release the clutch and throw on the brake in case he becomes confused for any reason. The tanks for cooling are on the side, where they get all the passing breezes.

The trap is built to carry four passengers, with a rear seat



St. Louis Motor Carriage Company's Runabout with Buggy Top

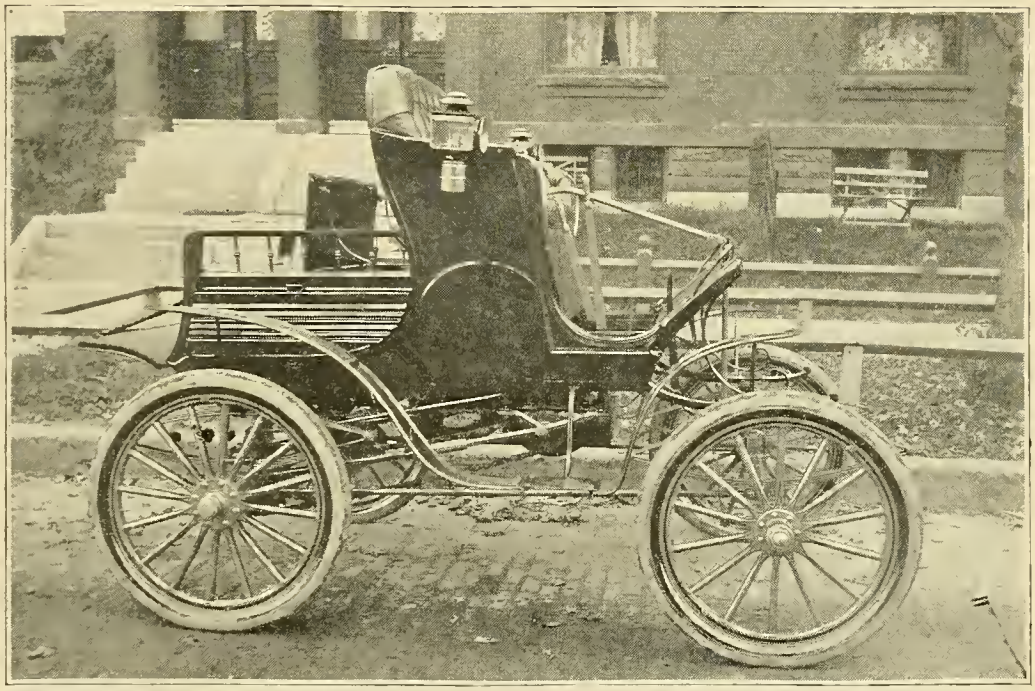
which folds out of sight when not in use. This is fitted with a double cylinder motor of larger power than the runabout.

The De Dion-Bouton Motorette Company, who are the American representatives, sole agents and licensed manufacturers of the De Dion-Bouton Company, of Puteaux, France, whose reputation is world wide as the most successful manufacturers of the lighter types of motor carriages called motorettes or voiturettes, also motor cycles, including tricycles and quadricycles, will make their bow to the American public with a full line of their different types of motor cycles and motorettes.

This company was organized only a few months ago, and has

established their works in South Brooklyn, at the corner of Thirty-seventh street and Church lane, where they have practically unlimited facilities for the turning out of their products, and the motorettes to be exhibited at the Garden will be the first product of the factory.

The De Dion-Bouton Company, of Puteaux, France, are the original inventors, patentees and developers of a very successful hydro-carbon or gasoline system of the lighter class of vehicles of this type, and practically every first-class manufacturer in England, France and Germany use motors of the De Dion-Bouton Company's make in connection with their motor cycles and motorettes.

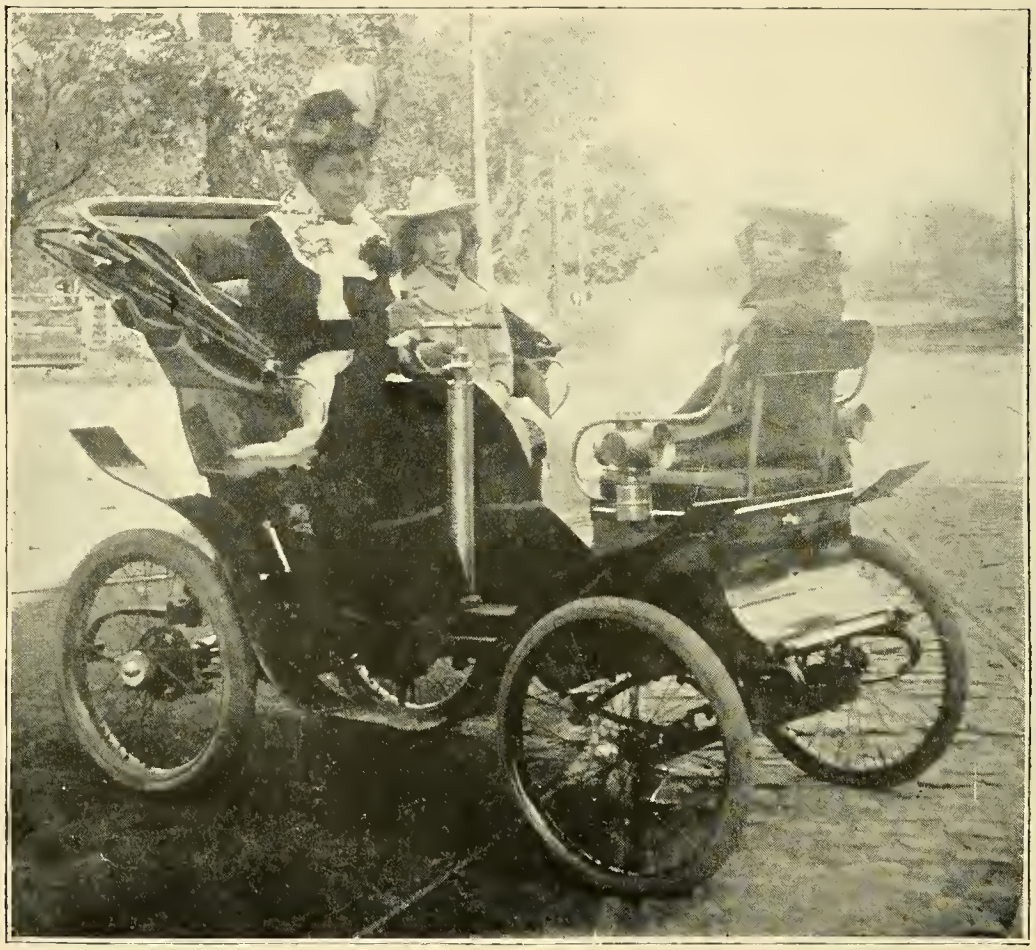


St. Louis Motor Carriage Company's Trap

The American De Dion-Bouton Motorette Company is therefore in a position to furnish the American public for the first time with a successful, practical and thoroughly tried and perfected hydro-carbon or gasoline system of motorettes and motor cycles, and the cordial reception, indorsement and large amount of business that has already been received by them shows the appreciation on the part of the American public of the success of this well-known system.

The exhibit of the De Dion-Bouton Motorette Company will be found on the left-hand side of the Madison Square Garden, in the left corner.

The company is presenting for the inspection of the public four different samples or types of their New York motorette, each one having some special modifications or typical features, illustrations of which are shown herewith. This motorette certainly presents to the public the most desirable type of general motor carriage or motorette for all-around use. They are intended for general pleasure purposes and use in the city and country in touring, and are built to operate at a fair rate of speed, up to a maximum of 25 miles per hour, which is believed to be all



New York Type "Motorette" of the De Dion-Bouton Motorette Company

that is desirable for pleasure purposes. Another very attractive modification of the New York motorette is a surrey operated from the front seat, with a hood or top over the rear seat. Where long rides are desired, and where parties object to riding backwards, this modification of their standard motorette is certainly a very desirable one. Another type of New York motorette which certainly will attract special attention, particularly from the doctors and for use around the city for calls and going out

evenings, is the doctor's brougham, which is operated from the inside and holds two passengers.

The company also shows a design of a gasoline hansom cab which they are building, but which it was unable to complete in time for the Exhibition. This certainly is going to fill a long looked for want in a practical commercial cab for hiring or for commercial purposes, to be operated by a *chauffeur*.

Coming to the next general type brought out by the Motorette Company we find a very attractive, natty little Brooklyn type for two passengers. This carriage certainly is one of the best little

Brooklyn Type "Motorette" of the De Dion-Bouton Motorette Company.

two-passenger runabouts for all-around purposes. The capacity of the motor is sufficient to take the vehicle up ordinary grades. We learn that quite a number of the officers and members of the Automobile Club of America, as well as of other automobile clubs in different cities, have ordered from the Motorette Company motorettes of the New York and Brooklyn types.

Three different types of motor quadricycles are shown. These types of motor cycles are the most popular type in Europe of all those manufactured, and the Motorette Company believes that when the American public comes to a full realization of the pleas-

ures and touring capacity of these little quadricycles in place of bicycles, there will be a large demand for the same.

They also have a new type of unconvertable quadricycle, which will be put on the market next Spring. This latter machine is equipped with a very powerful motor and is expected that it will be a favorite with the American riders. They also show several types of motor tricycles.

In the special exhibit of the Motorette Company, in connection with the special exhibit of the Automobile Club of America, is shown the high-power racing tricycle, which is equipped with a

Motor Tricycle of the De Dion-Bouton Motorette Company

special 7 horse-power motor, which is capable of a speed of 50 miles per hour. This machine won the 900-mile Paris-Toulouse Race in France a few months ago.

In this special exhibit is also shown a New York type of motorette which has a record of over 7,000 miles run the last year, and is in perfect running condition to-day, which shows no appreciable amount of wear as result of its service. The last trip of this motorette was a 1,600-mile run to the Chicago Automobile Contest.

In addition to this, the company is showing a special high power type of New York motorette, used by Mr. C. J. Field, Vice-President and General Manager of the company for touring purposes, with an extra high speed and capacity over the New York type No. 1, capable of operating at a speed of 35 miles per hour.

The Motorette Company will have two motorettes for a practical demonstration on the track and outside the Garden for those who desire to make a trial of them.

The Haynes-Apperson Company will have three carriages on exhibition, each one interesting. The double seat or four-passenger carriage is equipped with an 8 horse-power double cylinder engine. This company has a special form of automobile engines which were designed by them early in 1894. Its cylinders are arranged on opposite sides of the crank shaft, the cranks being arranged to avoid vibration. They use three forward speeds and one backward.

The speed changes are all controlled by one lever, so that the management of the carriages is entirely controlled by the two levers. The regulation and the flexibility of their engines are controlled by a throttle, the same as in a steam engine, and the speed of the engine is as sensitive to the throttle as in a steam engine. The gasoline is fed to the vaporizors through metal piping and is controlled by a float. The proper mixture of gasoline and air is secured at all times, whether a light or heavy charge is used. The valves for controlling the mixture are operated by a foot lever conveniently located in the floor of the carriage. By controlling the size of the charge the impulses of the engine are regular, whether under light or heavy load, thereby reducing the vibration to a minimum. Their vehicles are all fitted with large pneumatic tires of a special construction. They use an improved roller chain, which is also of their own design and made especially for their use by the Baldwin Chain Company.

Flexible roller bearings are used in its axles, their steering arrangement is of original design and their frame construction has many patented features.

The Automobile Which the Public Wants

MUCH time and attention is being given to the racing automobile at present. Undoubtedly this feature of the motor vehicle is useful for certain purposes, but the generality of people are not looking for racers, but a reliable, serviceable carriage. In this connection it may interest some to read a short paragraph which appeared in a recent issue of the Providence *Journal*. It said:

"Many newspaper writers, well informed on most of the topics discussed by them, gravely describe the automobile capable of a rate of thirty or forty miles an hour as 'the perfect motor vehicle.' Those who have had practical experience know that the 'perfect automobile' must have other recommendations. Capacity for speed is by no means the most important requirement. A vehicle which will average ten or twelve miles an hour ten hours a day for three hundred days without expensive repairs when operated by a person of ordinary judgment may properly be considered 'perfect.' As yet no builder has produced a mechanically driven carriage which has successfully withstood such a test. Excessive speed on city streets and country roads is neither desirable nor safe, and record-breaking runs have only one good feature—they show weakness in construction and errors in design more quickly than trips made at moderate rates of speed and thus enable manufacturers promptly to correct miscalculations as to the strains caused by jolting over rough highways."

Book Review

"Horseless Vehicles, Automobiles and Motor Cycles," by Gardner D. Hiscox, published by Norman W. Henley & Co., No. 132 Nassau street, New York; price, $3.00. This book opens with an historical account of the motor vehicle industry, accompanied by a number of illustrations of early carriages. There are chapters devoted, respectively, to vehicles using steam, gasoline and electric motors. The book contains numerous illustrations of the different forms of carriages now in use, and ought to prove of value to those interested in the construction and practical manipulation of automobiles generally.

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A Live Journal for all interested in Motor Vehicles

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THE AUTOMOBILE FROM A COMMERCIAL POINT OF VIEW

ON another page of this issue we reprint the first part of an article by Mr. Fliess, in which he views the automobile industry from a commercial viewpoint, and it is probable that his article could not have appeared at a more opportune time.

At present there are doubtless many persons of means who have serious thoughts of investing money in automobile enterprises. The question which naturally is uppermost in the minds of such people is, "How long will the fad of automobilism last?" Of course, as it now stands the automobile is largely used as a pastime by the majority of private individuals. One reason for this is undoubtedly the high price asked for them, while at the same time it is true that not a few physicians have already put money into them for professional service.

Editorial

Apart from the pleasure of automobiling as a pastime, it would be very difficult for one to visit our large cities and observe in how many ways the motor vehicle is used without feeling convinced that it had already become and will continue to be more and more an important factor in the social and commercial life of our country. It is because of the automobile's practical utility in these two very important phases of our relations one with the other that leads us to have settled convictions in the soundness of the industry and its ultimate development.

It would be well, however, for those who contemplate the investing of money in automobile enterprises, to go very slowly. In the case of new fields of work, such as the automobile, what is new to-day may be antiquated to-morrow.

There can be little doubt but that there will be a great demand for that style of motor vehicle which will displace the horse in actual service. None of the machines so far placed on the market are all that could be desired, but it is reasonable to expect that at no very distant time the " carriage of the future " will make its appearance.

The Final Automobile

IN the October issue we published the first of this series on the practical construction of automobiles. That paper dealt with the bearings, and under the title of " Permanent Bearings " gave the result of Mr. Dolnar's long experience in that direction. The present issue takes up " Location of Motor and Power Transmitting Elements," while the remainder will deal with Clutches—Fuels and Combustion—Motor Framing—and Wagon Framing and Wheels—in the order named.

While the title may sound ultra-positive on the part of the author, his practical experience gives weight to his arguments, and he is proving his faith in the conclusions given by investing many thousand dollars in a machine which depends largely on the truth of these principles for its success.

Automobile Show at Grand Central Palace

THE list of exhibitors at the automobile show to be held at Grand Central Palace, November 14 to 24, will include a large number of those who exhibited at the Garden.

It occurs, not during the warmest political week of the whole campaign, but after the turmoils of election are over and when things have resumed their normal routine, which ought to be in its favor.

The Palace show has the advantage of occurring during the Horse Show week, when more than 50,000 out-of-town visitors are here taking that show in.

The Cooke Locomotive and Machine Company will exhibit a truck with a carrying capacity of 3½ tons, 17 feet 6 inches long and 8 feet 6 inches extreme width across platform. This will be the first time this truck has been exhibited in the United States—in fact it is the first truck to be constructed in this country under the patents of the Thornycroft Steam Wagon Company, of England. It has been in satisfactory operation for the past three months.

It is expected that the whole exhibiting space will be taken before the show opens. There are now, however, a number of desirable spaces vacant. Full particulars may be obtained by addressing Marcus Nathan, Manager, Grand Central Palace, New York.

The Final Automobile

Hugh Dolnar

II.—Motor Location and Power Transmission Elements

CUGNOT began automobile construction with a pair of oscilating steam cylinders in front, and his use of the oscilator was followed in a solitary instance, shown at the Times-Herald 1895 Chicago Automobile Exhibition. This Chicago wagon had an oscilating cylinder on each side, 2-inch bore by 12-inch stroke, with direct independent spur gearing to the independent rear drivers, and a Scotch boiler, fired by

plumber's gasoline torches, under the wagon seat, and resembled Cugnot's venture in not making nearly enough steam to supply the cylinders. Dr. Gurney, Hancok and Dance placed their steam cylinders in various positions, always close to the boiler. Dr. Gurney invented the water tube boiler, and Hancock used a pair of double acting steam cylinders secured to his vertical internally fired boiler, and working downward on a crank shaft carrying two sprockets chain connected to the rear driving wheels. Period, 1825 to 1837, say. Then the partisans of the "Hay Motor" triumphed until the '90s. With the revival of the use of steam on common roads in England, nothing could suit the fine conservative tastes of the English wagon designers except the placing of a little hoisting engine on the wagon platform, usually in front, fancy and invention being strictly forbidden in all respectable English engineering circles.

Daimler, when he found his little pleasure route gas motor driven railway line a success, made wagons with two or four vertical or slightly inclined internal combustion trunk cylinders placed both in the rear and front of the vehicle, and so was first in those types. Benz was a quick follower with a single horizontal gas driven cylinder, Otto cycle, and, of necessity, a heavy flywheel. The various French makers of road wagons have commonly preferred vertical internal combustion motors, placed between the front and rear axles. Except in a single instance there is as yet no established type of motor wagon for use on common roads.

In the first paper of this series an attempt was made to show that a permanent bearing, requiring neither lubrication nor attention for many days together, might be produced. If such a bearing can be found it is very clear that it must be rigidly supported by the motor and wagon framing to obtain the full measure of its possible advantages. It is money thrown away to build costly ball bearings having only a very small clearance, unless they can be made to properly support the journals running in them. Hence the first demand for all the wagon framing members which support moving parts, is rigidity and inflexibility. The degree of rigidity demanded is, however, relative only, and not absolute. As is well known, absolute rigidity of support is extremely difficult to obtain even where deeply sunken foundations of massive masonry are admissible, and an absolutely rigid support for automobile bearings is evidently an absurd requisition, if the bearings are to be distributed in widely separated locations on the wagon frame.

Certainly the very first requirement of the automobile is light-

ness of construction, because every pound of weight must be carried on the pneumatic tires, which should be loaded as lightly as possible, and because every pound of wagon weight must be driven by the motor, and is non-paying load, and so should be reduced to the lowest possible limit. Notwithstanding these manifestly correct weight and lightness assumptions, many automobile builders assert that a much greater weight of wagon than is really needful to carry the motor and the passengers should be given to the wagon, to obtain steadiness of motion while running. George Whitney, who built some eight or ten steam wagons, no two alike, made his first wagon to carry two passengers weigh only 650 pounds, but at the time of the completion of his eighth experimental vehicle he said that a road wagon to carry two passengers should weigh not less than nine or ten hundred pounds, this great excess of weight over the actual load carrying demands of the wagon being needed, as he expressed it, "to make the wagon stay down on the road." The European wagon builders appear to make no special effort to reduce the weights of their vehicles, which are held as light at a thousand or twelve hundred pounds, and run up to fifteen hundred pounds, and a ton, when half the weight would easily and safely carry the paying load; that is, the passengers and the motive elements. Winton, some of whose wagons have given great satisfaction in steady use, makes no particular effort to avoid weight, and builders in general seem to agree substantially with Whitney, that a thousand or twelve hundred pounds of wagon weight is not objectionable. From the standpoint of engineering economics, however, the lighter a wagon of given capacity can be made the better it is, so long as safe load carrying capabilities are secured.

The value of light construction was fully understood by the Stanleys at the outset of their highly successful efforts in steam wagon construction, and at the end of the second year of their work, when they had completely evolved their type of vehicle, now largely produced in the form of the well-known "Locomobile" and the "Mobile," built by two different makers under the Stanley patents, the Stanley wagon for two passengers weighed only about 510 pounds with all supplies aboard, ready for travel. This was with a boiler weighing no less than 95 pounds empty, 4 or 5 gallons of gasoline and 12 gallons of water. The water supply of the Locomobile has been increased now to 20 gallons, making a weight of 160 pounds for this item alone, so that the Locomobile must weigh well toward 700 pounds ready for the road, the increased size and weight of the water tank probably calling for some added weight of wagon framing.

The Stanley wagon when it first appeared was universally condemned by automobile builders at large as being so light and frail in construction as to be certain to go to pieces on the road. Many hundreds of the Stanley wagons, which must now be regarded as the only firmly established type of mechanically driven road vehicles, are in daily use, and fully show that the framing is abundantly strong, and that this lightest of the largely produced automobiles is heavy enough to meet all practical requirements. Since Stanley's work has become so widely known the many imitators thereof have gone away from the original Stanley lines in both directions, making what are in appearance and substance almost exact copies of the Stanley work weighing from 450 pounds to 900 pounds for two-passenger wagons.

Since automobiles are made to weigh from 500 to 3,000 pounds in weight to carry the same load of two passengers and the needful running supplies, it is clear that there is no established practice in wagon weights. As to forms which shall be given to the principal wagon members, there is an equally wide divergence. Wheels are made of wood, with solid rubber tires, and with steel rims and wire suspension spokes, both types finding favor with makers and users as well. Channel iron and tubing are both used for the principal frame members. The "American" electric wagons even went so far as to change from some years of use of steel tube framing to solid steel forgings of substantially rectangular section throughout, claiming that these examples of smithy production are superior in every way to any pieced-up steel tube frame which can be made, although all of the other electric vehicle makers in America, without exception, so far as known to the writer, adhere to the steel tube frame.

While there is as yet no such thing as established practice in wagon wheel or frame construction, the location of the motor, and the choice and location of transmission elements are equally varied and diverse.

If there can be said to be any majority agreement among European automobile makers as to where the motor shall be placed and what devices shall be interposed between the motor and the driving wheels, that agreement appears to be in favor of the Daimler plan which located the motor in the extreme front of the wagon, where the dash-board of the horse-drawn vehicle is placed, with leather belts or gearing from the motor shaft to the counter shaft, and chains from the counter shaft to the driving wheels. Very many constructors leave out the belts, substituting light gearing therefor, either spur or beveled, between the

motor shaft and the counter shaft, and retaining the chains from the counter shaft to the driving wheels.

While there are some apparent advantages in this Daimler arrangement of placing the motor in the extreme front, it has the vast demerit of distributing the transmission elements all through the whole extent of the wagon framing, thus making anything like a rigid support of the moving parts an absolute impossibility. In our American steam wagons Hancock's English arrangement of 1830 has been adopted, the boiler and engines being vertical with chain transmission from the engine crank shaft to the balance gear located directly on the rear driving axle. This makes a very satisfactory arrangement, light, cheap, compact and strong, except for the inherent weakness of the chain, and the stretch of the chain, which is certain to lead to accident if not carefully looked after.

Both chains and belts appear to the writer to be wholly unsuitable for use in motor wagon driving. Belts are more objectionable than chains, as they vary in length with the amount of moisture carried by the atmosphere, and the belt ends cannot be easily or securely fastened together by unskilled hands, while the belt tension needful to secure adhesion to the pulley surface sets up a heavy friction not incident to the use of either chains or gearing.

It is not needful that the advantages gained by locating the motor in front of the driver's seat should be enumerated here, because the great disadvantages of no luggage space and weak machine part support are defects of such grave importance that the front motor is sure to be discarded as soon as wagons are shown which have a large luggage carrying capacity, and give a thoroughly satisfactory support to the motor shaft, the gearing and the driving axle at the point where it takes motion. It is a perfectly easy matter to place as much as nine or ten horsepower of internal combustion motor, with all the tankage needed for a 100-mile run, and all the gearing needful for the "locomotive drive," on one single integral frame of cast metal, either gray iron of some of the aluminum bronzes, without exceeding 300 pounds in weight, or making the whole of this well supported assemblage of motor parts too large to all go comfortably under the rear seat of a four-passenger wagon in such a way that by turning this rear seat upward and backward the whole of the machinery will be fully exposed and readily accessible to the driver in every part, while the driver stands upright on his feet. The writer is now completing a motor which fully meets these conditions, which cannot be patented broadly, and which will

certainly be succeeded by many other wagon motors having the same advantages as to part support and the space occupied.

The term "locomotive drive" is to be understood as meaning a direct drive by gears or chains from the motor shaft to the balance gear on the rear axle, with, of course, a reverse of about the same speed. The speed reduction from the motor shaft to the rear axle may be in any ratio desired, various makers using a two to one, two and a half to one, three to one and four to one reduction of speed between the motor shaft and the rear axle. The Stanley wagons did use two and a half to one reduction with a chain drive, and link valve motion reverse, which simple arrangement at once avoids all clutches, gears and counter shafts, and makes an absolutely silent drive. This "locomotive drive," which may be reasonably expected to be the prevailing type for light passenger work as soon as its great advantages are clearly understood, is in effect precisely the same as the railway locomotive drive, and the first requisite of such a drive is a motor of sufficient power for any hill climbing to be done, as this arrangement does not include speed change gear. Thus the motor cannot be made to vary the rate of the drivers except by varying its own rate of speed, and must run slow when the wagon is required to run slow, and fast when the wagon runs fast. In other words, the wagon must be overpowered so far as level road driving is concerned, and not only overpowered but very largely overpowered, since every wagon must in some way be made capable of giving the drivers four or five times the power needed for fair level road work. These are unfavorable conditions for steam motors, which are large wasters of fuel when worked much below their maximum capacity. The mere fact, however, that all of the millions of tons of load hourly under railway translation are moved by this overpowered system of driving, without changes of gearing other than by shifting the links of the valve motion, shows very conclusively that the overpowered drive has great merits, even where steam is used, and must be regarded as wholly suitable for such small labors as are incident to light road wagon driving; this assertion is also fully proved by the Stanley wagons, which are good hill climbers, although they have no change gears.

The internal combustion motor is in all ways almost precisely the reverse of the steam engine, and since its cylinder does not require to be made hotter than it naturally is, the internal combustion motor can burn small fuel charges and work far below its maximum capacity with very little, if any, waste of fuel. The cylinder fired motor must waste, say, 75 per cent. of the total

power generated by the fuel combustion, in cylinder cooling to insure the motor against speedy self destruction. Hence, as in the Winton and many other wagons, the speed of the vehicle is very readily regulated by charge volume reduction, and if a reducing gear be added for very stiff work in deep mud and sand, the wagon can meet all road requirements in very good form indeed. This type of wagon can also avoid all refinements of construction, and the Winton is one of the very simplest wagons now in use.

The belief and expectation that satisfactory automobiles would be offered to the public which should be of such simple construction as to be readily and well repaired at any village smithy, has passed; the wagon users have discovered that the simple designs are invariably deficient in special functions absolutely essential to satisfactory performance. This, however, does not in any way make it less desirable that all the working parts of the wagon should be so located and arranged as to be easily reached and examined and touched by the driver. Where the motor is placed in front the cover can be removed and inspection of the motor parts so be made easy. The transmission elements must, however, in this case reach from front to rear of the vehicle, so that the parts underneath the wagon, which are quite as likely to require attention as the motor itself, can only be reached by the hand of one who lies on his back underneath, or by having a pit of sufficient depth to permit of standing under the wagon.

Mrs. M. E. Kennard, writing in the *Autocar,* October 6, 1900, well shows the great importance of accessibility of motor parts in the following extract from her story of a tour made with an 8 horse-power "Napier" wagon known as "Sir Charles." A pin had broken off in the cam shaft and the cam shaft would not turn. Mrs. Kennard writes this: "All the next day Brookes and I spent arduous, anxious hours endeavoring to remove the fragment of the broken pin from the hole in which it remained tightly wedged. I could only act as a very humble assistant, whose willingness failed to atone for want of skill. Without a pit, the job was singularly awkward. The base chamber had to be detached, and the fly-wheel stood obstinately in the way of split-pins, bolts and nuts. For two consecutive days Brookes [the "Mechanicien"] spent the greater portion of his time on the flat of his back, wedged beneath the car, while I stood over him with a lighted candle which flickered freely on his upturned face. 'The punch, mum, the large chisel, the big spanner,' he gasped periodically, whilst I hastened to find the desired tools and place them in his hand. Eventually he had to borrow a drill

from the blacksmith, and drill a hole right through the tenacious fragment, before, to our joy, out it fell. Then Brookes inserted a fresh pin, and after awhile replaced the base chamber, governor, etc." Mrs. Kennard goes on with more troubles.

Without commenting on the singular incapacity of Brookes to run the wagon up on some sort of blocking or staging so he could work more at ease, it seems that the design of this much praised "Napier" wagon displays a pitiful poverty of inventive talent and common sense, as well as a lack of elementary knowledge of machine construction. Evidently the "Napier" constructors are not aware of the Woodruff key, or they would never tolerate the use of pins for securing wheels to shafts. Evidently, also, very ordinary skill in machine designing would so dispose the small parts of the motor that they could be easily disassembled. Mrs. Kennard's graphic diction very fully and clearly illustrates the necessity of ready access to the motor parts, and it is really quite surprising that the "Napier" wagon, which is unquestionably the result of much thought, should involve such serious errors of design. But the "Napier" is no worse than other European road wagons, all of them being about equal in general poverty of mechanical construction refinements, in inconvenient arrangement of parts and want of accessibility generally, the more costly wagons being even more faulty in these important particulars than the cheaper constructions, which have fewer parts. The final automobile will certainly have all of its machinery so placed as to be easily inspected, and easily reached, without working overhead in a pit, and without lying on the flat of the back on the ground.

This one requisite of ready access to parts seems to fully warrant unqualified condemnation of the front motor location. Where the motor is placed in front the transmission elements must be underneath the wagon body, and their highly important parts can be reached only by the removal of the wagon body, by the use of a pit, or by crawling under the wagon in the manner of Brookes in Mrs. Kennard's harrowing narrative.

Locating the motor at some point in the rear of the driver's foot-room is even more objectionable than the dashboard position. With the motor in front of the driver all the parts of the motor itself can easily be reached, leaving only the intermediate transmission elements difficult of access. Where the motor is placed under the seat of a two-passenger wagon, as in the De Dion and Stanley wagons, a pit becomes an absolute necessity, and since the pit cannot be carried on the road with the wagon, it is clearly evident that it may not be at hand when most needed.

It is true that parts of the wagon body may be made easily removable, so that access to some of the more frequently manipulated parts of the mechanism may be made easy, and this is done in many instances. The only full and adequate solution of the problem seems, however, very clearly to be found in so compacting the motor with all of its attendant tanks, tubes, batteries and wiring that everything can be carried on a single integral frame at the rear of the vehicle, and so disposing the various parts that they may all be easily seen when the tailboard or rear seat of the wagon is turned up, and arranging the whole so that everything can be seen and reached by the hand of the driver while he stands on his feet. These conditions are partly met in the Benz, Oakman and Winton wagons, more fully, perhaps, in the Oakman than in either of the others named.

Where, as in case of the Stanley type of steam wagons, the machinery and tanks fill all of the wagon body, leaving no unoccupied space whatever, either the pit must be used or the wagon body must be taken off, when it is needful to reach the working parts, one or both.

Designers in general seem to have first of all accepted general accessibility to the mechanism of a motor wagon as an absolute impossibility, and to have resigned themselves to such compromises as might be most readily made, robbing Peter to pay Paul, and never reaching really satisfactory conclusions anywhere. For all this, it is not an impossible task to make the whole of the wagon machinery easily accessible on all occasions and in all locations.

The question of what the transmission elements between the motor shaft and the driving axle or axles should be, is as yet indecisively answered, the only general agreement being that there should be a speed reduction from the motor shaft, no attempts to drive the driving wheels directly by the motor connecting rods having resulted in satisfaction within the writer's knowledge. The railway locomotive pistons are coupled directly to the driving wheels, but if this is attempted in the road wagon the cylinders must be so large in diameter for use at slow speeds as to make it impossible to supply them with steam from a boiler of reasonable dimensions when the wagon is to be rapidly driven. If the intermediate gearing stops at a simple speed reduction from the motor shaft to the driving axle balance gear, it may, as in the Stanley steam wagon type, consist simply of a chain with a small sprocket on the motor shaft and a large sprocket on the balance gear drum. With the non-reversing internal combustion motor a reversing gear must be added, and clutches must be intro-

duced, and it is still deemed desirable by most automobile designers to include in the transmission elements an ideal speed and direction change mechanism, which may be actuated by a single hand lever so as to cause the wagon to run either backward or forward at any rate of speed from zero to the maximum, without varying the speed of the motor shaft. No such speed changing mechanism is known, nor has any near approach to it been made. Dieterich, of Hartford, U. S. Patent 634,327, October 3, 1899, shows a one-direction speed change universal from zero to the maximum, without a friction loss much exceeding that of the best spur gearing, and in his extremely ingenious invention furnishes what appears to be the nearest approach yet made to a correct speed change, but the fact that this elegant mechanism cannot be reversed makes it needful to place it between the motor shaft and a reversing gear leading to the driving axle, if it is to be used with a non-reversing motor. If the speed change is to be made with commonly known devices the designer can choose between direct changes by different sized spur gears and pinions, the ratchet drive, the friction disk and traversing friction driven pinion, the disk sometimes being developed into a hollow sphere, and worm gear and worm mechanisms. The spur gear speed change must have clutches for all the speed variations, and so must the worm gear changes. The friction disk and its modifications are ideal so far as mere action is concerned, since they give all speeds from zero to maximum, in both directions, without clutches, and are absolutely silent in action. These great inherent advantages have caused many experiments to be made with the friction disk and traversing pinion drive. The fact, however, that this drive commonly shows a friction loss not under 35 per cent. of the power, and that the traversing friction pinion is hard to keep up, has caused the general abandonment of this form of speed change for automobile use, often after great money expenditure. Hart, of Poughkeepsie, by placing the traversing pinion between two disks driven in opposite directions has made this disk drive very satisfactory up to the transmission of perhaps as much as one-fifth of a horse-power. In general terms, however, it may be safely asserted that the friction disk and traversing pinion, with the inherent fault of an indeterminate pitch circle, will not do at all for automobile driving. The ratchet drive is universal in both directions, and gives a speed change from zero to maximum, but acts to drive by successive impulses only, not by a continuous action. It is, however, possible to so arrange a ratchet speed change as to give a considerable number of impulses for each revolution of the driving wheels, as many as 32 separate

impulses for each driver revolutions being easily obtained, and as this ratchet speed change is silent, reversible, easily controlled by a single lever, calls for no clutches and wastes very little power in friction, it may yet find a considerable field of use, in spite of its intermittent action. This speed change problem is at present considered to be of great importance in automobile construction, but if the locomotive drive is found sufficient, as it certainly appears to be for all light vehicles, then the demand for the universal speed change disappears.

Having disposed of the speed change question, the designer is next confronted by the problem of transmitting power from the countershaft, or from the motor shaft if no counter shaft is used, to the driving wheels. The balance gear may be applied to the counter shaft, in which case it may be very small and light, the whole arrangement weighing only a few ounces in some of the electric wagons. If the balance gear is placed on the driving axle the axle may be divided, or it may be continuous, with one wheel secured to a sleeve loose on the axle, while the other driving wheel is secured to the axle itself. The balance gear, which should have three pinions, neither more nor less, must then be strong enough to transmit the power at the reduced rear axle speed. The balance gear has but little motion, and really but little work to do, and is not a prolific source of troubles. The transmission to the drivers may be direct, the rear axle being wholly stationary, and it may be made through chains or through spur gears, which may have plain or spiral teeth. Counting all the automobiles now produced, the chain is used much more frequently than the spur gear. A much used plan places a large sprocket directly on each of the driving wheels, thus using two chains from the counter shaft to the drivers. This scheme is extremely faulty, as the two chains never wear equally, and are consequently never of the same length exactly, and so can never both be properly adjusted. The chain has the grave inherent fault of a multitude of moving parts, each subjected to individual wear, and two chains exactly the same length when placed in work will not keep their parity of extent for any length of time, although the work done by each is about the same. A single chain, led to the rear axle carried balance gear drum, makes a much less faulty arrangement than the two chain drive, but in the case of the single chain it is essential that convenient and certain means for taking up the slack of the driving chain should be supplied.

The chain should be as light as is consistent with tensile strength, since the chain life is not dependent on bearing surface

dimensions, and wear increases rapidly with chain weight increase. Very nearly all of the chain wear is caused by the vibration of the slack side of the chain, and is not in any way due to the actual work of power transmission which is performed by the chain. The wear is due to grinding, each link pin and block of an uncovered chain doing road work being liberally supplied with abrasive material. Chains should be covered by a perfectly dust proof casing, which is in all cases a monster of such hideous appearance as to forbid its general adoption. An absolutely dust proof chain case is also difficult of construction, and unless the case is perfectly dust proof it is of little or no use. Hence, although the evils of a grit laden chain are well known, the chain case is very rarely or never applied to the automobile. All of these faults of the chain are, however, counterbalanced by the fact that it will work about as well when the sprockets are a little out of line as if all the parts were exactly where they should be. This makes insufficiently supported working parts act far better with a chain drive than with a spur gear drive, and is probably the real cause for the retention of the chain in road wagon work. With rigid support and perfect bearings, spur gearing, which can be easily inclosed in dust proof casings, is in every way vastly superior to the chain as a power transmitting element, although a clean, well lubricated chain loses less power by friction than a spur gear in equal work. It is, of course, only the merest make-shift engineering which will tolerate the partial alleviation of one set of faulty conditions by the introduction of other elements which must be faulty to be efficient. Yet this is precisely what a great number of automobile constructors are now doing. Working parts are imperfectly supported on flexible frame members, and the many-jointed, mud-collecting, rapidly-wearing chain is brought in because it will work pretty well when the sprockets are considerably out of line.

The only correct way out of all this muddle is to place permanent bearings on rigid framing, use gear transmission exclusively, employing spiral gear teeth in all cases to avoid noise, and inclosing all moving parts in dust proof cases. These conditions have not yet been met in any commercial road wagon construction; it seems beyond doubt, however, that they will be found present in the final automobile, which certainly cannot include constant length variations of important driving members.

Speed on Public Roads

THE question of speed is one which makes itself felt at almost every turn. Leaving aside the racing mechine, built solely for speed and properly for use only on tracks or some special course set apart for them, and we come to the side which is really most important, the speed of road carriages. While it is unnecessary to limit it to the speed of a horse, as there are many places where fifteen and even twenty miles an hour may be safely made on good roads, the question of accidents by collision is an ever present one.

The judgment of the individual driver must be the guide to the proper speed in most cases, but is it desirable to have a maximum speed of over twenty miles an hour for road vehicles? This limit would seem to be satisfactory from nearly every point of view, and would prevent claims of higher speeds being made by antagonistic individuals that seem to abound.

Fast driving on the roads is to be deprecated in most cases, as it is unnecessary, unwise in that it endangers passersby, and makes enemies instead of friends, and is sure to cause undue restrictions on the speed of motor vehicles by local or State laws.

If all users will endeavor to keep the speed of their machine within proper limits, particularly when passing or meeting teams or pedestrians, many of the legal limitations can be avoided. These are often absurd in their restrictions, and it is better to avoid them than to have the trouble of getting them repealed afterwards.

A united effort to refrain from speeding on public roads will have a good effect and prevent many annoyances to the users of motor vehicles of any type.

New Electric Omnibuses for New Haven, Conn.

SOME time ago, in New Haven, Conn., there were placed in service a number of electric omnibuses. After trying them thoroughly it has been decided to remove them, as the experiment has not proved successful. One of the principal faults discovered was the extreme heaviness of the vehicles, each of them weighing three tons, and their operation called for an unusually large amount of power. Their seating capacity was

12 passengers inside and 6 outside. Their speed also was too slow, the maximum being but 8 miles per hour.

The new buses, five in number, have been ordered from the Woods Motor Vehicle Company, of Chicago. Their weight will be one-half that of the present vehicles and their seating capacity will be ten, instead of eight. There will be no roof seat, but the driver's seat will be large enough so that it may accommodate two passengers, besides the driver. They will be geared to be run at a speed of twelve miles per hour if desired. Three of them will be in regular service and the headway will be reduced from fifteen to eight minutes. The other two will be held as reserve vehicles or to let to private parties for trips to points within the city limits. These vehicles will also be equipped with springs which will not render it necessary to depend so much upon the resiliency of the tires.

When talking, a few days ago, with a representative of this journal, a well-known automobilist spoke of the inconvenience sometimes caused by the inability of manufacturers to furnish vehicles in a shorter period than is usually named by them. This is, in some instances, a real annoyance, but it is certain such condition will not exist for long, and purchasers will soon be able to enter a salesroom, select their vehicles and ride home in them, just as it is now possible to do in the case of the bicycle.

Gradually the methods of specialization in manufacture will be adopted, and the more such methods are introduced the quicker will it become possible for buyers to select what they want right on the spot and not have to wait, as is now so often the case.

Unquestionably the exhibition now going on at Madison Square Garden, as well as that which is to follow it at Grand Central Palace, from November 14 to 24, will give to the automobile industry an unusual impetus, commercially and socially.

Undoubtedly many will be present at both of the shows referred to who will have their interest deepened in the manufacture and operation of automobiles and the fact that the first one is under the auspices of the Automobile Club of America, which comprises some of the leading families in the country, will give to it a dignity it would not otherwise have.

The event ought to prove quite a society triumph and bring to our city many members of the representative families of the country. Let us hope this may be so, and that the Automobile Show may become as unique and attractive an event as is the Horse Show.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Automobile, Electric—

Illustrated description of a vehicle which when loaded has a weight of twenty tons. Battery is of the Phœnix pattern, with sufficient capacity for a run of 25 miles. "Electrical Review," New York, October 10, 1900.

Automobiles, Their Imperfections—

By W. H. Booth. An article in which the writer treats of the qualities of the horse as compared with the automobile. "American Machinist," New York, July 26, 1900.

Carriage, Electric—

Very complete illustrated article descriptive of the Joel electric vehicle, "The Automotor Journal," London, October, 1900.

Controller, Automobile—

Description, with illustration, of a new type of controller which may be used on practically all types of electric vehicles. "Electrical Review," New York, October 17, 1900.

Cooling Device for Motors—

Describes the Macquart device for cooling motors by a circulation of air, "Automobile Topics," October 20, 1900.

Gasoline Motor, Construction of a—

One of a series of articles appearing in the "Motor Vehicle Review," of Cleveland, by C. C. Bramwell, in which instructions are given as to how such vehicles ought to be built. The article is illustrated. "Motor Vehicle Review," Cleveland, October 11, 1900.

Gear, Spur Equalizing—

Illustrated description of a type of gear to meet requirements of all motor vehicles in which spur gearing is used throughout. "Motor Vehicle Review," Cleveland. October 11, 1900.

Gears, About Change—

An article by M. C. Krarup, in which he studies the problems involved in regulating the speed of motor vehicles. "Motor Age," Chicago, October 18, 1900.

Governor, Speed—

Illustrated article describing an automatic governor for electrically propelled vehicles. "Electrical World and Engineer," New York, September 29, 1900.

Ignition Tubes—

An illustrated description of a system of tube ignition invented by M. Collin-Dufresne. "Autocar," London, October 6, 1900.

Inflator, Tire—

Illustration and description of a power-driven inflator used on the "Napier" of Mr. Kennard, in which he brings the engine into use for operating it. "The Motor Car Journal," London, October 13, 1900.

Motor, Bicycle—

Illustrated description of the Holley machine, showing its various parts. "The Motor Vehicle Review," Cleveland, October 18, 1900.

Motor Car, The Luflury—

Illustrated description of a car which was exhibited at the Paris Ex-

position. The particularly new feature about the car is the variable speed-gear adopted, which is arranged to give five speeds forward and three backward. "The Motor Car Journal," London, October 13, 1900.

Motor Carriage, The Spiller—

Description and illustration of a new style of gasoline vehicle possessing a number of new features. "Motor Vehicle Review," October 11, 1900.

Motor Vehicles for Road Service, Heavy—

By Fred. W. Maynard. An article dealing with the specific forms of motor-wagons which have proved successful in England. "Engineering Magazine," New York, September, 1900.

Panhard and Levassor—

Illustrated description of a twelve horse-power machine of the type named, fitted with both electric and tube ignition. "The Autocar," London, October 13, 1900.

Plug, Electric Ignition—

Illustrated article, descriptive of a new form of plug, in which baked soapstone (steatite) is used for the insulating material instead of porcelain. "The Automotor Journal," London, October, 1900.

Runabout, Light Electric—

Illustrated description of a new runabout designed by Mr. Walter Baker, of Cleveland. Its total weight is less than 500 pounds, the batteries weighing only 186 pounds. The vehicle can be run 30 miles on one charge. "Electrical Review," New York, October 10, 1900.

Stanhope, Electric—

Description of a new vehicle which has just been placed on the market. "Electrical Review," New York, October 17, 1900.

Vaporizer, Oil Engine—

An article describing an engine recently designed by Mr. Torbensen in which the vaporizer serves to ignite the explosive mixture after the engine has been started. "The Automotor Journal," London, October, 1900.

Vehicle, Construction of a Motor—

By L. Elliott Brookes. Part III. of a series of articles which go into the practical construction of a carriage adapted for use in connection with a four horse-power gasoline motor. "Motor Age," Chicago, October 18, 1900.

Vehicle, Racing—

Illustration and description of a very powerful motor-car used for racing purposes. It is of thirty horse-power. "The Autocar," London, September 29, 1900.

Vehicle, The Reading Steam—

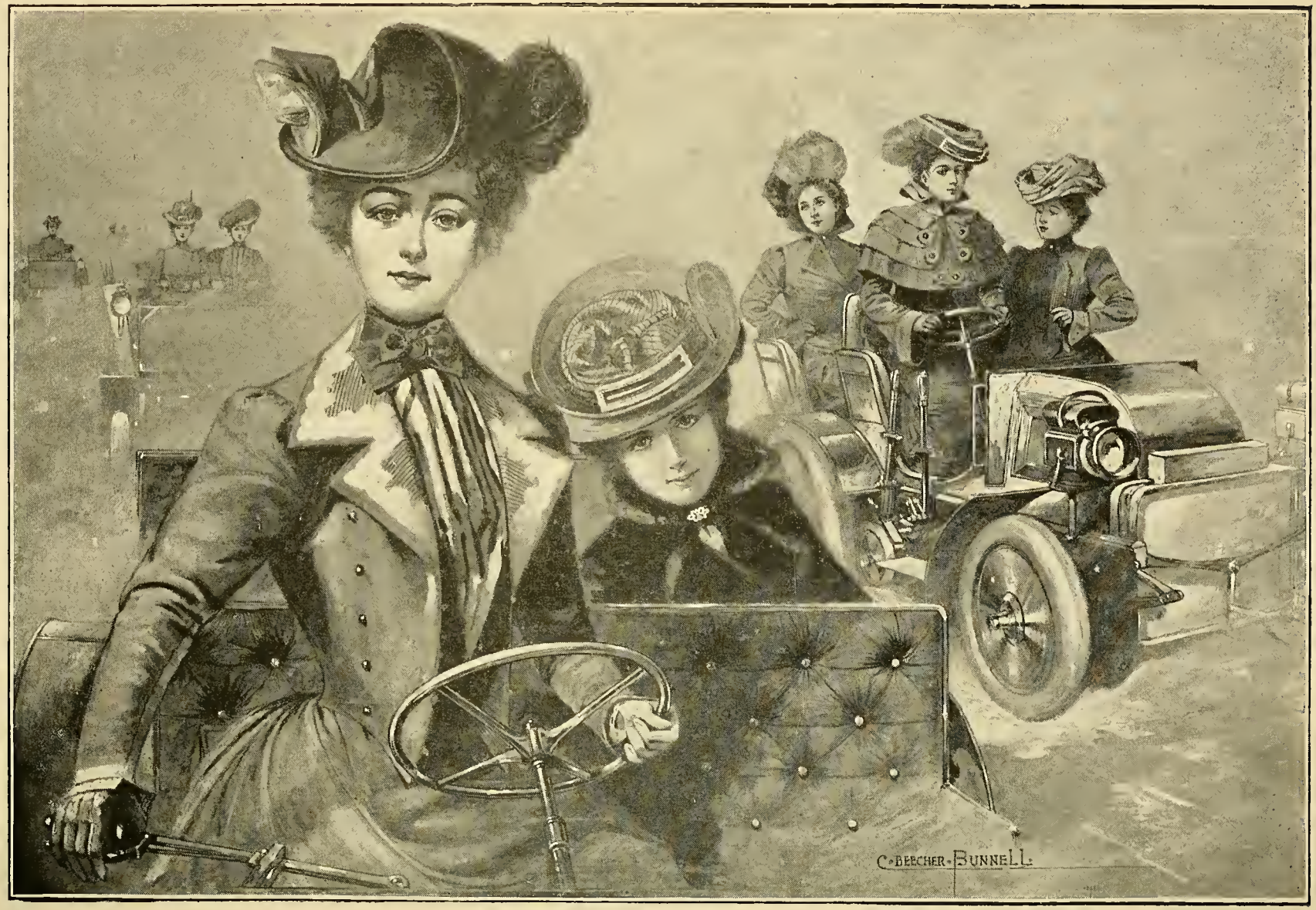
Illustrated description of one of the late type of carriages. "Motor Age," Chicago, October 18, 1900.

Vehicles at Paris Exposition—

An illustrated article in which are given descriptions of a large number of the leading motor vehicles that were exhibited. The article is very complete and is accompanied by a goodly number of illustrations. "Automotor Journal," London, October, 1900.

Voiturette, Progress—

Illustration and description of a carriage of attractive appearance. "The Autocar," London, October 6, 1900.



Horsewomen of the Twentieth Century

The Automobile
MAGAZINE

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Captain Kerosene

By I. B. Rich

CAPTAIN KEROSENE, as it came to be called, was the product of Frank Halstead's brain—on paper as yet—but destined to play a greater part in his future than he dreamed. But of that we shall hear later.

Halstead was a young mechanic in the large factory of the Continental Motor Vehicle Works, in Watsessing, N. J., and, like many another in the shop, he had large ideas of improving the motors. All bright mechanics have, but the new ideas are not always adopted, for various reasons, principally commercial.

Halstead was a college graduate who wanted to see and know the shop end of his chosen profession, and had gone into the shop to see the whys and wherefores for himself, as well as replenish his little bank account, which had been almost depleted by the drain of the last college year. He had evolved a plan for a motor to supplant the one in use by the aforementioned C. M. V. Co., and making a radical change in the fuel—using kerosene instead of gasoline, as was being done. He could tell you the heat value, the specific gravity of oils, and a lot of other things you'd forget before he was through, and prove without question that his was the only motor—and he believed it. Having decided on kerosene, he planned a motor to use it, and tried to interest the superintendent.

"Don't care anything about it, Halstead. It may mote and then again it may not. I'm hired to build these gasoline motors as cheap and as good as I can. If they get out a dynamite motor I'll build it. But you don't get your Uncle Benjamin into new schemes. Go to the G. M. with them, every one of 'em."

So the General Manager was approached, but proved adamant, even when the petition for a trial was seconded by his daughter, who was decidedly interested in Halstead, whether his motor ever moted or not, and in spite of his emaciated bank account.

"Why, look here, Halstead; even if your machine works you don't realize what it means to us to adopt it. We've got fifty thousand dollars' worth of special patterns, tools and fixtures which would be only good for junk. The experiments would cost ten thousand dollars, and what would the stockholders say to that? Say, 'let well enough alone,' wouldn't they? We've made a reputation on gasoline motors, they run well and there's a demand for all we make, so there we stick."

"But, Mr. Champlin, suppose another concern does go into kerosene and make it a success. You'll lose your trade and reputation, too. Why not be in the lead and give them either kind they want?"

"Well, I'll risk that sooner than the wrath of stockholders who are always looking for one per cent. more on their dividends. And now, Halstead, don't fool away any more time on that scheme. Improve our motors all you can, but don't get too new."

Of course, Halstead didn't stop—Champlin didn't expect he would—and he just couldn't, for two reasons. His mechanical ambition must be satisfied and—but this should have come first—he must have money before he could hope to make a home for the future Mrs. H., if all went well.

"It's no use, Margery," he said, after the interview; "I can't drop it. I've got to push it and I believe it will work, too. I shall see another man to-night who will back me, I think, and then I hope to make money enough, so somebody will change her residence some fine day. Good night, dear. I know you wish me all kinds of luck."

The other man enthused over the idea to the extent of backing him in the construction of the first carriage, and another week saw Halstead installed in a little shop, working early and late on his new motor.

Experimental work drags slowly and weeks lengthened into months until a year was close at hand before the machine was tried. It wasn't one of these successes you read about, where everything goes off without a hitch. Such things don't happen often in cold iron and steel, but it ran after a fashion, and the defects were located and remedied.

Mr. Champlin only heard the adverse comments, and he was anxious to help Halstead, for he liked his nerve in branching out

and trying things himself, but he wanted him back in the C. M. V. Co., and so made one more attempt to get hold of him—through his daughter this time.

"What's the use of his fooling, Margery? The machine don't go and he'll never make it a success. You better persuade him to come back to us. I'll make him foreman to-morrow and push him. But, of course, I can't consent to his marrying you while he is in an opposition company. The stockholders would swear I was in that, too. If he really wants you he'll do that much, I know."

"But he can't, father. It wouldn't be fair to Mr. Jones, who has furnished the money for the experiments, and his own reputation is at stake. You wouldn't want a man for foreman or superintendent who had failed. Oh, he'll make Captain Kerosene go and I'll go with him some day—or night," she added, under her breath.

"Must mean to elope," muttered her father; "well, I'll block that little game, I guess." But he changed his mind shortly after when he happened to hear a voices in the next room and caught the words, "I'll be here sharp at ten with the new one. Meet me by the drive and we'll see how quick Captain Kerosene will get us to Rahway. I've arranged things so there will be no delay, but——"; he lost the rest of the sentence in his merriment, for he chuckled to think of the capture of the elopers, the discomfiture of Halstead, and vowed he would have him in the C. M. V. works inside a month.

"Guess he doesn't know I've got one of the new machines here —one of our racers. Well, I'll have some fun with Halstead. Kind of hard on Margery, but she'll stand it. Plucky girl, that."

Slowly moved the clock that evening to three people, but the town clock boomed ten at last, and a small figure in traveling dress and cloak hurried down the drive. At the same time another figure, not small, walked rapidly to the carriage-house. "Don't want to catch them too quick," it said to itself; "guess I'll wait a minute."

Halstead and Captain Kerosene were waiting, and after assisting Margery to her place, he lit his lamps and climbed in, throwing in the low speed gear as he did so, to be followed by the high speed gear a half minute later.

A light flashed in their rear and they turned to see her father's machine surging into the road from the drive.

"That's father's new racer, Frank. I was afraid he overheard our plans to-day. Found him in the next room trying not

to laugh, just after you went. Good machine he's got, too, but I have faith in Captain Kereosene to-night, dear; but keep him on high speed, for father's new machine is a flyer."

"Glad of it, Margery. Want to show him what Captain Kerosene will do. But it means a hard run to beat him to Rahway long enough to have the ceremony over before he comes, but we'll try it," and he pushed the sparking lever to the last notch.

"Don't worry, Frank; I'm sure we'll beat him if we don't break down. Father isn't a man who gives up easily, but I think we'll be all right if we keep on like this," for they were flying now.

The valley road lay in white patches in the moonlight, while the lonesome street lights threw fantastic shadows along the road before them. Up, now, till South Orange lies below them on the left and on the rising hill beyond. Street lights in the distance are the only sign of life and even they are fading as Maplewood is neared—and passed.

"What's that," as a decided slowing down occurs, and Frank shuts off the power, jumps from the carriage and grabs one of the lamps. "Better see what it is before your father comes in sight," and he goes behind to investigate. Not the best work for a dress suit, but circumstances alter cases.

"Its the sparker," he said; "seems to be weak. Don't understand it, for I put in a new one this morning. Batteries may be weak, but ought to be all right. No connections loose; that'll fix it. Wonder what's become of your father. Couldn't take any shorter road than we have and he wouldn't do that, I don't believe; he'd race fair. Hope he hasn't gone in the ditch."

"Oh, he's a good driver, Frank, and maybe his connections are loose, too," and she smiled a little. Under ordinary circumstances Frank would have wondered, but he took smiles and everything else as his this time and didn't inquire further.

Meanwhile Mr. Champlin was having troubles of his own. Starting out in high glee at the chance of a race, he talked to himself as he went along, for want of a better companion.

"I'll give him a run for his money, anyhow. Rather like his nerve and there's no doubt he's bright. But to think of his daring to run away with a girl—my Margery, at that—in a new machine that's hardly run at all. I'll have the laugh on him before we strike Maplewood, and then—what's that? Slowing down, as I live! Didn't know I moved that sparking lever. No; that's on full. What in blazes is the matter? Oil open wide,

too. Stopping, by jingo, just as I was gaining on him. Well, I must have a look at it, any how; acts as if the oil was out; tanks were full this morning, I know. Empty, as I live; ought to have looked before I started. Well, here's some in the extra can. Won't delay much, after all. Now we'll start again. Oil don't smell just right, but I guess that's my imagination. Won't run, eh—won't even start. Never knew a C. M. V. motor before that wouldn't start. Nice recommendation for the only machine on earth when the general manager can't start it. Chasing an eloping daughter, too, and can't start the motor. Halstead's probably flying like a scared rabbit, too."

"I wonder if Halstead would play a trick on a man." Then he drew a little of the oil into the cover of the can and took it to the roadside to test it; lighted a match, but it wouldn't burn. "Water, by jingo; not even kerosene. Now the next question is, who did it? Nice pickle I'm in, here in South Orange. Have to haul the machine out of the road and go home in the train. If Halstead did that he's no son-in-law of mine, if he did beat me to Rahway."

Halstead and Margery reached Rahway without further incident and were united as the clock sounded the close of the eventful day. Returning the next morning to receive the parental blessing they found Mr. Champlin by the roadside getting the machine ready to run home.

"Sorry you broke down, Mr. Champlin; I wanted a good race, just to show you what Captain Kerosene could do," said Halstead, as he slowed down.

"Didn't break down; C. M. V. motors don't break down. Some one nearly drained my oil tank and filled the supply can with water. 'Course you don't know anything about it?

"No, he doesn't, father; I did that. I thought you overheard our plans when I found you in the next room laughing. Of course, I knew Captain Kerosene was all right," with a smile at Frank, "but I wasn't going to risk being caught when a little forethought would prevent it. Left enough to get you well away from home, then filled the other with water. Nothing like a little forethought, you know, father. Now, what will you do to the culprit?"

"Kiss her and we'll all go home together. Got ahead of me that time."

Legal Decisions Affecting the Automobile

By W. M. Seabury

DECISIONS by the courts of the various States in this country affecting motor vehicles and all horseless carriages and their rights upon the public highways have, up to this time, been extremely few and far between.

It is not difficult to account for this lack of legal decisions affecting motor vehicles in this country when it is remembered that the calendars of our courts in many of our cities are overcrowded with cases awaiting trial.

In New York County the calendars of the Trial Term of the Supreme Court are so crowded that it takes at least two years for a case to be reached in its regular order. Kings County is little better than New York County, and we have no doubt that a condition of affairs similar to this is not at all unusual in cities in other States.

After the trial of a case in New York County a year may easily elapse before a decision of the court of last resort is obtained finally disposing of the issue involved.

The case of Fred. Nason *et al. vs.* Jonathan B. West, reported in 31 Misc. R., 183, is the first case in New York State which we have been able to find in which a motor carriage was involved.

In this case, as it will be remembered from our issue of September last, a runaway was caused by a horse taking fright at a motor vehicle on the public highway at Rochester, New York.

The case was tried in the Municipal Court of Rochester and from a judgment rendered on a verdict of $42.95 in favor of the plaintiff the defendant appealed to the County Court.

It will be remembered that Judge Sutherland, of the County Court of Monroe County, reversed the judgment, and in holding that there could be no recovery in the case, said: "The horse has no paramount or exclusive right to the road, and the mere fact that a horse takes fright at some vehicle run by new and improved methods and smashes things, does not give the injured party a cause of action."

This case was argued at the May, 1900, term of the court and has already attracted considerable attention. We have heard that it is now on its way to the Appellate Division of the Supreme

Court, and that a decision from this court may be expected at some future time.

The views expressed in the opinion of Judge Sutherland have met with favorable criticism. In commenting upon the case it is said in the October, 1900, issue of the New Jersey *Law Journal:* "Good new law is based on good common sense, and we suspect that common sense is back of this opinion of Judge Sutherland. It is true that the introduction of bicycles, trolleys, automobiles and similar methods of conveyance, and unknown to our ancestors, have caused many accidents, especially from the frightening of horses, and this is to be deeply regretted, but how can it be otherwise? In time horses will become as fearless toward these new conveyances as those brought up in the vicinity of railroad tracks usually are of locomotives. At all events, they must get used to them and the public must get used to them. There can be no other solution of the problem than that all these modes of conveyance must have equal rights upon the public highways, and while it is true they may cause accidents for the present, the ultimate benefit to the public at large is greater than most of us can now foresee."

It is evident from the statement of the case of Guyre *vs.* Vroom, contained in this same issue of the New Jersey *Law Journal*, that Mr. Justice Dixon, of New Jersey, does not entirely agree with the views of Mr. Justice Sutherland of New York.

This case has not as yet been officially reported, but from the account given of it in the journal referred to it appears that a man named Guyre, who was an Erie Railroad conductor, brought suit against Dr. Vroom for damages for the loss of his wife. It seems that Mrs. Guyre was driving at Midland Park when Dr. Vroom's automobile, being beyond his control, backed into the horse driven by Mrs. Guyre. The animal became frightened and ran away, throwing Mrs. Guyre from her buggy and inflicting injuries from which she afterwards died.

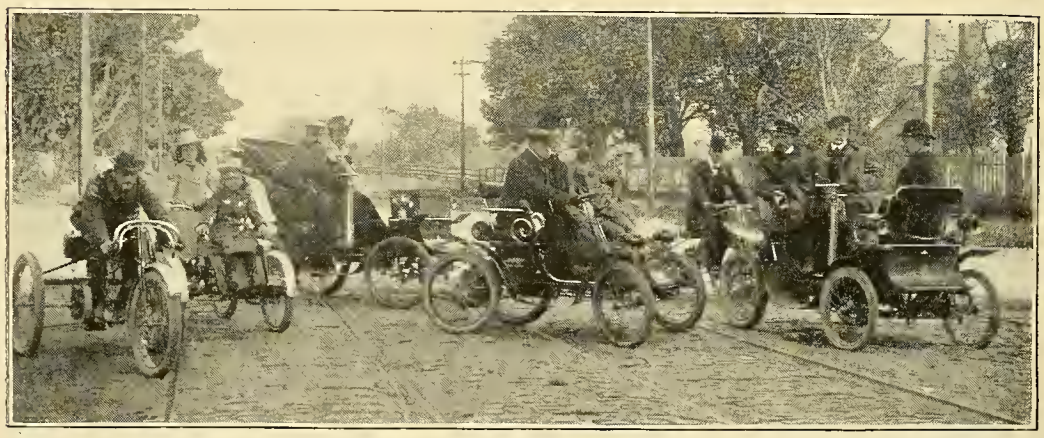
Dr. Vroom's testimony was to the effect that the horse became frightened when two hundred and seventy-five feet away from the automobile, which Dr. Vroom stopped upon seeing that the animal was afraid.

Dr. Vroom maintained that he had the machine under perfect control, and gave an exhibition in front of the court-house to show the Court and jury his ability to handle it. Mr. Justice Dixon in his charge to the jury said: "The first question to which you come for the purpose of deciding the defendant's responsibility is whether this machine was a nuisance. You have seen how it was operated. You have heard the witness describe

the mode of operation, and the question rests with your sound judgment as to whether the machine, driving along country roads without a horse in front and discharging steam behind, is likely to frighten a horse on the highway and thus endanger the road so as to constitute the machine a nuisance. It is agreed that it is an improved method of locomotion, but it does not follow from that that it is to be tolerated. The right to drive horses along the highway is an established right, a common right, and if a modern method of locomotion is used of such a nature that it commonly brings discomfort and danger to those exercising the common right, the established right of travel on the highway, then it is a nuisance and cannot be tolerated. If it occasionally or exceptionally frightens horses that would not make it a nuisance. In order to make it a nuisance its common effect must substantially interfere with the people who drive horses along the highway."

The jury remained out a few minutes and then returned for instructions upon certain points, at the same time informing the Court that they had agreed that the automobile was not a nuisance. The jury returned to their room and remained, considering the case, all night; finally disagreed and were discharged.

We agree with the views expressed by the New Jersey *Law Journal,* and regard this decision as not altogether sound.



The Automobile Show at Madison Square Garden

THE First Annual Exhibition of Automobiles, under the auspices of the Automobile Club of America, has been held and was in every respect a decided success. This success was assured the opening night when, in spite of the fact that the city was ablaze with political frenzy, a large number of people turned out to do homage to the new mode of conveyance.

The show was pre-eminently one of automobiles and their accessories. The public was promised nothing else but this, and so many visitors on the opening night speaks well for the great interest which is being manifested in the automobile, as well as for the gentlemen who planned and completed the arrangement of the exhibition.

On several occasions representatives of some of the best known families of the country were present, which gave it a high social aspect.

One very striking thing about the show was the great seriousness with which visitors inspected the different vehicles, and as though they meant business.

The exhibits were greatly admired by all present, and a feature which added materially to the show was the opportunity for seeing the vehicles in motion as well as affording a chance for visitors to take a ride in the vehicle which pleased them more than did others.

The first contest was held on the night of Monday, November 5, and was confined to electric vehicles. The total distance traveled was about 200 feet and it was held on the Twenty-sixth street side of the track. Start was made by a pistol and the first obstacles were rows of barrels set across the track. The track being 20 feet wide and the openings being alternately on opposite sides of the track, necessitated sharp turning to go through successfully. The vehicle described the course of a Virginia rail fence. Then the vehicle was run into a pen with sides arranged so that the driver was forced to back out through another opening, and then go forward out through still another opening, forming a sort of a maze. Then the contestant had to go through a curved line of barrels. The pen or maze appeared to be the hardest impediment to negotiate successfully, as it required stopping,

backing out at quite a different angle, stopping again and going forward at still another angle. In their anxiety to do this quickly most of the contestants had some part of their machine touch the sides of the pen. The tread of the wheel varied from 4 feet 6 inches to 5 feet, and the sides of the pen were shifted to allow the same clearance for all the vehicles. The winner was Walter C. Baker, of Cleveland, on a Baker runabout, whose time was

Inclined Track of the Mobile Company's Exhibit

25 seconds, he touching the least number of times with his hubs. The second man, Edward Adams, who operated a Riker vehicle, was not very far off in time, he doing it in 27⅖ seconds, but even though he lost on time he would have lost otherwise on the number of obstacles he hit. Others went through in times ranging up to 35 seconds and colliding with obstacles almost every time they had to go near one. This con-

test proves nothing about the vehicle, it being entirely a matter of skill with the operator. The winner went through the ordeal with so little concern that his superiority was even noticed by the spectators, who, after each of his two trials, gave him plenty of applause. The judges were T. C. Martin, R. A. Fliess and Dr. S. S. Wheeler.

These contests aroused a great deal of enthusiasm. Many prospective purchasers were influenced by the time certain vehicles occupied in getting between the obstacles, but it would seem that the more important thing would be the number of obstacles disturbed while running. There can be no doubt that the factor of able manipulation is an important one, and while a certain carriage may cover the distance in a shorter time than some others much depended upon the operator. It is better to go slow than to run fast and have such running result in accident. The question of safety must forever be uppermost in the minds of those who both manufacture and operate motor vehicles.

Similar contests were conducted on the evening of Tuesday, November 6, which were confined to gasoline vehicles only. The following firms were represented: The International Motor Carriage Company, Ohio Automobile Company, Holyoke Automobile Company, and the Automobile Company of America. The winner of the obstacle race was a vehicle of the last-named company.

Society was again in evidence on Wednesday night. Not only was there an excellent attendance, but many fashionable folk were observed in the boxes watching the endless procession of swift moving vehicles or in the arena listening to the explanations of the exhibitors as they lectured on the superior merits of their respective products.

Among the well-known people present during the afternoon or evening were Mr. and Mrs. Edward McVickar, Mr. and Mrs. H. B. Duryea, Mrs. Hermann Oelrichs, Mr. and Mrs. H. Mortimer Brooks, Miss Gladys Brooks, Woodbury Kane, Frederick Gebhard, Lorillard Spencer, Jr., Mr. and Mrs. Hamilton Cary, Albert C. Bostwick, A. Gordon Norrie, Mr. and Mrs. Alfred de Cordova and Mr. and Mrs. Clement C. Moore.

An incident of the afternoon was the arrival of a military motor-cycle, built by the Mobile Company of America, carrying four National Guardsmen, with their rifles and equipment, including 1,000 rounds of ammunition apiece, shelter tents, blankets, cooking kits, and intrenching tools. The vehicle made the run from Tarrytown, 31 miles, in 65 minutes. It is steam propelled, 12 horse-power, and weighs 1,500 pounds. It joined in the pro-

cession about the arena and attracted a great deal of attention. This wagon is one made as a result of a suggestion of General N. A. Miles, of the United States Army.

There were no special contests, and in consequence a much larger proportion than usual of the spectators was able to try a ride in the vehicle which took their fancy. All the carriages were well patronized, except the delivery wagons and the small two or three wheeled varieties of artificially propelled vehicles.

Military Wagon of the Mobile Company of America

Several visits to the show were necessary for the average visitor to obtain even an approximate idea of the extent and variety of the many devices shown, particularly those of auxiliary use. An ingenious application of the "coin in the slot" idea was shown in an "electrant" designed to supply electricity as a hydrant supplies water, after the necessary coin is deposited, of course.

It is an iron construction about a foot square and four feet high. The *chauffeur* inserts a plug, which he must carry with him, and establishes a connection with his batteries. The contact allows a door to open, in which is the slot and a switch. Upon depositing a quarter in the slot and shifting the lever enough electricity to propel an ordinary electric vehicle a distance of 25 miles is obtained. It is expected that these automatic devices will be installed in suburban villages and places on the main lines of travel between important points where an electric vehicle might otherwise become stalled for lack of power. The power of the electrant is derived from a dynamo.

The number of carriages on the track was quite large, and the many styles and colors, together with the variety of costumes worn by those occupying the carriages, gave to the scene a fairy like appearance. There was an unusually large gathering assembled in the gallery, but for some reason or other the contests which had been arranged for steam vehicles did not take place, much to the disappointment of a great many persons present.

An exhibit which attracted considerable attention was that of the Mobile Company of America, who rented the entire space on the roof garden. The hill climbing exhibition evoked much admiration, and, as will be seen from the illustration, the performance is really remarkable. There are three different grades: the first being 40 per cent., the middle one 45 per cent. and the third leading to the tower being 35 per cent. The carriage ascends at the rate of 12 miles per hour. In descending the first grade is made with the vehicle backing. When the first halting place is reached the carriage is turned round and descends front first. No one can just realize what such a grade really is until they attempt to walk up and down.

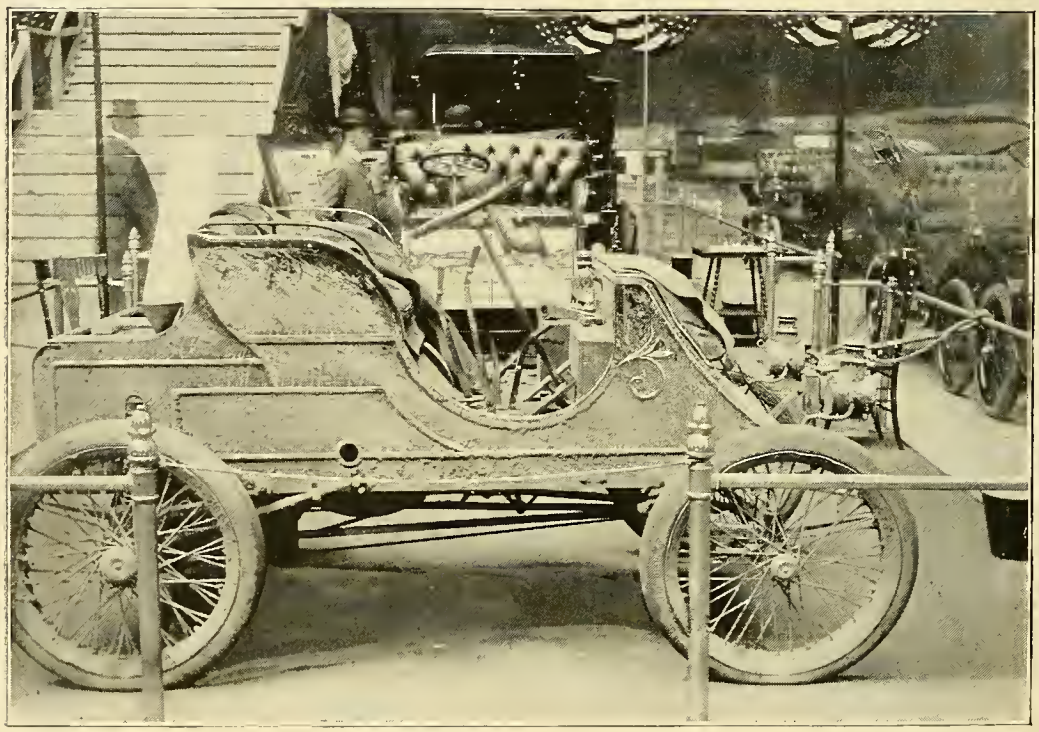
The Mobile Company had a large number of one-seated and two-seated vehicles, delivery wagons, etc., on exhibition, its carriages being in great evidence on the track.

Winton's racing carriage, in which he came overland from Cleveland to New York, was almost continually surrounded by visitors. The vehicle was covered with mud and served as an excellent object lesson as to what some vehicles can stand in the way of rough usage. The vehicle came from Cleveland to New York in a little over thirty-eight hours, which gives an average speed of 21 miles per hour.

The Paragon Insulating Company, of Cleveland, showed an exceedingly interesting thing in the way of a charging plant suitable for private use, in which a compact gasoline motor is directly connected to a shunt-wound dynamo, carrying an out

board ring oiling bearing and wound for the voltage required by the batteries. The apparatus starts, runs and stops automatically, and the engine uses either gas or gasoline.

Thursday proved to be a red letter day in a number of respects. The attendance numbered about 6,000. Large numbers of machines were constantly on the track and the evening brought a number of amusing incidents connected with the contests. For some reason the exhibition management succeeded in instilling more enthusiasm on the part of exhibitors to enter the competitions, which made it more representative than had been the case previously, owing to their backwardness to enter. The novel



The Winton Racer

character of the steam tricycle contests seemed to strike the crowd just right, and they evoked much laughter and amusement.

A starting contest for gasoline vehicles was won by the "gasmobile" of the Automobile Company of America.

The Loan Exhibit of the Automobile Club of America was very interesting and was inspected by a curious crowd almost continuously. Among the more interesting exhibits included was an exact duplicate of Dudgeon's carriage built in 1860. This is a crude affair, although the arrangement for warming the feet of passengers is quite original. Then there was the steam bicycle of S. H. Roper.

The Panhard machine of Grant Lyman, which was attended by his French *chauffeur,* Julian Blanchard, was the centre of much interest. It has a 12 horse-power motor. The automaton shown in the attitude of pushing an invalid's chair and several other interesting relics of the early days of attempts in connection with self-propelled vehicles proved quite instructive and formed a striking contrast with the more modern vehicles shown in the arena of the Garden and on the track.

The first gasoline vehicle built in America also interested a great many by its striking appearance as compared with the machines about it. This carriage was built in 1893 by Haynes & Apperson, of Kokomo, Ind., and one of the builders informed us that when it was shipped from Kokomo for New York it was run to the depot under its own power. Many miles were covered by Mr. Haynes in it during the years 1893, 1894 and 1895.

Friday was a busy day for all hands, as the number of visitors still was large. The great feature of the day in the way of tests was brake and obstacle contests for delivery wagons.

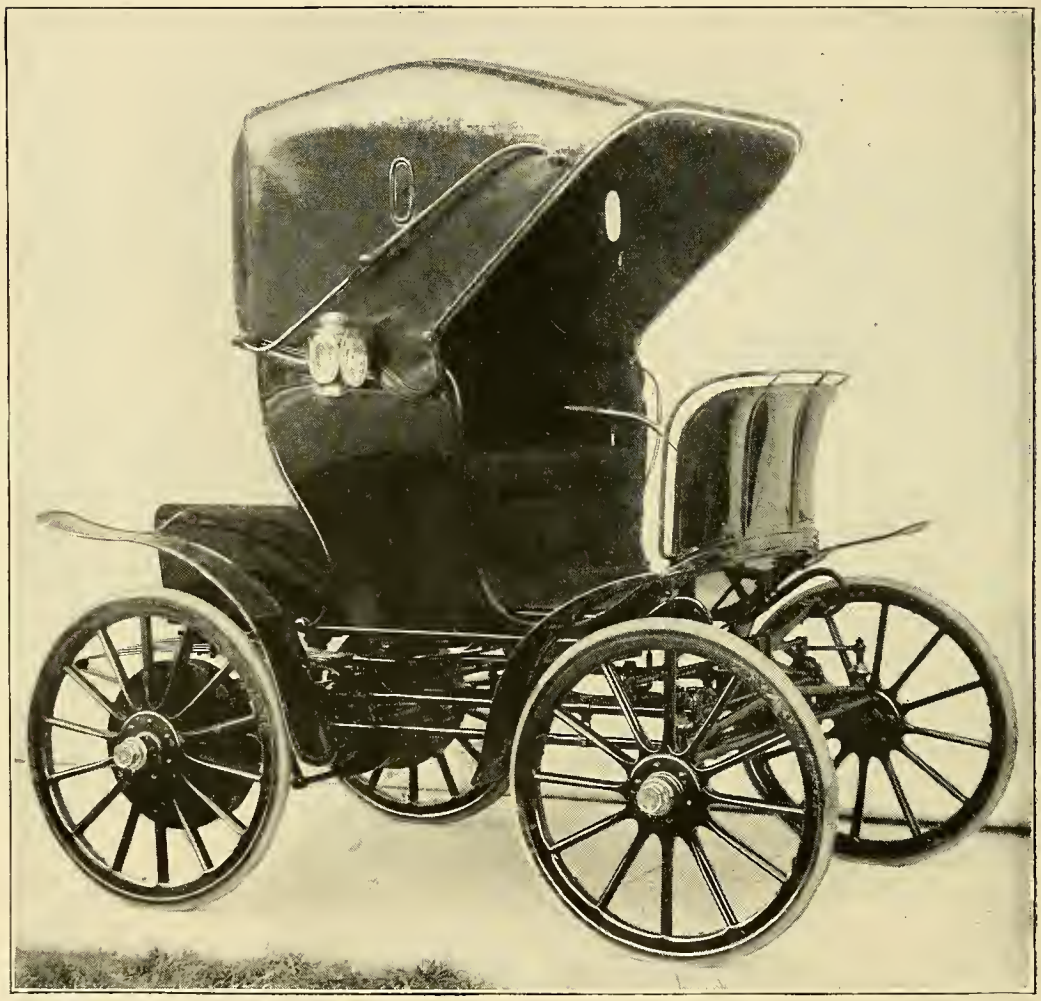
At the close the exhibitors and members of the Automobile Club of America adjourned to the assembly room, where a banquet was held. Vice-President Albert C. Bostwick presided in the absence of Albert R. Shattuck. Speeches were made bearing upon the different features of the show.

Five electric delivery wagons entered for the quick stopping contest, a run of 100 feet being required and then stopping as quickly and within as short a distance as possible. The distances varied from 6 to 23 feet, and the times from 5⅘ seconds to 8⅗ seconds. In the final heat the vehicle that made the quickest time before won in 6⅖ seconds, stopping within 10 feet and 7 inches.

The obstacle race had seven starters, all big vehicles, and every one bearing names of well-known New York firms. The winning wagon came up to the requirement in 1.01⅕. There was a decidedly practical element in these contests, for it demonstrated what huge delivery motor vehicles are capable of doing on the public streets in averting accidents. The suddenness of the stop when going at a lively pace was a distinct revelation to a large proportion of the spectators.

Saturday, November 10, saw the closing day of the exhibition, and it is safe to assume that the members of the Automobile Club of America, exhibitors and visitors alike look back with great satisfaction upon the success of the enterprise from every point of view. The attendance on the closing day was as large, if not larger, than it had been on the previous days. There was, how-

ever a feature of the exhibition which was felt keenly by many of the visitors, and that was the failure to carry out all the contests and races as arranged. There were many who were especially anxious to witness these, and on more than one occasion visitors were heard to express themselves very forcibly about the matter, and such expression was entirely justifiable, for no matter how little disappointment the failure to hold certain contests may have caused those exhib-



Stanhope of the National Automobile and Electric Company

iting it was a source of great disappointment to many visitors. There may have been good reason for this omission, but it is hoped that on future occasions it will be arranged so that those who attend will see all they have been promised.

A number of the exhibitors at Madison Square Garden also had space at the Grand Central Palace Show held from November 14 to 24, and simply moved their carriages from one building to the other.

Automobile Show at Madison Square Garden

We were unable in some instances, owing to lack of time in which to make necessary illustrations to present views of a number of exhibits made, and take pleasure in giving our readers a chance to see and read of these, for while a number of our readers visited the show there are others who were not able to.

The National Automobile and Electric Company, of Indianapolis, exhibited eight different vehicles, of which we illustrate two, the break for four passengers and a Stanhope. The first-

Four Passenger Break of the National Automobile and Electric Company

named vehicle is fitted with a 2½ horse-power motor, its radius of action being about 45 miles.

The Stanhope shown has graceful lines and is capable of running 45 miles on one charge.

All vehicles shown by this company were fitted with electric power, electric lights, electric alarm bells, fully equipped with Weston combination meters and all modern appliances.

The exhibit of the Automobile Company of America, Marion, N. J., was a very attractive one and was very much admired by the people. The carriage with white body and pig skin trim-

mings was considered a thing of beauty, while the delivery wagon which we illustrate was a favorite.

Two Stanhope phaetons of the same type as the winners of the first and second prizes to American-made machines at the Guttenburg races were shown. The motor is of triple cylinder design, compact in form and very powerful. The vaporizer, supplying the three cylinders, is of the constant level type, and the ignition is by a jump spark. Two forward speeds and the six-mile reverse are inclosed in a dust-proof case. All intermediate speeds are obtained by throttling the mixture, and this tiny throttle effects the changes instantly. The motor, transmission gear, tanks and body are fastened to the bar iron frame, and this entire

One of the Carriages of the Automobile Company of America

weight is carried by four semi-elliptic springs between the axles and the frame. Great flexibility of wheel support is thus obtained. These are ideal touring carriages, the tank capacity of both water and gasoline being sufficient for a day's journey. The radiating coils under the tool boot in front reduce the amount of water to be carried four-fifths. No oil cups are seen and the wheels and shafts have roller bearings. Steering is done by a side lever, this insuring quick action. Foot pedals control the reverse clutch and the brakes on the rear hubs, and the 32-inch wooden wheels have 4-inch tires.

A most luxurious surrey formed another type shown. This is equipped with a hydro-carbon motor of multi-cylinder design,

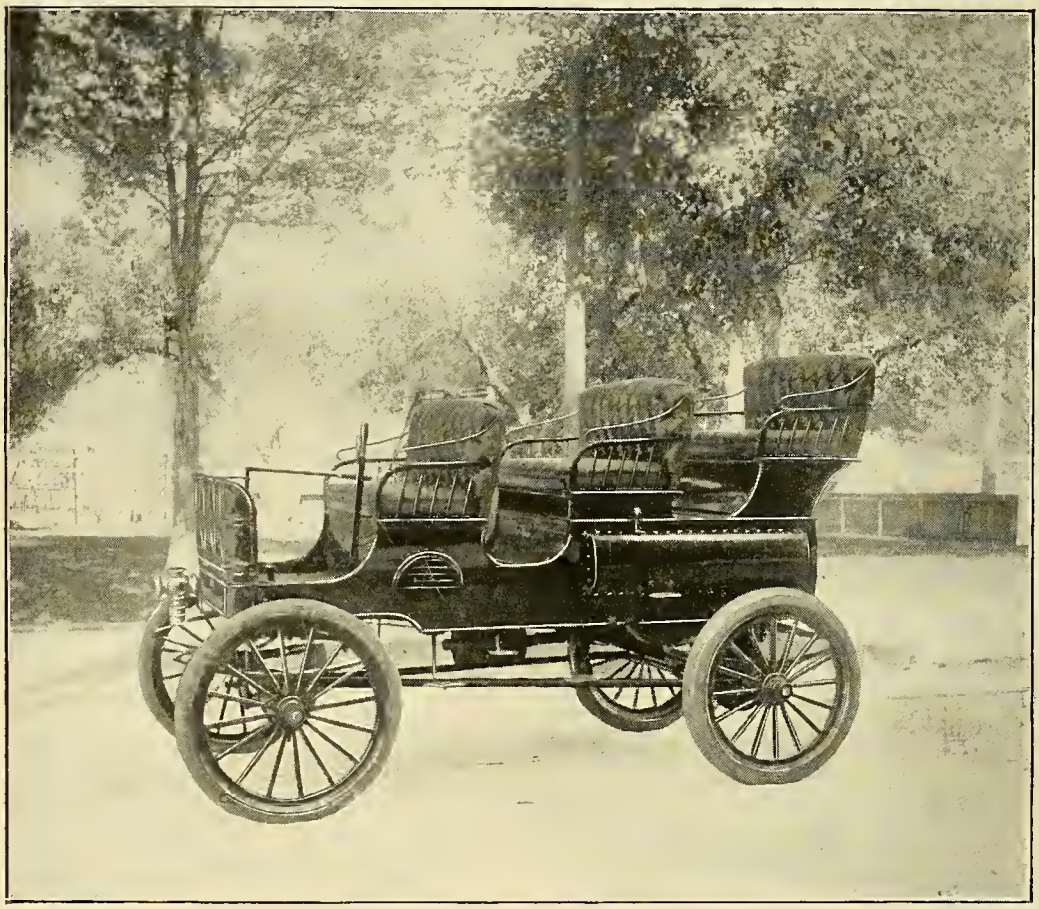
Automobile Show at Madison Square Garden

Delivery Wagon

The "Gasmobile" of the Automobile Company of America

developing power for a 25 per cent. grade. The same simplicity and strength of mechanism, the same thoroughness and finish of detail found in the Stanhopes are evident here, and, indeed, characterized each feature of this exhibit.

A graceful Victoria in red and green attracted much attention and at the east end of the exhibit, under the electric " gasmobile," the different parts of the automobiles were artistically arranged for inspection. These vehicles are built on the interchangeable



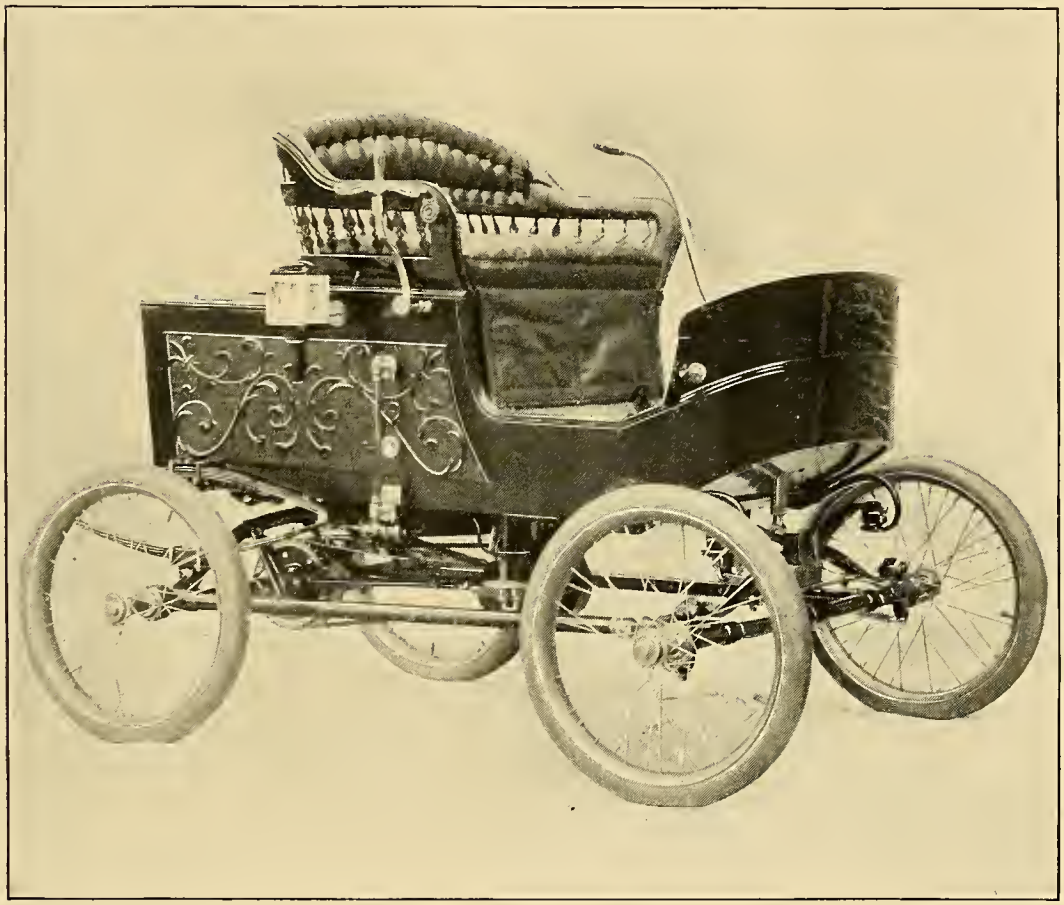
Three Seated Carriage of the Haynes-Apperson Company.

plan, and with the exception of the tires and wooden wheels, the entire output is manufactured by the company at its plant at Marion, Jersey City, N. J.

Haynes and Apperson Company, of Kokomo, exhibited two or three vehicles. This firm is one of the pioneers in the successful manufacture of motor vehicles, and has done a number of very creditable things. Their factory is running full blast at present in order to keep up with orders. We present illustration of this company's six-passenger automobile, which, as will be

seen, is provided with three seats, each one a little higher than the other, enabling passengers to get an unobstructed view of the country while riding.

These carriages are substantially built and fitted with a 12 horse-power engine, which will take the carriage up a 20 per cent. grade. The speed of the carriage is 15 miles per hour. The seats are very wide, and eight passengers can readily be accommodated.



The "Toledo" Steam Carriage

One of the new things in the way of steam driven vehicles was that of the American Bicycle Company's, known as the "Toledo" carriage. From the time it was brought into the Garden to the time it was taken out again a curious crowd surrounded it during the exhibition hours, as certainly it was a beautiful example of automobile building. It is standard gauge tread, carries 36 gallons of water and 9½ gallons of oil. The running gears made up on 1¾, 14 and 16 gauge tubing with a patent device on the steering lever which removes all vibration

The arrangement of a pump in combination with the steering lever is such as to render it possible to pump water to the boiler when running, if necessary.

The engine is of the simple two-cylinder type with piston valves. The stroke is 3¼ by 4¼ inch, developing 6¼ horse-power at a steam pressure of 200 pounds to the square inch. The boiler is of a new water tube type, having eleven tubes and a double shell. This boiler steams very rapidly. Air is supplied to the air tanks by a power air pump driven by the engine, and is put in and out of commission by the pressing of a plunger with the foot. Reverse and throttle lever is all in one.

The carriage is decidedly handsome and is a thing of beauty. The body is of high finish, and everything about the vehicle is suggestive of a reliable and serviceable carriage.

The automobile seems to be something more than a mere fad, and it is by no means true, as is very often supposed, that only wealthy people have serious thoughts about owning a motor vehicle. A man interested in the sale of automobiles informed us recently that in many instances inquiries come from people whom one would least expect were considering the purchase of a motor carriage. From all sorts of unexpected sources inquiries and requests for information come.

"I'm thinking very seriously of getting one," said a milkman the other day, "and I will tell you the reason why; within the past year I have lost two horses. One cost me $150 and the other cost $165. I could almost buy an automobile for that, and the automobile wouldn't die on my hands. It wouldn't eat its head off, either, nor would it fall down and break its legs. So, you see, it isn't as funny for a milkman to have an automobile as it sounds."

The above contains a great deal of horse, or, we should say, "automobile," sense, and is only one instance of how the new method of transportation is taking hold of commercial as well as social life.

The Horse's Ode to the Automobile

Oh, Auto!
You insensate bundle
Of wheels and gears,
And things,
Without ancestry or hope of posterity,
Do you ever lay the flattering unction
To your soulless
Mechanism
That you can
Supplant me?
Me! The helpful
Aid to all the race of human kind;
The beast of burden;
The wheel horse
Of Victory of every epoch
In the struggles of
Humanity
From the days of Elijah
To the present time!
What were the Crusaders
In their search
For the Holy Sepulchre;
And the spreading of
The Word?
What the Armies
Of Alexander,
Of Cæsar,
Of Napoleon,
And all the wars
Of all the conquerors
Of National Fate
And human destiny
Without me and mine?
We who are sons and
Brothers to the sentient
Creatures,
Who swept the
Plains of Marengo
And Austerlitz,
And made the world ring
With the daring
Of Balaclava?
Go to, you Auto!
You painted toy.
When you get through
Your rubbering
And your bumping,
And your puncturing,
Turn you your eyes
Upon me with
Envy for the thing I am
And always will be;
The joy of men,
The pet of women.
You will never know
The tumultuous thrill
Of God's creatures,
As when I am leader
In the race.
Perish the thought!
I am son of
Alexander's Bucephalus
And brother to Rienzi.
The steed
As black as the shades of night
Who brought
Sheridan
All the way
Down from Winchester
To save the day.
If I had not,
And you had been IT
What would
Phil have done
That bright September morn
With a punctured tire
And a slipped eccentric?
The affrighted air
Would not have borne
The herald of

Victory:
But the spiltherinktums
Of a heap of scrap.
When from the palsied grasp
Of Man
The sceptre falls.
And the earth is
Shrivelled to a scroll,
You may hitch
Your wagon to the stars
And find the planets,
Having lost their heads,
May tie to you;
But until then
Whisk and whirr
But don't think you're in it
With me.

—*Ex.*

Book Reviews

"Motor Vehicles and Motors." By W. Worby Beaumont. Published by J. B. Lippincott Company, Philadelphia. Price, $10.00. This is a most exhaustive treatise on the design, construction and operation of motor vehicles driven by steam, gasoline and electricity. The book ought to be of real assistance to engineers and motor vehicle constructors. The information it contains is explicit, definite and reliable. The work is profusely illustrated, while the press-work is excellent. The author devotes some space to early vehicles, road resistance, frictional losses, air and wind resistance, carbureters, etc. The book is an admirable one and great pains have evidently been taken to make it so. It contains 636 pages and is bound in cloth.

The chapters originally intended to be written by Dugald Clerk on the physics and economics of internal combustion motors will appear shortly as a separate volume. The whole work is excellent, and the publishers as well as author are to be complimented.

The Electric Automobile: Its Construction, Care and Operation. By C. E. Woods. Published by Herbert S. Stone & Co., Chicago and New York. Price, $1.25. The author goes into the introduction of automobiles, giving a number of illustrations of some early carriages. Other chapters deal with carriage construction, operation and care of electric automobiles, construction and use of storage batteries, the operation and control of motors as used on automobiles. There are numerous illustrations of different types of motor vehicles. To users of electric carriages this book ought to prove of great value. It contains 177 pages and is bound in cloth.

Motors and Motor Cars: Their Defects and Remedies

A PAPER bearing the above title was recently read before the Cycle Engineers' Institute by Charles T. Crowden, and below we print extracts from it:

It is not proposed to go into the historical part of the subject, but it may be mentioned that a machine was constructed by Mr. Edward Butler in London between the years 1884-1886, at the same time as Messrs. Benz and Daimler were at work in Germany. The machine, which was called the petrol cycle, was very much like the Bollée machine afterwards brought out, and was not further developed because of the "Red Flag Act," which did not allow its use in England. At the same time Mr. Butler also constructed a high speed oil motor or engine to run from 800 to about 1,000 revolutions per minute. At this time there were no gas or oil engines which would run above 180 to 200 revolutions.

Motor cars cannot take their supply of gas from the street mains very well, so a portable gas works, or "carbureter," is carried, in which air, during the suction stroke of the motor, is drawn through or over a volatile spirit called petrol or gasoline, having a specific gravity of .680 to .700. What is a carbureter? or what kind of carbureter should be used? many people inquire, especially those who have a thirst for motor philosophy. The carbureter is a vessel in which a small quantity of petrol or hydrocarbon is carried and mixed with air in a regulated quantity to suit the motor. Firstly, the air can be drawn across the liquid; secondly, the liquid can be sprayed through a vessel; thirdly, the air can be drawn across a saturated cotton or gauze wick; or, fourthly, the oil can be injected into the motor direct at each suction stroke. The suction of the motor causes the gas to be generated when wanted in sufficient quantities to supply the motor and effect complete combustion without smell. Carbureters may be divided into the following classes: Firstly, surface carbureters; secondly, spray carbureters; thirdly, wick carbureters; fourthly, petrol ejected, with air supply, direct.

Lubrication is a most important point in connection with the successful working of motors. Gas or explosion engines would have been possible years before the days of Lenoir, Otto, and others, had some one come forward with a mineral oil to lubricate it with. The heat of the explosion, the temperature of which is

about 800 to 1,000 degrees Fahr., should pass through the walls of the cylinder, after every power stroke, to the water jacket. The temperature of the cooling water ought not to exceed 180 degrees Fahr., or else the oil will become congealed in the motor cylinder. The cylinders themselves also become distorted, the valves stick up, and various other troubles present themselves, which have led the author to the conclusion that even for small motors a water jacket is required to get the full power of the motor, and to get rid of the offensive smells of unjacketed motors.

Some men have clipped or threaded radiating ribs on to their cylinders. Now to get the thorough effect of radiating there must be a continuity of substance. Heat will not pass through separate bodies as through a solid one. The rings should be tongued at the joints. In this respect, what will do for a steam engine practically will not do for gas or petrol engines. A still further improvement may be looked for in this respect. A compression of over 100 pounds, or more if it could be maintained, would be the means of increasing the power of the motors considerably.

Great attention should be paid to the valves to see that they are seated properly, and they should be ground in with rotten stone, not emery. It does not much matter whether the seats are mitred or flat. The valves and valve seats should be made renewable and separable from the motor, so that spare ones can interchange, as the fault is not always with the valves themselves, but with the valve seatings, which are usually made a part of the motor. The same pattern of valve could serve both for the inlet and the exhaust, and in the case of a double engine one pattern of valve may serve for both cylinders. Instead of lift valves Mr. Butler still uses a revolving valve that travels at half the speed of the motor. The author has seen these valves taken out after working for a month, day and night—resting only on Sundays. The valve is similar to a Corliss valve, revolving instead of reciprocating. A black oxide forms on the wearing part of the valve or seat, which makes it almost impossible to touch with a file. As these valves have now been running successfully for about fourteen years, they are worth the attention of motor constructors. The valve springs in use on most motors are far too short, and ought to be longer. Valves, pistons and rings should be thoroughly cleansed in paraffine, and the crank shaft turned round some forty revolutions when the motor is not in use. This would largely prevent the sticking up of valves, tight pistons, etc.

A motor car engine should be constructed as light as possible, without any signs of springing or contortion, remembering the

force of the explosion acting on the piston, say at 600 or more revolutions per minute. The moving parts also should be as light as possible, and balanced. As far as the piston, connecting rod and crank go, the fly-wheel may be suitably weighted, and should be as large as possible, and heavy. Even then a large amount of vibration will exist, especially when the car is stationary, and the motor is running as slowly as possible. The vibration is not felt when the car is traveling slowly, and, to my mind, is more imaginary than real. The motor car is for traveling purposes, not for standing still at corners to shake up its passengers. If motormen must stay at corners, let them stop their motors and then start them again when required. To get rid of this so-called difficulty, motors are made with two or more cylinders, arranged in different ways to partially balance themselves. Not only do the moving parts require balancing, but the explosions also. Firstly, take a double-cylinder motor, with the cranks set opposite one another. Here all the moving parts are balanced, but not the explosions, and there is an impulse at every one-and-a-half revolution. Secondly, take a double-cylinder engine, cranks set together. Here we have motor parts unbalanced—impulse or explosions every revolution. Explosions or impulses are more regular, but not balanced. Thirdly, take a single-cylinder engine, with piston and cranks, as usual, instead of a back cover, another piston having a cross head with two connecting rods, one at either side, coupled on to cranks set together opposite to the centre crank, so that the pistons meet and recede from one another at each revolution. This, in the author's opinion, is a very rude practical attempt at balancing. The side connecting rods can never be made to work without knocking, and that even at slow speeds. Fourthly, take a single cyclinder, open at both ends, with two pistons, each piston connected with a rocking beam, and each rocker connected to a single crank by the connecting rod; here there is perfect balancing of parts and explosions, but at the expense of increasing the number and weight of moving parts. Fifthly, take a single-cylinder engine of the simplest construction, and the moving parts made as light as possible, heavy fly-wheel balanced for its intended speed, moving parts which are partially balanced by the fly-wheel and balance-weight. The centre of the fly-wheel should be placed in the centre of the car, and revolve in the direction in which the car travels. All these so-called balanced engines have been made and tried, and as they were more complicated to keep up and more expensive to manufacture, and not suitable for running at high speeds, the author considers

for a motor car a one-cylinder engine, with simple parts, get-at-able on the road, far more useful than these complications.

The oil or petrol motor, unlike the steam engine, cannot be readily started and stopped, and therefore must be kept running whether the carriage is at rest or going full speed. A governor is usually fitted to control the working number of revolutions. Other means for slowing down the number of revolutions when not required are sometimes fitted. With the use of steam the motor can readily be started and stopped, as long as sufficient steam can be supplied from the boiler or steam generator. With the petrol motor a friction clutch, a transmission gear, and a change speed gear are required. With the steam engine, instead of the foregoing, a troublesome steam generator is required, with its cleaning of tubes internally and externally, which ought to be done every week. In the case of steam motors, water and fuel can be carried to last from twenty-five to thirty miles running. Oil fuel is too expensive in this country (England), but it is very convenient, as the heat can be easily regulated to make the necessary steam required to drive the motor over the various roads to be traversed.

Most motor manufacturers put their engines anywhere convenient—many in one corner of the frame, some in front, and some behind. The motor should revolve in the direction the carriage is traveling, and if one fly-wheel be used, this should be placed on the centre line of the car; if two fly-wheels are used, one each side of the centre line. Motors arranged in this way will steady the carriage whilst traveling and will minimize the vibration and prevent it from capsizing. Fly-wheels placed horizontally will give even better results. Most makers fix their motors too near the ground, so that they are difficult to adjust and repair, being more or less in the dust and dirt. Motion is transmitted from the petrol or continuous running motor by means of a friction clutch or change speed gear. For driving a differential countershaft or axle by means of chains or spur gearing at least three or four changes should be provided. To change the speed-gear wheels it is first necessary to withdraw the friction clutch, then make the change in the gear, and lastly put the friction clutch slowly in again.

The road carriage or truck should be constructed much stronger than for horse draught to do the same work, as it must be remembered that the horse is carried as well as the load, and that the driving strain of the horse is to be taken up by the carriage. The wheels must be stronger, as they have not only to carry the load, but to drive it along as well. The tires should be

elastic; solid rubber tires are the best known at present. Pneumatics are far too expensive, and on some roads very dangerous. The vehicle should be fitted with a strong and well-constructed steering gear, and with a band brake, operated by a foot lever, acting on the differential gear shaft. There should also be a powerful lever brake acting on both rear wheels as an emergency brake. A device should be fitted for preventing the car from running back downhill in case the motor should fail. The body should allow access to all the machinery, so that it can be adjusted and examined without removal. For examination at home the body should be easily removable, without disturbing any levers or machinery of any kind. The author would urge the necessity of using the very best material and workmanship in the construction of motor vehicles. Inferior and cheap materials are useless. To work motor cars successfully, especially petrol engines, cleanliness is the great secret of good running. Stoppages, or so-called breakdowns, are, in nine cases out of ten, due to negligence, forgetfulness, or dirtiness on the part of the operator, and it is by serving a course of failures and trials, which are disappointing at the time, that one becomes sufficiently wise to prevent the same occurring again in the future.

After the reading of the paper a discussion took place in which Messrs. Sturmey, Staner, Hewitt, Warner, Jones, Craig and Leechman took part.

The following lines have been written by Mr. Henry Edmunds, a well-known automobilist of Great Britain:

You may ride on a horse, or a mule, or a moke,
You may drive in a carriage, or sail in a boat,
You may swim in the water, or fly in the air,
Go just as you like, but only take care;
You may skate, you may walk, take train, tram, or bus,
Go in great state, or without any fuss,
You may bike on a wheel, a single or tandem,
Go just as you please, at will or at random,
You may stay at home near, or travel afar,
But nothing can equal a mote on a car.

The Steering of Automobiles

QUITE a number of accidents have happened recently, all of which seem to be more or less due to the steering mechanism of automobiles giving way. The accidents appear to have been confined to no particular type of car, and not in any special degree to any one system of steerage. The matter of providing an absolutely safe and sound means of effecting the required control has, throughout the development of the motor car, been felt to be one of the most difficult and urgent problems.

The substitution of wheel steering at sea by means of a worm and pinion in place of the direct action of a wheel or tiller, provides greater security against the risk of accidental deviation, at the expense of less sensitiveness of control and a lack of "sweetness" in executing delicate and rapid manœuvres. In the same degree the abandonment of the pivoted axle of a motor car in favor of the two separate and intercepted axles now usually adopted, while tending to abolish the liability of the axle to swing round bodily when one wheel encounters an obstacle, presents new mechanical problems, owing to the relative inherent weakness of the intercepting system. Again, an increase in the size of the parts which specially require strengthening leads to a corresponding augmentation of weight, to a greater amount of frictional resistance, and to other drawbacks. The whole question, indeed, bristles with fine points. A split-pin gives way, therefore let us do away with split pins. As an alternative cause of mishap a nut unscrews, or strips its thread, therefore nuts must be abandoned.

There can be no doubt that a distinct room for improvement exists in well-nigh all the steering mechanisms so far adopted in the automobile industry, and the necessity for practical perfection in this particular direction scarcely needs emphasizing. Under proper control, with all its working parts in good order, the automobile is distinctly the most manageable vehicle to be met with on common roads, and to the result the efficiency of its steerage most materially contributes. But with a defective steering gear it at once becomes the most dangerous user of the highway.

"Automobile Topics" is the name of a new illustrated weekly devoted to the doings of automobilists. The number before us contains 26 reading pages. The topics are presented in an interesting style. A schedule of coming events is included and there is a department devoted to what is going on at the leading theatres in the city. It is published in the Park Row Building and is edited by E. E. Schwarzkopf, formerly connected with this publication.

Comparative Tests of Electric Automobiles for City Service

PART II.

The average power consumption of vehicle *A* from Table II. for a complete circle of the park, going north on Fifth avenue, was 90.52 watt-hours per ton mile. The average power consumption going north on Eighth avenue was 90.99 watt-hours per ton mile. Taking the average of these, we find 90.75 watt-hours per ton mile to have been required for the propulsion of vehicle *A* over good asphalt pavement—with the exception of about .4 of a mile of bad cobble and macadam. Therefore, 90 watt-hours per ton mile may be taken as possible under ordinary conditions for vehicle *A* on level asphalt in good condition. This for an average speed of 9.71 miles per hour.

Having now seen what vehicle *A* was able to do under ordinary circumstances, it becomes of interest to know whether the results obtained were exceptional in any way, or whether they may be taken as representative of what may be required of electric vehicles in general under similar circumstances.

To determine this point, a number of vehicles of several other makes were tested over the same ground as vehicle *A*, under exactly similar conditions. In Table III. the results obtained while testing vehicle *B* are recorded. This vehicle was an electric delivery wagon designed for use in the same class of light delivery service as was vehicle *A*.

TABLE III.

[*Vehicle B.*]

Weight of vehicle	3,380 lbs.
Weight of passengers and instruments	334 lbs.
Weight of load carried	..
Total weight causing drawbar pull on test	3,714 lbs.
Battery equipment	40 cells
Weight of battery	1,250 lbs.
Per cent. of battery weight to total weight of vehicle	36.98 per cent.
Per cent. of battery weight to total weight causing drawbar pull	33.65 per cent.

Weather clear; no wind. Streets in good condition.

Principal ground covered on test: Fifth avenue, from Fifty-ninth street to One Hundred and Eleventh street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Tenth street, from Fifth avenue to Eighth avenue; One Hundred and Eleventh street, from Fifth avenue to Eighth avenue; Eighth avenue, from Fifty-ninth to One Hundred and Eleventh street.

Total distance covered during test ..... 26.19 miles
Total time in motion ..... 2 hr. 39 min. 30 sec.
Average speed while in motion ..... 9.85 miles per hr.
Total watt-hours used on trip 3,808
Average watt-hours used per car-mile 145.4
Average watt-hours used per ton-mile 78.29
For a distance of ..... 0.85 mile
Time in motion was ..... 6 min.
Average speed while in motion ..... 8.5 miles per hr.
Number of watt-hours used 129.6
Average watt-hours used per car-mile 152.47
Average watt-hours used per ton-mile 82.1

For a distance of ..... 2.61 miles
Time in motion was ..... 14 min.
Average speed while in motion ..... 11.18 miles per hr.
Number of watt-hours used 396.8
Average watt-hours used per car-mile 152 03
Average watt-hours used per ton-mile 81.87

For a distance of ..... 0.52 mile
Time in motion was ..... 3 min. 30 sec.
Average speed while in motion ..... 8.91 miles per hr.
Number of watt-hours used 19.2
Average watt-hours used per car-mile 38.85
Average watt-hours used per ton-mile 20.72

For a distance of ..... 2.54 miles
Time in motion was ..... 14 min.
Average speed while in motion ..... 10.88 miles per hr.
Number of watt-hours used 432
Average watt-hours used per car-mile 170 08
Average watt-hours used per ton-mile 91.58

For a distance of ..... 0.6 mile
Time in motion was ..... 4 min.
Average speed while in motion ..... 9 miles per hr.
Number of watt-hours used 129.6
Average watt-hours used per car-mile 216
Average watt-hours used per ton-mile 116.31

For a distance of ..... 2.61 miles
Time in motion was ..... 15 min. 30 sec.
Average speed while in motion ..... 10.1 miles per hr.
Number of watt-hours used 356.8
Average watt-hours used per car-mile 136.66
Average watt-hours used per ton mile 73.59

For a distance of ..... 0.87 mile
Time in motion was ..... 5 min. 30 sec.
Average speed while in motion ..... 9.5 miles per hr.
Number of watt-hours used 86.4
Average watt-hours used per car-mile 99 31
Average watt-hours used per ton-mile 53.48

For a distance of ..... 2.63 miles
Time in motion was ..... 15 min. 30 sec.
Average speed while in motion ..... 10.18 miles per hr.
Number of watt-hours used 404.8
Average watt-hours used per car-mile 153.91
Average watt-hours used per ton-mile 82.88

Tests of Electric Automobiles for City Service

For a distance of.... .....2.64 miles
Time in motion was..... .....14 min.
Average speed while in motion..... .....11.31 miles per hr.
Number of watt-hours used..... .....342.4
Average watt-hours used per car-mile.....129.69
Average watt-hours used per ton-mile..... 69.83

For a distance of..... ....0.62 mile
Time in motion was..... .....5 min. 30 sec.
Average speed while in motion..... .....6.76 miles per hr.
Number of watt-hours used.....145.6
Average watt-hours used per car-mile.....234.83
Average watt-hours used per ton-mile.....126.45

For a distance of..... .....2.55 miles
Time in motion was..... .....17 min.
Average speed while in motion..... 9 miles per hr.
Number of watt-hours used..... .....396.8
Average watt-hours used per car-mile..... . .155.6
Average watt-hours used per ton-mile..... 83.79

For a distance of..... .....0.64 mile
Time in motion was..... .....4 min.
Average speed while in motion.....9.6 miles per hr.
Number of watt-hours used..... .....57.6
Average watt-hours used per car-mile..... 0
Average watt-hours used per ton mile..... .....48.46

For a distance of..... .....2 63 miles
Time in motion was..... ...15 min.
Average speed while in motion.....10.52 miles per hr.
Number of watt-hours used..... 336
Average watt-hours used per car-mile..... .....127.75
Average watt-hours used per ton-mile..... 68.79

For a distance of ....0.6 mile
Time in motion was ....5 min. 30 sec.
Average speed while in motion..... ....6.54 miles per hr.
Number of watt-hours used.....144
Average watt-hours used per car-mile 240
Average watt-hours used per ton-mile 129.24

For a distance of.....2.65 miles
Time in motion was .....16 min.
Average speed while in motion .....9.93 miles per hr.
Number of watt-hours used 368
Average watt-hours used per car-mile 138.86
Average watt-hours used per ton-mile 74.77

For a distance of .....0.63 mile
Time in motion was .....4 min. 30 sec.
Average speed while in motion.....8.4 miles per hr.
Number of watt-hours used 62.4
Average watt-hours used per car mile.....99 04
Average watt-hours used per ton-mile 53.33

Open circuit voltage at beginning of run	85 volts
Open circuit voltage at end of run	77.5 volts
Drop in 26.19 miles	7.5 volts
Running voltage at beginning of run	76 volts
Running voltage at end of run	66.5 volts
Drop in 26.19 miles	9.5 volts

From Table III. it will be noted that vehicle *B* covered 26.19 miles with an average rate of power consumption of 78.29 watt-hours per ton mile. The average speed was 9.85 miles per hour. The open circuit voltage at the end of the run was 1.93 volts per cell, and the running voltage was 1.66 volts. The maximum rate of power consumption noted was 129.24 watt-hours per ton mile. This rate of power consumption was recorded on a run of .6 of a mile, from Fifth avenue and One Hundred and Eleventh street to Eighth avenue and One Hundred and Tenth street. This particular part of the ground covered on this test included bad cobble pavement, a small grade and some bad macadam road surface. The speed on this section was only 6.54 miles per hour.

For the same section on another trip in the same direction, vehicle *B* showed a rate of power consumption of 126.45 watt-hours per ton mile at a speed of 6.76 miles per hour, which is at practically the same rate; and the results confirm the accuracy of those first obtained.

Over 24.5 miles of this run was around Central Park. Table IV. gives the result of two complete circles around the park in opposite directions.

TABLE IV.

[*Vehicle B.*]

Once around Central Park—North on Fifth avenue, south on Eighth avenue.

For a distance of	6.45 miles
Time in motion was	40 min. 30 sec.
Average speed while in motion	9.55 miles per hr.
Number of watt-hours used	942.4
Average watt-hours used per car mile	146.1
Average watt-hours used per ton-mile	78.62

Once around Central Park—North on Eighth avenue, south on Fifth avenue.

For a distance of	6.27 miles
Time in motion was	35 min. 30 sec.
Average speed while in motion	10.59 miles per hr.
Number of watt-hours used	977.6
Average watt-hours used per car-mile	155.91
Average watt-hours used per ton-mile	83.95

The discrepancy in distance that will be noted between the trip of vehicle *B* around the park, going north on Fifth avenue, and for the same trip as noted in Table II. for vehicle *A*, is due to the fact that vehicle *B* on this trip went through One Hundred and Eleventh street, instead of One Hundred and Tenth street.

The average of the two circles around the park noted in Table IV. gives 81.28 as the average rate of power consumption required to propel vehicle *B* around the park on good pavement—with the exception of the .6 of a mile of bad road surface noted above. So it is thought 80 watt-hours per ton mile may be taken as a possible rate of power consumption for vehicle *B* on level asphalt in good condition for an average speed of 10 miles per hour.

A comparison of the results obtained from Tables II. and IV. shows that vehicle *A* required 90 watt-hours per ton mile to propel it on level asphalt, while vehicle *B* required but 80. Hence it would seem as though the results obtained while testing vehicle *A* are in no way exceptional, and may be taken as representative of what may be expected of well-designed electric vehicles in general under similar circumstances.

Both vehicles *A* and *B* were equipped with solid rubber tires, and the ratio of the weights of their batteries and passengers to the weights of the vehicles as units was practically the same. The wheels of each vehicle were equipped with ball-bearings. The armature shaft on vehicle *B* was also equipped with ball-bearings. This was not the case with vehicle *A*, which would seem to indicate, as might be expected, that there is a saving in power consumption where ball-bearings or other friction reducing devices are used at all possible points.

A TEST WITHOUT FRICTION-REDUCING DEVICES.

That this is the case, the results presented in Table V. seem to confirm. In this table the results obtained while testing a vehicle designed for use in the same class of light delivery service as vehicles *A* and *B* are given. This vehicle was equipped with solid rubber tires, as were the others; but, unlike them, it had no ball-bearings or other friction reducing equipment at all—the wheels and motor shafts running in plain bearings.

TABLE V.

[*Vehicle C.*]

Weight of vehicle	4,190 lbs.
Weight of passengers and instruments	335 lbs.
Weight of load carried	...
Total weight causing drawbar pull on test	4,525 lbs.

Battery equipment ..... 44 cells
Weight of battery ..... 1,200 lbs.
Per cent. of battery weight to total weight of vehicle ..... 28.63 per cent.
Per cent. of battery weight to total weight causing drawbar pull ..... 26.51 per cent.

Principal ground covered on test: Fifth avenue, from Twentieth street to One Hundred and Eleventh street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Eleventh street, from Fifth avenue to Eighth avenue; Eighth avenue, from Fifty-ninth street to One Hundred and Eleventh street; Twenty-first street, from Seventh avenue to Fifth avenue.

Total distance covered during test ..... 24.75 miles
Total time in motion ..... 2 hr. 47 min. 54 sec.
Average speed while in motion ..... 8.83 miles per hr.
Total watt-hours used 5,316.8
Average watt-hours used per car-mile 214.82
Average watt-hours used per ton-mile 94.92

For a distance of ..... 2.38 miles
Time in motion was ..... 18 min. 54 sec.
Average speed while in motion ..... 7.55 miles per hr.
Number of watt-hours used 561.6
Average watt-hours used per car-mile 235.96
Average watt-hours used per ton-mile 104.22

For a distance of ..... 2.62 miles
Time in motion was ..... 15 min. 30 sec.
Average speed while in motion ..... 10.14 miles per hr.
Number of watt-hours used 494.4
Average watt-hours used per car-mile 188.7
Average watt-hours used per ton-mile 83.11

For distance of ..... 0.55 miles.
Time in motion was ..... 5 min.
Average speed while in motion ..... 6.66 miles per hr.
Number of watt hours used 220.8
Average watt-hours used per car-mile 401.45
Average watt-hours used per ton-mile 177.39

For a distance of ..... 2.6 miles
Time in motion was ..... 17 min.
Average speed while in motion ..... 9.17 miles per hr.
Number of watts-hours used 579.2
Average watt-hours used per car-mile 222.77
Average watt-hours used per ton-mile 98.44

For a distance of ..... 0.63 mile
Time in motion was ..... 3 min. 30 sec.
Average speed while in motion ..... 10.8 miles per hr.
Number of watt-hours used 80
Average watt-hours used per car-mile 127
Average watt-hours used per ton-mile 56.12

For a distance of ..... 0.68 mile
Time in motion was ..... 4 min. 45 sec.
Average speed while in motion ..... 8.58 miles per hr.
Number of watt-hours used 200
Average watt-hours used per car-mile 294.11
Average watt-hours used per ton-mile 129.96

Tests of Electric Automobiles for City Service

For a distance of	2.61 miles
Time in motion was	15 min. 45 sec.
Average speed while in motion	9.94 miles per hr.
Number of watt-hours used	472
Average watt-hours used per car-mile	180.84
Average watt-hours used per ton-mile	79.91

For a distance of	0.58 mile
Time in motion was	4 min. 30 sec.
Average speed while in motion	7.73 miles per hr.
Number of watt-hours used	97.6
Average watt-hours used per car-mile	168.27
Average watt-hours used per ton-mile	74.35

For a distance of	2.57 miles
Time in motion was	16 min. 30 sec.
Average speed while in motion	9.34 miles per hr.
Number of watt-hours used	588.8
Average watt-hours used per car-mile	229.1
Average watt-hours used per ton-mile	101.23

For a distance of	2.67 miles
Time in motion was	15 min.
Average speed while in motion	10.68 miles per hr.
Number of watt-hours used	489.6
Average watt-hours used per car-mile	183.37
Average watt-hours used per ton-mile	81.02

For a distance of	0.61 mile
Time in motion was	5 min.
Average speed while in motion	7.32 miles per hr.
Number of watt-hours used	216
Average watt-hours used per car-mile	354.09
Average watt-hours used per ton-mile	156.46

For a distance of	2.55 miles
Time in motion was	18 min.
Average speed while in motion	8.5 miles per hr.
Number of watt-hours used	576
Average watt-hours used per car-mile	225.88
Average watt-hours used per ton-mile	99.81

For a distance of	3.7 miles
Time in motion was	28 min. 30 sec.
Average speed while in motion	7.78 miles per hr.
Number of watt-hours used	740.8
Average watt-hours used per car-mile	200.21
Average watt-hours used per ton-mile	88.47
Open circuit voltage at beginning of run	90 volts
Open circuit voltage at end of run	84 volts
Drop in 24.75 miles	6 volts
Running voltage at beginning of run	85 volts
Running voltage at end of run	78 volts
Drop in 24.75 miles	7 volts

Vehicle *C*, therefore, from Table V., traveled 24.75 miles with an average rate of power consumption of 94.92 watt-hours per ton mile at an average speed of 8.83 miles per hour. The open circuit voltage at the end of the run was over 1.9 volts per cell, and the running voltage over 1.77 volts per cell. The maximum rate of power consumption was recorded over the .6 of a mile of bad cobble and macadam in One Hundred and Eleventh street, as was the case in the test on Vehicle *B*. This maximum was 177.39 watt-hours per ton mile. It is 20.93 watt-hours higher than the 156.46 watt-hours per ton mile rate noted for this vehicle over the same ground in the same direction at another time. The latter rate was obtained while traveling under more normal conditions, and it is thought is more accurate.

Over 18 miles of this test was around the park, and Table VI. shows the results of two complete circles of it.

TABLE VI.

[*Vehicle C.*]

Once around Central Park—North on Fifth Avenue, south on Eighth Avenue.

For a distance of	6.4 miles
Time in motion was	41 min.
Average speed while in motion	9.36 miles per hr.
Number of watt-hours used	1,374.4
Average watt-hours used per car-mile	214.75
Average watt-hours used per ton-mile	95.02

Once around Central Park—North on Eighth Avenue, south on Fifth Avenue.

For a distance of	6.44 miles
Time in motion was	40 min. 50 sec.
Average speed while in motion	9.46 miles per hr.
Number of watt-hours used	1,358.4
Average watt-hours used per car-mile	214.03
Average watt-hours used per ton-mile	94.7

From Table VI. the average of the two trips around the park shows a rate of power consumption of practically 95 watt-hours per ton mile for level asphalt, as against 90 watt-hours per ton mile for vehicle *A*, and 80 watt-hours per ton mile for vehicle *B*. This bears out conclusively the contention that it is necessary to use friction-reducing mechanisms at all possible points in order to get the lowest rate of power consumption.

Some manufacturers, however, consider that the saving in power consumption thus effected is offset by the disadvantages which arise from the use of the increased number of parts required

and the greater liability of the mechanism to get out of order; thus causing a higher rate of depreciation and increasing the initial cost as well as the cost of repairs. Another disadvantage arising from this complication of parts, it is contended, is that the time and labor required to keep the vehicle in proper running order is much greater than when the simpler mechanism is employed.

THE ADVANTAGES OF A LIGHT VEHICLE.

In Tables I., III. and V. it will be noted that the average watt-hours used per car mile were, respectively, 155.27 watt-hours, 145.4 watt-hours and 214.82 watt-hours, which clearly indicate the advantage of a light vehicle from the point of view of its rate of power consumption. As these vehicles were all designed to carry practically the same load, it follows that so far as operating expenses are concerned, the lighter vehicles are better adapted to the service required of them.

So far the tests considered were made on vehicles that carried no load except that caused by two passengers and the instruments used for testing purposes. The question which suggests itself in this connection is, Will the addition of a "load" in any way affect conclusions based on results obtained while testing vehicles without loads?

To determine this important point, vehicle *A* was loaded and a test was made which covered part of the same ground covered on other tests with vehicle *A* unloaded under identical conditions. Table VII. gives the results obtained on this run.

TABLE VII.

[*Vehicle A.*]

Weight of vehicle	3,085 lbs.
Weight of passengers and instruments	305 lbs.
Weight of load carried	625 lbs.
Total weight causing drawbar pull on test	4,015 lbs.

Per cent. of battery weight to total weight of vehicle	36.3%
Per cent. of battery weight to total weight causing drawbar pull	27.89%

Principal ground covered on test: Fifth avenue, from Fifty-ninth street to One Hundred and Tenth street; Fifty-ninth street, from Fifth avenue to Eighth avenue; One Hundred and Tenth street, from Fifth avenue to Eighth avenue; Eighth avenue, from Twentieth street to One Hundred and Tenth street; Twenty-first street, from Seventh avenue to Eighth avenue; Broadway, from Forty-second street to One Hundred and Twentieth street.

Total distance covered on test.....1.744 miles
Total time in motion.....1 hr. 59 min. 55 sec.
Average speed while in motion.....8.72 miles per hr.
Total watt-hours used on trip.....3,249.6
Average watt-hours used per car-mile..... 186.33
Average watt-hours used per ton-mile 92.81

For a distance of.....1.23 miles
Time in motion was.....11 min. 30 sec.
Average speed while in motion.....6.41 miles per hr.
Number of watt-hours used.....203.2
Average watt-hours used per car-mile..... 165.2
Average watt-hours used per ton-mile 82.29

For a distance of.....2.7 miles
Time in motion was.....21 min. 30 sec.
Average speed while in motion.....7.53 miles per hr.
Number of watt-hours used.....534.4
Average watt-hours used per car-mile.....197.92
Average watt-hours used per ton-mile..... 98.59

For a distance of.....2.57 miles
Time in motion was.....16 min. 20 sec.
Average speed while in motion.....9.44 miles per hr.
Number of watt-hours used.....414.4
Average watt-hours used per car-mile 161.24
Average watt-hours used per ton-mile..... 80.31

For a distance of.....0.53 mile
Time in motion was.....4 min. 30 sec.
Average speed while in motion.....7.06 miles per hr.
Number of watt-hours used.....158.4
Average watt-hours used per car-mile.....298.86
Average watt-hours used per ton-mile.....148.87

For a distance of.....2.61 miles
Time in motion was.....18 min.
Average speed while in motion.....8.7 miles per hr.
Number of watt-hours used.....544
Average watt-hours used per car-mile.....208.42
Average watt-hours used per ton-mile.....103.82

For a distance of.....3.32 miles
Time in motion was.....22 min. 5 sec.
Average speed while in motion.....9.02 miles per hr.
Number of watt-hours used.....657.6
Average watt-hours used per car-mile.....198.07
Average watt-hours used per ton-mile 98.66

For a distance of.....4.48 miles
Time in motion was.....26 min.
Average speed while in motion..... 10.33 miles per hr.
Number of watt-hours used.....737.6
Average watt-hours used per car-mile.....164.64
Average watt-hours used per ton-mile..... 82.01

Open circuit voltage at beginning of run	97 volts
Open circuit voltage at end of run	92 volts
Drop in 17.44 miles	5 volts

Runnning voltage at beginning of run	91 volts
Running voltage at end of run	86 volts
Drop in 17.44 miles	5 volts

From Table VII. it will be seen that the watt-hours per ton mile required by vehicle A remained practically the same, whether it was loaded or not. Therefore, all conclusions based on tests on unloaded vehicles, it would seem, hold true when considering vehicles carrying a load.

From Table I. the average watt-hours per ton mile required by vehicle *A* to cover a distance of 31.51 miles were 91.6. From Table VII. the average watt-hours per ton mile for 17.44 miles required by vehicle *A*, with a load, were 92.81, practically identical results, as the run of Table VII. included a little more hill work than that of Table I., which accounts for the difference shown.

Comparing the results obtained while traveling over the same ground with vehicle *A* loaded and unloaded, it is found that the watt-hours per ton mile for the average of two runs over the same ground unloaded give 80.27 watt-hours per ton mile at a speed of 10 miles per hour, while the watt-hours per ton mile for the vehicle with a load were 80.31 at a speed of 9.44 miles per hour—a closer agreement even than was noted above. The average watt-hours per car mile for this section of the unloaded run were 136.12; for the same section of the loaded run, 161.24.

It will be noticed in Table VII. that though the average watt-hours used per car mile by vehicle *A* while carrying a load were 186.33, this rate is still not as high as that shown in Table V. for vehicle *C* without a load, which emphasizes the point already referred to, that for the same class of service, from a commercial point of view, the lighter vehicle is better adapted to its work.

So far all the vehicles considered were equipped with solid rubber tires. To determine if any considerable difference in power consumption results when pneumatic tires are used, vehicle *A* was equipped with wheels on which were 4-inch pneumatic tires. These replaced front wheels on which were 2-inch solid rubber tires, and back wheels on which the solid tires were 2.5 inches. Table VIII. gives the result of this test.

TABLE VIII.

[*Vehicle A.*]

Weight of vehicle	3,050 lbs.
Weight of passengers and instruments	305 lbs.
Weight of load carried	....
Total weight causing drawbar pull on test	3,355 lbs.
Per cent. of battery weight to total weight of vehicle	36 72 %
Per cent. of battery weight to total weight causing drawbar pull	33.38 %

Principal ground covered on test: Fifth avenue, from Forty-second street to One Hundred and Tenth street; One Hundred and Tenth street, from Fifth avenue to Seventh avenue; Eighth avenue, from Forty-second street to One Hundred and Forty-ninth street; Seventh avenue, from One Hundred and Tenth street to One Hundred and Fifty-fourth street; Macomb's lane, from One Hundred and Fifty-fourth street to One Hundred and Forty-ninth street.

Total distance covered during test	12.85 miles
Total time in motion	1 hr. 21 min. 45 sec.
Average speed while in motion	9 43 miles per hr.
Total watt-hours used on trip	2,252.8
Average watt-hours used per car-mile	175.32
Average watt-hours used per ton-mile	104.51

For a distance of	1.43 miles
Time in motion was	9 min. 30 sec.
Average speed while in motion	9.03 miles per hr.
Number of watt-hours used	246.4
Average watt-hours used per car-mile	172.3
Average watt-hours used per ton-mile	102.71

For a distance of	2.56 miles
Time in motion was	15 min.
Average speed while in motion	10.24 miles per hr.
Number of watt-hours used	384
Average watt-hours used per car-mile	150
Average watt-hours used per ton-mile	89.42

For a distance of	0.4 mile
Time in motion was	4 min.
Average speed while in motion	6 miles per hr.
Number of watt-hours used	91.2
Average watt-hours used per car-mile	228
Average watt-hours used per ton-mile	135.91

For a distance of	2.04 miles
Time in motion was	13 min.
Average speed while in motion	9.42 miles per hr.
Number of watt-hours used	396.8
Average watt-hours used per car-mile	194.5
Average watt-hours used per ton-mile	115.94

For a distance of	2.5 miles
Time in motion was	15 min. 30 sec.
Average speed while in motion	9.67 miles per hr.
Number of watt-hours used	608
Average watt-hours used per car-mile	243.2
Average watt-hours used per ton-mile	144.98

For a distance of	2.56 miles
Time in motion was	15 min. 30 sec.

Average speed while in motion	9.9 miles per hr.
Number of watt-hours used	310.4
Average watt-hours used per car-mile	121.25
Average watt-hours used per ton-mile	72.28

For a distance of	1.36 miles
Time in motion was	9 min. 15 sec.
Average speed while in motion	8.82 miles per hr.
Number of watt-hours used	216
Average watt-hours used per car-mile	158.82
Average watt-hours used per ton-mile	94.67

Open circuit voltage at beninning of run	98.5 volts
Open circuit voltage at end of run	94 volts
Drop in 12.85 miles	4.5 volts
Running voltage at beginning of run	90 volts
Running voltage at end of run	89 volts
Drop in 12.85 miles	1 volt

From Table VIII. it will be seen that the average watt-hours per ton mile were 104.51 for vehicle *A* with pneumatic tires on for a distance of 12.85 miles. This is a much higher rate of power consumption than was required by this vehicle with solid tires on. Owing to the nature of some of the ground covered on this trip, the result noted above cannot be used for direct comparison. Part of this test, however, was over the same ground previously covered by the vehicle under identical conditions, with the exception that solid tires were used. A comparison of the results obtained while traveling over this ground, first with solid tires and then with pneumatics, gives the rate of power consumption for solid tires as 80.27 watt-hours per ton mile, as against 89.42 watt-hours per ton mile with pneumatics, at practically the same speed.

It may be assumed, therefore, that vehicles equipped with pneumatic tires will show a slightly increased rate of power consumption over those equipped with solid tires.

Part of the test recorded in Table VIII. was over a macadam road surface, and the rate of power consumption while traveling over this section of the route was 115.94 watt-hours per ton mile.

For a distance of 2.5 miles, which included some macadam road surface, cobbles, a sandy stretch of road, a slight grade and some asphalt, the average rate of power consumption noted was 144.98 watt-hours per ton mile, and for a distance of .4 of a mile over cobbles and bad macadam the rate of power consumption was 135.91 watt-hours per ton mile. This accounts, in some measure, for the high average rate of power consumption recorded for the trip. Even with such a high rate of power consumption,

however, as is shown for nearly half the distance covered, the total average watt-hours used per car mile were only 104.51.

All the tests noted to this point were made under ideal weather conditions, and the greater part of each run was over good asphalt pavement. Therefore, the results so far may be looked upon as representing the best that can be expected of electric vehicles under ordinary commercial conditions in New York City to-day at this present early stage in their development."

Piston, rod and crank shaft power loss, 25 per cent.; belt transmission from motor shaft to speed shaft, loss say 10 per cent.; toothed gearing from speed shaft to sprocket shaft, loss 10 per cent.; sprocket and chain transmission from sprocket shaft to driving wheels, 10 per cent. loss by friction.

Say, as before, that ¾ of 1 horse-power effect is required on the drivers, then the sprocket shaft must be supplied with 0.825 horse-power, the counter-shaft with 0.9 horse-power; the crank-shaft must deliver 1 horse-power to the counter-shaft belt, and the cylinder and piston must generate 1¼ horse-power to exert a ¾ horse-power wagon driving effect between the driving wheels and the road surface, as against 0.825 horse-power in the first example. This means, in plain English, that the wagon having the ordinary elements of power transmission with sliding bearing surfaces must have a motor considerably more than one-third more powerful than it needs to be, and must consume more than one-third more fuel per mile of travel than is needful, thus making more weight and running cost, and demanding more attention from the driver, more cost for repairs, and more work on the wheel tires by more than one-third than is needful, useful or desirable. The wagon must be heavier than it needs to be, and for every pound the constructor adds to the wagon weight he must add a certain other increment of wagon framing weight to carry that added pound in safety. Lumping all these things together and speaking in round terms, it is perfectly safe to say that all the French, German and English wagons now made weigh from one-half more than would be needful if they were made with the best possible bearings to double the smallest safe weight, and so demand from six to twelve times as large a motor to meet all the varying conditions of road wagon propulsion as is utilized in the case of the lightest safe wagon fitted with the best possible bearings on a good level road. From 3½ to 6 brake horse-power must be delivered by the crank-shaft to the power transmission elements of the wagon carrying two passengers, carrying from seven to ten times the fuel actually needful and requiring vastly more attention from the driver and vastly more repairs than the lighter wagon with the best possible bearings.

From this standpoint of view the all-overshadowing importance of the bearing becomes plainly apparent, and it seems very clear that the first requirement of a satisfactory automobile is permanent bearings, operating with the least friction possible with commercially practicable elements.

This conclusion in regard to bearings is not generally accepted as correct by automobile constructors. Panhard and Levassor, the celebrated French automobile constructors, made elaborate experiments with ball bearings under working conditions and arrived at the conclusion that ball bearings gave no gain whatever at high speeds, and only half of one per cent. gain at low speeds, and also announced in general terms that the frictional resistance of the wagon bearings formed only a very small part of the total resistance to wagon propulsion and ball bearings for wagon, motor and transmission parts are almost universally regarded as unsuitable for all wagon use, except in vehicles of the very lightest description.

Certainly no rider would use a bicycle without ball bearings, and our light American steam-driven wagons which may be regarded as having more nearly reached a standard form than any other mechanically driven vehicle made, use ball bearings in the road wheels, for the balance gear, for the crank-shaft and for the crank ends of the connecting rods.

Undoubtedly the experiments of Panhard and Levassor were made with faulty forms of ball bearings.

In a subsequent issue of the *Electrical World and Engineer* Mr. Fliess contributes a second article, in which he shows what electric motor vehicles may be expected to do when encountering adverse conditions. From the data which is given in the two articles it was shown that for light delivery service electric vehicles may reasonably be expected to travel 22 miles on one charge of battery at an average speed of 8.5 miles per hour under ordinary service conditions when carrying a load usually placed on vehicles in this class of service. It is also demonstrated by the articles referred to that they can be expected to do this with an average rate of power consumption seldom exceeding 115 watt-hours per ton mile and an average battery efficiency not often less than 70 per cent. of the running voltage is not often allowed to drop below 1.75 volts per cell on a trip—this when the carriage is fitted with rubber tires.

In a third article the author goes into the relative cost of horse-drawn and electric vehicles, in which he shows that mechanical transportation on common roads will become more advantageous as the condition of roads improves and the average speed of traffic on city streets has been raised.

The Gradometer

VERY few automobile or cycle riders have an accurate idea of the grade per cent. they can climb. If their machines ascend easily, they are apt to underrate the grade per cent.; while, on the other hand, if it is hard work to get up, they are apt to greatly overrate the grade per cent. The grade that an automobile will climb has been as much overrated by manufacturers and users as has the horse-power that the motor would develop. There has been no convenient instrument with which to measure the grade. Pendulums with a graduated circle have been tried, and they answered fairly well when at rest, but beside being very bulky they were entirely unreliable when attached to

a vehicle under motion. The vibration would cause the pendulum to swing back and forth so readings could not be taken. The Adams Company, of Dubuque, Iowa, has just placed upon the market a very attractive little instrument that may be attached to the side of the seat of any vehicle or to the top tube of a bicycle, and the grade the vehicle is ascending or descending can be determined at a glance. Gradometer is the name given the instrument, and it consists of a nickel-plated casing, 6 inches long, containing a curved glass tube filled with spirits, leaving a small bubble, which acts the same as a spirit level. The casing has graduations on one side of the opening and figures from 0 to 30 each way from the centre on the other side, so the per cent. of grade can be read from the level to 30 per cent., either ascending or descending. The half tone shows a gradometer attached to the left side of a vehicle seat.

The Automobile as a Factor in the Construction of Good Roads

AS bearing upon the influence the more general introduction of the automobile will have upon good roads, we give extracts from an editorial which appeared in the New York *Tribune* of Sunday, November 4:

"Though general progress in the improvement of public highways is slow, it cannot be doubted that the cause of good roads is destined to prevail. Even if there were only a feeble indication here and there of interest in the subject, it would still be unreasonable to suppose that a thrifty and intelligent people would always remain indifferent. But in recent years there has been a notable awakening, which in some States has already produced actual results of great importance. In an address to which we lately referred President Mendenhall of the Worcester Polytechnic Institute, who is a member of the Highway Commission, describing what is being done in Massachusetts, said that during the last six or eight years more money had been spent there in road improvement than in any other State. The plan now in process of execution involves a reconstruction of the road system of the Commonwealth, embracing about 2,000 miles, or 10 per cent. of the whole, to which local effort will doubtless, in time, make large additions. An annual appropriation of $500,000 enables the Commission to complete about 50 miles every year, and it could probably obtain $1,000,000 from the Legislature if it so desired. Truly this is a wise liberality which may well cause envy in other parts of the country.

"We have frequently discussed this subject, but we find a new and particularly interesting suggestion in the fact that Dr. Mendenhall's address was delivered before the Automobile Club of America. The part which the bicycle has taken in the promotion of highway improvement is acknowledged to be important. Perhaps it might not be exaggeration to say that the influence exerted by wheelmen in support of that work has been stronger than that proceeding from any other source, and it now seems probable that the movement will be taken up by the owners of horseless vehicles with increasing earnestness as their number multiplies and their use extends. So long as, outside of centres of population, the automobile remains chiefly an instrument of pleasure it may not count for much in the demonstration of the

good roads proposition, and it is even possible that some persons will be so narrow minded as to listen with a trace of resentment to claims made in its behalf. But if such a feeling should develop it could not last long. There is reason to suppose that the automobile is destined to occupy a great place in the domestic economy of the civilized world. In proportion as it makes its way into the common service of the people by its adaptability to commercial and industrial uses, they will recognize the conditions which it peculiarly demands and consent to supply them.

"There are many indications that the automobile is on the eve of a general conquest comparable in extent with that which the bicycle so swiftly achieved and otherwise more important to mankind. The recent show in Madison Square Garden cannot fail to stimulate the growing interest that it illustrates. It attracted an immense number of visitors and will go on record as one of the great industrial displays with which that indispensable building is identified. And after it was over the impression remained in many minds that another powerful advocate of good roads had come into existence."

First Run of the Rhode Island Automobile Club

THE first club run of the Rhode Island Automobile Club was held October 22 and was a decided success. Carriages of all types—steam, gasoline and electric—were present. There were seventeen in line at the start. The run ended in a dinner at the Narragansett Hotel, at which a number of the members related their experiences.

Committeeman Lippitt spoke of the purposes of the club and the necessity, for organization, to secure headquarters, and for mutual protection against accidents. He spoke of the need of having a man experienced in the repair of electric, steam and gasoline machines available at all times, and of how easily, with a good membership, and sufficient dues, such a man could be secured to be at the service of all club members at all times without cost other than the club dues. He also referred to the necessity for organization to protect members against undue liability for accidents, and of the strength such an organization could add to the efforts now being made by the wheelmen and horsemen of this country in the cause of good roads.

Secretary Fletcher spoke of what the club could do for owners in holding gatherings, at which each might give his own experience for the benefit of the whole.

Mr. Mossberg spoke on the future of the automobile from the standard of a manufacturer. He said that while the limit of electric machines now seemed to be about 30 miles, he believed that the great advance in batteries within the last year would result in making the electric machine the best of all. He said he was now experimenting on a machine that would, he was convinced, go 60 miles without recharging. He believed there would be no trouble soon in finding charging stations, as with the advance of the automobile interest they would be established at all points.

President Chase said the gasoline machines had made great strides forward in the last few years, and were now, in his opinion, the most reliable. In France, where they are now four or five years ahead of this country, they are taking up electricity and working out its problem. The Tourists' Cycle Club of France, of which he had for years been a member, issued an automobile book in connection with its last bicycle road book, in which the location of all the charging stations was given. Batteries are daily being improved for adaptation to the automobile, he said.

Mr. Lippitt said he had been approached by owners of drug stores in nearby towns, who had offered to keep gasoline on hand at all times for the members of the club, on condition that they be posted as club stations.

The Rhode Island Automobile Club has been active for about two months, but was chartered several months before that time. It now has 24 members, 15 owning machines. About 20 applications have already been received, to be acted on at the next meeting, and arrangements are to be made, as soon as the growth of the club warrants, for a club-room and other conveniences.

When a man gets to the stage where he thinks the automobile is what he wants, he is confronted by several problems, the main one being, Which carriage shall I buy? He wants a machine that will require but little attention, that will be ready at all times, that will start when he desires and stop ditto, that will get him home without breaking down and not require a mechanic to operate it. The average man does not care for the details, and whether the cost of operation is one-half a cent a mile or two cents a mile isn't of great importance if the other requirements are fulfilled.

Automobiles—Pro and Con

By R. E. Marks

MOST people expect too much of an automobile. They seem to forget it's a machine and hasn't any brains, as a horse has, and will go into a stone wall or off the dock unless the driver stops it—a horse wouldn't. But just suppose the case of a man who had never seen a horse, except at a distance, and put him in a carriage with the reins in his hand. Tell him how to turn to the right and left, to stop, back, etc., and then let him go ahead. Is it likely he will get through a ride without numerous misgivings as to whether he will ever get home alive or not?

Then suppose the horse goes lame, he isn't likely to know whether it's a stone in his shoe or ordinary lameness, while any of the other ailments will be just as mysterious to him as motor diseases are to the average man.

As I said before, an automobile is a machine, and as any machine is practically certain to get out of order sooner or later—generally sooner—such occurrences should be expected and provided for. Learn the symptoms of the various diseases to which your particular motor is heir and to diagnose the case so as to determine whether it is appendicitis or convulsions. The maker should post you thoroughly on these possible happenings so you will be prepared for emergencies. I'm not trying to discourage anyone, far from it, for it's the greatest institution that has come in our day, but I want to prevent disappointment on the part of those who may fancy that an automobile never breaks down and that the motor always motes three hundred and sixty-seven days a year. I wish I knew how to make them so they would, but I don't. Still, they give one more pleasure than any other vehicle I know of.

Then there's the question of noise and odor which most manufacturers declare are entirely absent from their machines. But there isn't a machine that I know of using oil for fuel in any way that is entirely free from smells which we would rather do without. Some are worse than others, but the oil odor is there to more or less degree.

When, however, we consider the small amount as compared with the volume of air around us on a country road it isn't much of a question after all and one least to be considered.

The noise phase of the question is largely one of education. We grow up with the beat of horses' hoofs in our ears and we become accustomed to it, although on hard macadam roads the noise is considerable. But the regular puff-puff of the motor's exhaust is different. Its extreme regularity and the sound being of a different nature makes it much more noticeable at first, when in reality it is often less than that of horses' hoofs.

But against its undesirable points we can set those which tell so strongly in its favor, and its growth is sure to astonish those who are apt to look on it as a passing fad. It has come to stay, and I believe its advancement will be aided by admitting its defects and trying to remedy them.

An Encouraging Sign

THOSE of us who were pioneers in the days of bicycling remember the vials of wrath that were poured on us from all sides when we left the city behind and hied away where fields were green. The old plow jogger on the road was worse than the thoroughbred, and the farmers told us in all kinds of ways and with various adjectives that we were nuisances and "hadn't no business on the roads with them things, anyhow."

But the automobilist has an easier row to hoe, for the farmers are looking with more favor on the new vehicles and seem rather ashamed of their horses when they shy at the motor-driven carriage. They, too, are getting into line, as shown by the interest shown at various State fairs and similar agricultural events. It's an encouraging sign.

Unless the present restrictions regarding automobiles on ferry boats are removed, the isolation of the eastern states from the rest of the country is as secure as though a Chinese wall was in existence along the Hudson river. With not a bridge for carriages across the river below Albany the only alternative is to return to the idea of Oliver Evans and his vehicle of 1804. This he ran across the City of Philadelphia to the Schuykill river and fastening paddles on the wheels ran it in the river as a boat. There seems to be a market for something of the kind in New York at present, unless some enterprising ferryman establishes an automobile ferry at a fairly accessible point.

Run of the Automobile Club of New Jersey

THE Automobile Club of New Jersey had a run on election day from East Orange to Morristown, a distance of about 20 miles each way. This is a trip that tries the hill climbing capacity of a machine, for although the roads are fine there are several long hills which must be ascended.

The run was marred at the outset by an accident to Treasurer Whipple's locomobile, which was carrying four at the time. In

Ready for the Run

turning out for a team the machine slewed and one of the rear wheels went to pieces. One of the occupants was thrown, hurting his knee quite badly, while those on the rear seat made hurried dismounts that were probably better examples of celerity than grace.

With this exception, however, the run was enjoyed by all participants and the return made in good time. The club is growing slowly, but surely, and bids fair to become quite a factor in the field. Just before starting they assembled on Mr. Scarritt's lawn, where the group picture was taken.

Celerior

The shades of night were falling fast,
As through a country village passed
A youth who drove through mist and storm
A motor-car of Daimler form.
Celerior.*

His brow was scored, his eye was bright,
His lamps shone forth their dazzling light,
While like a siren in a storm
Blared out the well-known motor horn.
Celerior.

By happy homes both warm and snug,
He wildly plied his sparking plug.
When right in front a helmet shone,
And from his lips escaped a groan.
Celerior.

"Too fast! Too fast!" the policeman cried,
And as the car his truncheon shied;
But speeding on like startled bird,
A loud and clarion voice was heard,
Celerior.

"O stay," the hostess said, "and rest,
Of all the inns this is the best."
He brushed a tear from off his eye,
And answered straight without a sigh,
"Celerior."

"Beware the newly metalled road,
Beware the drunken carter's load,"
This was the hostess's last "adieu,"
As car and driver fled from view.
Celerior.

Some laborers at break of day,
To work proceeding on their way,
Of something strange became aware,
Such scent of gasoline filled the air.
Celerior.

'Midst fragments scattered all around,
A motor man lay on the ground,
Still grasping in his hand of ice
The lever marked with plain device,
"Celerior."

The Automobile Magazine

There in the twilight cold and grey
Lifeless and scotched at last he lay,
While from the crowd which gathered round,
A voice fell solemnly profound,
"Celerime.†"

(T. Fred. Hunt, in *Motor Car Journal.* After Longfellow—a long way after.)

* Celerior = Faster.
† Celerime = Too fast.

An application was filed November 1 in Common Pleas Court No. 4, Philadelphia, asking for a charter for "The Pennsylvania Automobile Club." The main purpose of the organization, as set forth in the application, is the "encouraging and promotion of automobiling and the cultivation of the study of machinery used in motor vehicles among the members and others; increasing proficiency in operating the same; encouraging the betterment and improving of public roads and highways; fostering a general interest in automobiles and for promoting social intercourse among its members and the maintenance of a club-house."

The incorporators are F. L. Sweany, D. W. Webster, Charles S. King, of Camden; Henry J. Johnson, William F. Rudolph, Charles E. Wright, Robert P. McCurdy, L. Goodman, George E. Gossler, S. R. Weaver, J. K. Wharton, Julian Haugwitz, Edwin M. Rosenbluth, Benjamin F. Buzby, of Swedesboro, N. J.; T. C. Palmer and Charles L. Klauder. The officers are as follows: President, F. L. Sweany; First Vice-President, Julian Haugwitz; Second Vice-President, Charles L. Klauder; Secretary, Henry J. Johnson; Treasurer, Charles E. Wright; Directors, in addition to the above, Robert P. McCurdy, William F. Rudolph, D. W. Webster, Charles S. King and George E. Gossler.

It is stated that an automobile accident insurance association is about to be formed in New York City. Its objects will be to insure its policy holders against accidents and to defend the innumerable law-suits which have been brought against motorists all over the country, often on very slight provocation.

Correspondence

(Desiring to make this department of real value, we invite contributions from men who are interested in both the construction and operation of automobiles.)

A PUZZLED PURCHASER

I want an automobile, but the kind to buy is puzzling me just as the question of bicycle did a few years—only this seems worse. Being somewhat familiar with steam engines makes me lean a little that way, but it's nip and tuck between steam and gasoline with me now. Electrics are fine, but out of the question for suburbanites at present, and I want at least a 50 mile range of action—rather have 75, as I'm rather a long-distance man. It seems to sum up about as follows:

Steam means a boiler with a flame under it and an engine. The boiler requires a feed pump and a fuel regulator, so that the operator must watch the water glass, must regulate his fuel, keep his eye on the steam gauge and see that his oil and water tanks don't run dry. The engine itself is easy to regulate and run.

The gasoline machine uses the fuel direct in the engine, but requires water for cooling the cylinders, so there are two tanks to look after just the same, but the water doesn't need much attention, as very little evaporates. But while there isn't so much to watch in the way of gauges, there is the fuel feed, the spark regulator and the high and low speed clutches. Then there is something a little mysterious about the gasoline engine to the man who is familiar with steam, and he doesn't quite understand the " why " of the carbureter, the spark plugs and their batteries and some other points. I like the idea of getting down to first principles and using the fuel direct in the engine, but I'm not sure which type of machine I want to run regularly.

R. E. M.

New York.

DELIGHTS OF THE AUTOMOBILE

It is a curious fact that the newest things are not new—which is essentially what Solomon said centuries, or miliads, ago. The newest seeming thing, though, just now is the automobile—or, if you prefer to call it mobile, locomobile, simply auto or horseless carriage, you can do so, as it has these and other suggested names.

Few people, perhaps, remember that in 1827 Gurney, of England, built a road wagon that was propelled with some success by steam. American papers of that date—particularly the New York *Mirror*—gave some account of it, and also illustrated it. It was in form something like a farmer's heavy two-horse freight wagon. Another, of a somewhat different style, was tried about the same time in Springfield, Mass. Just why neither of these became a permanent success is not far to seek. Neither English nor American highways seventy-three years ago were fit for an automobile, while a certain number of our modern highways, if not all of them, are fairly well developed for its use. In addition to this, the progress of invention and the use of new materials have now made easy the already assured success in automobile travel.

Inasmuch as what is needed surely comes, if only by degrees, the improved highway is already developing, both by the foresight of communities and the force of inviting and compulsory legislation. The bicycle has done something to mend and better our public roads, and it is reasonably expected that the automobile will do the rest.

Besides all this, the advantages of a self-propelled carriage are too many and too important not to see. Its boon to cities and the larger towns will prove in time incalculable. The horse, no doubt, will survive this new vehicle's invasion, but he will be nobler, cleaner and fewer in number in the very near future. Under present conditions public health and municipal cleanliness are seriously menaced by the thousands of horses that have hitherto been a necessity. Travel in the country will have a new impetus and pleasure, when there is no overdriven and overheated animal to sympathize with in the effort to attain the end of your journey. The dust will go behind you, or be laid by some automatic sprinkler, the whip and whip-socket will be discharged; there will be no pause for oats, and the horse-fly will cease to annoy, while harness, fly-nets and watering-tubs can go into repositories to keep the company of ancient armor and other curios of a forgotten date.

The public has found out already that for certain work no vehicle can rival the one that is self-propelling. The doctor, the chief of a fire department, our large department stores and the cabman now employ it to great advantage. In fact no wheeled service is beyond the reach of this motor. It can be yoked for commercial use or for pleasure simply. It makes the business of transportation a pleasure and open-air riding a delight not easily imagined. It gives oxygen to the blood of the passenger,

and almost puts the feeling of wings on the shoulders. We need not now envy so much, as most people do, the celerity of the bird, for he, inspiring as his power and motion undoubtedly are, cannot sit down on his journey. He must even "paddle his own canoe," but the automobile matches pretty nearly a bird's average speed and takes you along with luxurious privilege. The instructed driver of it has merely a pleasant diversion in directing it, and needs no coachman.

It is doubtful if any new article of manufacture during this century of multiplied inventions has ever created for itself, almost at once, so great and increasing a demand as the automobile. The statement would hardly seem credible, if we did not know it to be so, that there are now not less than two hundred different styles of automobiles in the world's markets, each claiming more or less merit.

CHAS. W. SPURR, JR.,
Secretary, Automobile Club of Long Island.

New York, N. Y.

England will be well to the fore in the next race for the Gordon Bennett Cup. No less than five 50 horse-power Napiers are to be put on the stocks forthwith, chiefly with a view to this event. They are to be built to the order of Lord Carnarvon, Count Zborowski, Mr. Mark Mayhew, Hon. C. S. Rolls and Mr. Edge, respectively. It is said that they will be of little use in England, as it will be impossible to let them out to anything approaching their full power; but in France, where one can often see five miles ahead in a straight line, fast driving is another matter.

The fifth meet of the Automobile Club of Philadelphia took place October 27, 1900. At 3.30 P. M. the under-mentioned members and their guests left Broad and Walnut streets for Essington. This point was reached, after a pleasant run, at 5 P. M. After dining at "The Orchard," the country home of the Athletic Club of Philadelphia, the party returned to Philadelphia.

Present—Henry G. Morris, James Elverson, Jr., and guest, Pedro G. Salom, Walter B. Smith, C. W. Kelsey and guest, Frank C. Lewin, J. B. Entz, T. B. Entz, Captain John S. Muckle, John L. Wilson, Herbert Warden and guest, Louis J. Kolb and guest.

The run was made without mishap and all kinds of machines were present.

Notes from Abroad

Mr. Paul Meyan, editor of *La France Automobile,* one of the leading French motor journals, has recently performed some wonderful climbing with his vehicle. He drove it up 54 miles of a road which rose about 6,760 feet above sea level.

The recent trials of alcohol as a substitute for gasoline for motors were an unqualified success. The route which the competing vehicles used was between Paris and Rouen. There were fifty-one starters, whereas, a year ago, on the occasion of similar trials, there were but six. Of the fifty-one that started thirty succeeded in running from Paris to Rouen, a distance of 78 miles, in six hours. A close inspection did not reveal any visible exhaust, save in a few instances. Although the odor from burnt alcohol is not so conspicuous as the odor from gasoline it is much more disagreeable.

Mr. A. Harmsworth, a prominent English newspaper man and a member of the Automobile Club of Great Britain, has offered a cup valued at $25 for the motor vehicle which, on its arrival at a certain point after covering a given distance, shall present the cleanest appearance.

There is something very practical about this, as it ought to be the aim of motor vehicle operators to keep their carriages as clean as possible. The donor of the cup referred to was led to do so because he thought the public became prejudiced against automobiles by seeing them arrive in towns after long rides in a dusty, uncared-for condition.

A number of our British contemporaries are devoting considerable space to the question of utilization of motor vehicles in military work. This is a subject which has not been brought to the front in this country as abroad, but it is coming, and there are a number of signs which indicate that the army authorities of the United States are alive to the importance of the subject, and are showing a willingness to help in any way they can to further the cause of the military motor carriage.

The Automobile Club of France, at the proposals of that champion of automobilism, Count De Dion, has decided to organize a 1,000-mile tour patterned after the similar trial carried out by their British neighbors.

Battery Stations of the Future

The utility and convenience of the electrical vehicles is recognized by everyone interested in the subject of automobiles, and there is no doubt that they would be much more largely used in the suburbs if it were not for the necessity of recharging frequently. This usually means from two to five hours at the charging station at best, and as these are few and far between in small cities and towns it becomes a question of comparatively short rides (assuming that you have a charging station near home) or of running the risk of finding a stray power plant that can charge the battery for you.

We have no doubt that a comparatively short time will see the establishment of charging stations at intervals along main traveled roads near the large cities, but the delay necessary for recharging would still be an objection. If this were overcome it would give the electric vehicle a decided impetus, as it has many desirable features.

The first step toward a solution would seem to be for the builders of electric vehicles to get together and decide on standard dimensions for batteries, so that they can be intercharged. Choose a unit suitable for the smallest vehicle likely to be built—say twelve inches square and ten inches high. Two units would then occupy a space twelve by twenty-four inches and ten inches high and more, in proportion, but they could be in whichever shape was most convenient for the body of the vehicle; *i. e.*, either end to end or side by side, or any desired combination.

This would allow different batteries to be used in your carriage and would facilitate the establishment of a series of "battery stations" all over the country. These need not be expensive installations, as a small engine and dynamo can charge a large number of batteries in a day, if worked under a steady load. Then the user of the electric carriage who was in need of recharging would stop at a battery station, exchange batteries and go on to his destination, possibly charging a number of times at different points on the route. He could either pick up his own battery on his return or have it sent to him if he should take another route home.

A plan of this kind almost of necessity requires a large corporation to manage it, and it might even assume the position of supplying the batteries to the makers of carriages, in which case it would not be necessary to return the particular battery at the

end of journey. It might be arranged on the basis of battery rental per hundred miles, with certain rebates if they failed to perform the work guaranteed.

Of course this is a trifle visionary at present, but it seems as though something of the kind was necessary in order to give the electric carriage its widest field of usefulness. The suburbanite who is electrically inclined is prevented from using his favorite machine by the difficulty of charging at home and the limitations put on his wanderings by the mileage of the battery.

Automobile risks are attracting the attention of underwriters of accident policies in the United States, and the fire hazards are creating considerable interest abroad. Some serious losses have resulted from the destruction of motor carriages. A writer in a foreign insurance journal recently described two heavy losses: "A friend of mine, manager of a leading insurance office, issued a policy of £700 upon an automobile, rate two guineas per cent. The owner and his wife were going for a ride, and had just taken their seats, when, before it had even moved, the automobile became a sheet of flame. No efforts of the groom made any impression on the fire, and in a few minutes nothing was left except a barrow load of old metal. Fortunately no one was injured. The sum of £500 was accepted in settlement of the damage.

"Again, only recently, a motor car was being driven from Harrogate to Leeds. Half way on the road a pair of nervous horses were met, and the car driver had reason to rapidly apply his brakes, when over went the car into a ditch. The petrol at once fired, and in an instant the whole was a mass of flame. The owner of the vehicle was standing near, an interested spectator, watching his £500 motor consumed.

"Quite apart from the hazard, nothing could be more unsatisfactory to insure, because upon the slightest accident by fire to a good motor car the whole has generally to be returned to the makers, frequently in Paris; and, what with the monopoly, the delicacy and skill of workmanship necessary, together with the high rates of such labor, etc., the bill generally works out to about the price of an entirely new vehicle."

Probably the different automobile clubs scattered throughout the country will find their greatest field of usefulness in their united efforts to promote the cause of good roads. A considerable number of the members of the Automobile Club of America look upon the work as of great importance and will push a fight along these lines.

Automobile Exposition at Grand Central Palace

THE above exposition opened on the night of November 14 and gave promise of a very successful show. Many of those who had had space at Madison Square Garden were in evidence, as well as a goodly number of firms who were not represented at the previous exhibition. From the time the first show closed on Saturday, November 10, the exhibitors were busy removing their products to Grand Central Palace for another stay of ten days.

The Palace show affords room for many manufacturers not represented at the Garden, and have been given reserved places for vehicles that will be on view for the first time. Its arrangement will be in marked contrast to the Garden exhibition, where the principal exhibits were placed within the track, thereby obscuring the view of the moving vehicles to a certain extent. At the Palace the track is the central feature, occupying the entire auditorium, and the exhibits are distributed around the track, a wide aisle intervening. A clear view of the entire track circuit is obtainable from the two commodious balconies of the auditorium. The space within the track is reserved for exhibitions of expert handling of automobiles. The track is made of double flooring, smoothly planed and closely fitted, no nails being used in its construction, all joints being fastened with screws. This makes the track very smooth. Landing stages, aside from the direct track, are provided to enable passengers to be taken on and off the vehicles without delaying those in motion. Features of the daily programme include afternoon and evening concerts by the famous Old Guard Band. All contests will be arranged by and conducted under the direction of a committee of the manufacturers exhibiting. The hall itself is beautifully decorated and illuminated, making the exposition a very attractive spectacle.

Among other things at the show is an automobile in which for the first time liquid air will be used as motive power. Liquid air has, of course, been made commercially for some time past, and it is only a matter of time, probably, when someone will devise some means by which it can be used economically. Its application at present is quite limited, and the automobile referred to is probably the first instance in which liquid air has been called into practical use.

The Cooke Locomotive Company, of Paterson, N. J., exhibits a practicable and, we should say, serviceable steam wagon designed for heavy service. It is constructed on what is known as the Thornycroft system. The boiler is placed in front. Coal is used as fuel, and the wagon exhibited is equipped with a horizontal compound engine of 25 horse-power. Like a great many of the English heavy wagons, it is so arranged that any type of body suitable to the work required can be put on. The wagon has been in continuous service about the Cooke shops for three months past. Undoubtedly there is a great field for such class of wagons, and after making a short run in one our conclusion is that there is every probability of a great demand for them. They run smoothly even when a speed of 8 miles per hour is being made. Solid tires are used, and the wagon as a whole is not at all out of proportion to the nature of work for which it is intended.

The first night of the show was, so far as the number of visitors was concerned, quite encouraging, and the Palace presented a very gay appearance. The booth of the Tripler Liquid Air Automobile Company was continually surrounded by a crowd of curious ones, anxious to learn all they could about the new motive power. Owing to an accident which had taken place at the company's compressing plant, it was not possible to obtain the necessary liquid air to drive the motor.

Items of Interest

(Readers will confer a favor upon the editors of this magazine by sending in any interesting item of news suitable for this department.)

It has been felt among automobile manufacturers for some time that something should be done in the way of an organization for the furtherance of the good roads problem, and to this end there was held, November 14, a meeting at the Hoffman House, New York City, to talk the matter over. At the meeting referred to the following organization committee was appointed: John Brisben Walker, S. T. Davis, Jr., of New York; A. L. Riker, of Elizabethport, N. J.; C. J. Field, of Brooklyn; J. M. Hill, of New York; A. W. Winslow and E. P. Wells, of Keene, N. H. About the only business conducted was the appointment of a Committee on Charter, etc., a Committee on By-laws, and a Committee on Legislation.

Items of Interest

Gen. Gallieni, a high French military authority, went to Madagascar lately and traversed the country in automobiles. He first used petroleum omnibuses where the roads were fairly good, and then, while passing through the forests, rode in a voiturette. There were heavy grades and rough roads, but he managed to make very good time; in some places as high as 11 miles per hour. The natives were tremendously surprised at the way the petroleum automobiles went along, and it is expected that in the near future sufficient improvements will be made on the roads in Madagascar to employ them for transportation of both freight and passengers.

Until the present sweeping restrictions in regard to gasoline are relegated to the "has beens" the question of what can be done to make it as little annoyance as possible confronts us. How would it do for the oil companies to establish a small warehouse on each side of the river near some convenient ferry? Have receptacles in which you could drain your oil tanks and label them with your name, to be called for. Or they could give you a credit check good on the other side for an equal amount. This, of course, presupposes the oil to be of standard quality. Arriving on the other side you fill up from their stock and go ahead. This necessitates a little pushing of your machine, but although this isn't pleasant, it is preferable to not getting across at all.

It is hoped that operators of motor vehicles will not make the mistake which many bicyclists make of running at very high speeds, making it dangerous for pedestrians. Accidents are becoming more numerous. It will not benefit the interests of the automobile any if the frequency of accidents caused by reckless driving is increased, and we trust cautiousness on this point will be observed by operators. Especially is this desirable on dark country roads, where street lamps are not so numerous as in cities.

At the recent automobile exhibition and race meet in Chicago a novel method was adopted by a smart driver of illustrating the niceties of control of which a motor vehicle is capable. The vehicle in question was a delivery van, and for display purposes a large framework was built in front of the grandstand after the manner of a see-saw. Up this the car was driven, and worked backward and forward at the balancing point, thus causing the see-saw to rock. A box was then placed in the centre of the track and the car was driven over it with such control that an egg placed on the opposite side of the obstruction was cracked, but not crushed.

The recent show at Madison Square Garden was an eye opener to many who visited it. There was a very general opinion that the number of different styles of automobiles was limited, and surprise was felt when so many varied types were shown. As illustrating this, one old lady from a small country town, upon seeing such a large number of vehicles, was heard to say to her husband, "Lord, William, we have only got one of them things in our town." We are inclined to think that not only to country visitors, but also many residents of our city itself, the show was a revelation, so far as variety of style is concerned.

There is in France an institution called the "Academy," which exercises supervision over literary matters and is composed of an extraordinarily influential set of people. The French language needs a good deal of supervising and these people find pleasure and probably some amusement in keeping the language in order. There is no neuter gender in French, so everything has to be masculine or feminine. The "Academy" gives forth the rules to be followed with new words. They have lately decided that the word "automobile" is masculine. What is trying to a poor memory is that "locomobile" has been declared a female. We have been greatly puzzled to make out the reason for the distinction, but incline to think that reason has been excluded in the decision. To make one masculine and the other feminine by *fiat* is just as sensible as habit has been which calls night feminine and evening masculine.

Items of Interest

One of the things which many American automobilists discover is the apparent lack of good literature on the subject of automobile construction and operation. There are few books which have been published in this country on the subject. There are, however, a great many French books, but the trouble is we do not all read that language. English writers have also devoted some time to putting into book form their knowledge of the construction and operation of motor vehicles. It is, of course, not to be expected that at this stage of the industry we should have many books on the subject. It is certain that as development takes place the necessary literature will make its appearance, and this country's contribution, we feel sure will not by any means be behind that of others.

An automobile drivers' union was recently organized at No. 126 Washington Street, Chicago, under the jurisdiction of the International Brotherhood of Electrical Workers, which is affiliated with the American Federation of Labor. While there are several stages in the process of evolution between an automobile driver and an Edison, it is said that the Electrical Workers' union is the proper place for the men who pilot the "auto."

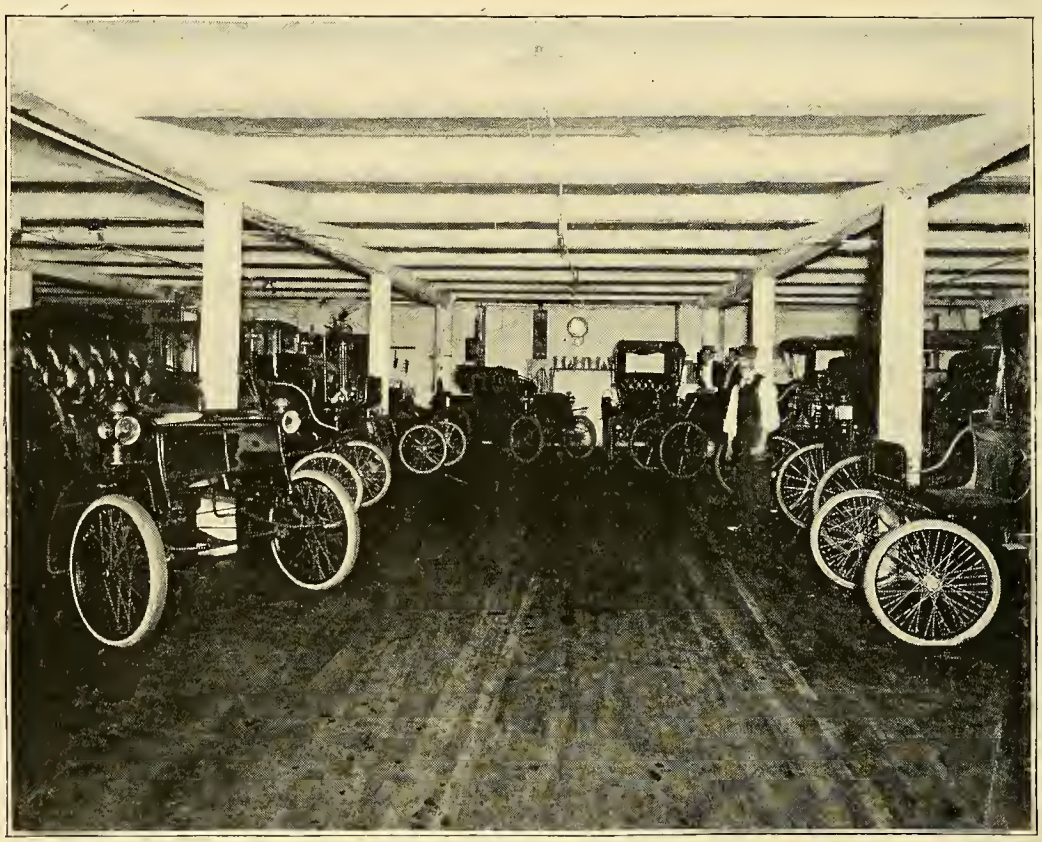
It is said that 90 per cent. of the 400 automobile drivers in that city will become members. Their weekly salary is said to vary from $5 to $10, and the object of the new union is to try and secure better remuneration for the men who are engaged in repairing the machines.

Columbia University Automobile Club held its first annual meeting October 30 to elect officers for the season. Henry Rossiter Worthington, formerly Vice-President of the club, was agreed upon unanimously as President. William Brock Shoemaker was elected Vice-President.

After the election of Lewis Iselin, '03 College, as Secretary and Treasurer, and of Roscoe Crosby Gaige as Manager, there was some discussion as to the admission of new members. Several new members were elected.

A Horseless Stable

THE housing of an automobile is, to a great many, a perplexing problem, much more so than in the case of the familiar "wheel," which, being small, can be run into some corner of a closet or made to stand in the hall. This, however, is not possible with the automobile, and while it is one thing to own a vehicle it must need have ample room in which to be housed and cleaned when its condition necessitates it. It is



A Horseless Stable

essential that it be kept up, especially its runing parts, and suitable quarters for doing this are absolutely necessary.

It is probable that in a great many instances the public are prejudiced against the motor vehicle by the sometimes shabby appearance presented by certain of them. This question of cleanliness has so been impressed upon the mind of Mr. Harmsworth, a prominent English automobilist, as to lead him to offer a cup valued at $25 to the automobile which presents the cleanest appearance after a run of a given distance.

A Horseless Stable

In order to keep automobiles up to the right standard of cleanliness and repair it is necessary either to have a house so constructed as to make it convenient to wash the carriages and provided with a pit, thus enabling the man delegated to overhauling the carriage opportunity to get at the working parts without having to lay upon his back. It is hoped that some day the running parts of motor vehicles will be so arranged as to make such a proceeding unnecessary. Unfortunately, however, the majority of motor vehicles do not possess this valuable and time-saving feature.

Panhard Machine of Grant Lyman. French Chaffeur Seated

All owners of automobiles are not in a position to build, equip and maintain such a house for the care of their machines. Even those who possess private stable accommodation will find that the care of a horse is a proposition entirely different from the care of an automobile. To equip a suitable place for the care and repair of motor vehicles entails the expenditure of much money, and now that the new mode of conveyance is becoming so common on our streets storage and repair stations are springing up in our large cities, where the work of storing and looking

after automobiles for longer or shorter periods is carried on. These stations fill a real want, and especially are they valuable to out-of-town automobilists who visit the city for a short stay. Carriages may be left at these stations, and when called for will be found in a clean condition, oiled, and the gasoline necessary

N. Mod. 17.

PRÉFECTURE DE POLICE

RÉPUBLIQUE FRANÇAISE

LIBERTÉ ÉGALITÉ FRATERNITÉ

N° 924

du Registre de l'Ingénieur des Mines.

CONDUITE

des Vehicules à moteur mécanique.

PERMIS DE CONDUIRE PROVISOIRE

Dans les limites de vitesse permises par les Règlements, et sous la réserve de ne pas longer les allées cavalières.

valable du 10 Août au 10 Septembre 190

à échanger dans les bureaux de la Préfecture de police contre un Certificat de capacité définitif.

SIGNATURE DU TITULAIRE :

Nom, prénoms et adresse du titulaire.

M. Blanchard

4 Impasse Levis à Paris

Système et genre de véhicule que le titulaire est provisoirement autorisé à conduire :

Voiture Canhaw 5 Cram

Observations et conditions particulières :

L'Ingénieur des Mines.

Paris. — Imp. MARCEL PRAED. — 5-1900

Permit Issued to French Chaffeurs

for the continuance of the journey, or, in the case of electric vehicles, current supplied direct from the plant on the premises.

Recognizing the rapid growth of motor carriages the Automobile Storage and Repair Company early in the present year established, at No. 57 West Sixty-sixth street, a station, which has since it founding handled a great number of carriages of all classes. The building is centrally located, and the main room

for the storing of vehicles is on the ground floor, thus obviating the use of elevators and the inconvenience attending them.

The illustration entitled "A Horseless Stable" shows the interior of the station, with carriages of various styles lined up on either side. Skilled mechanics are employed, so that repairs can be attended to on short notice. The station is equipped with apparatus for the proper washing of the motor carriages, just as is found in livery stables. As a convenience for patrons a private waiting-room with lockers has been provided. This same company has several other stations throughout the city.

If one is desirous at any time of seeing the various types of motor vehicles he ought to visit a station of this kind. Machines of foreign and home make are there, machines of all sizes.

An interesting carriage, which at the time of the writer's visit was being cared for at the station, was that of Grant Lyman, M. D. It is an 8 horse-power Panhard et Levassor carriage. When shown at the recent exhibition in Madison Square Garden in connection with the Loan Exhibition of the Automobile Club of America it attracted considerable attention. Our illustration shows it drawn up in front of station with its French operator seated in it.

In France the matter of licensing operators of automobiles seems to be looked upon with greater importance than here, and great pains are taken to insure that they be competent in every respect.

The accompanying illustration is a *facsimile* of the license issued to *chauffeurs* of automobiles in France. The permit shown is only of a temporary nature, and is signed by the Engineer of Mines. It also states the speed limit, with a restriction not to enter bridle paths reserved for horsemen. A space is left in which a portrait of the holder is placed.

Automobile Clubs in New England

By O. L. Stevens

THE Worcester Automobile Club, which was recently formed, is proving quite a successful organization. It was organized about the middle of August and since then has had quite an eventful career. It is an aggressive insti-

Officers of the Worcester Automobile Club

tution and is looking forward to a career of great usefulness in the world of automobiles.

The first meeting to discuss the subject of forming a club of local automobilists was held in the Locomobile Company's office and an organization was effected, making Mr. James E. Farwell their President; Mr. James W. Bigelow, Vice-President, and Mr. Henry T. McKnight, Secretary and Treasurer, with Mr. W. A. Sutton as Chief Marshal. The members first enrolled, beside

these, were: Mr. O. M. Savels, Mr. E. P. Smith, Mr. R. E. Durkee, Mr. H. C. B. Fanning, Mr. E. P. Sumner, Mr. Granby A. Bridges, Mr. J. W. Harrington, Mr. E. C. Harrington, Dr. E. G. Hoitt, Dr. C. L. Cutler, and Dr. E. H. Ellis, of Marlboro; C. R. Moules and George A. Ritchie. Mr. Sutton called this first session to order, and Mr. Savels, as temporary secretary, made the first record. By-laws and constitution were provided for and the club was started with all necessary formality and considerable enthusiasm. The members even sat around long after the business of the meeting was over talking about their

Mr. J. Ransome Bridge (President of Massachusetts Automobile Club) and Mrs. Bridge

respective machines, and telling what had gone well or ill with them on the road, as all true enthusiasts will.

A run to Lancaster took place the following Sunday, and other runs followed at intervals all through the fall. In September some of the club members entered in the first automobile races of the county at the Worcester Agricultural Fair. The club has grown steadily until it now numbers about forty. One or two changes in leadership have been made, principal of which has been the selection of Mr. W. J. H. Nourse as Chief Marshal. The members are skilful automobilists almost without exception. For indoor gatherings there have been addresses by guests or visitors on subjects of interest to the automobile owner, and it is likely

that meetings of this sort will be a feature of the club life this winter.

Though the Worcester Club has the distinction of being first in the New England field, there was an interesting association of automobile users among the students of Harvard University in existence as long ago as the fall of '99, and more recently automobile clubs have been formed in Providence, R. I., and in Boston. The Harvard organization has never been formal, its members merely club together in renting and fitting a neat little automobile stable of their own, and in hiring caretakers. The Providence club has had one or two successful club runs, while the Boston club, as yet in its infancy, is incorporated under the name of the Massachusetts Automobile Club, and has for its officers Mr. J. Ransome Bridge, President; Mr. L. E. Knott, No. 16 Ashburton place, Secretary, and Mr. Conrad J. Rueter, a Pemberton Square lawyer. John B. Walker, Jr., of the Mobile Company, is one of the Directors, and so is Captain Homer W. Hedge, well known as the ex-Secretary of the Automobile Club of America. Both the Rhode Island and Boston clubs have practically the same objects as the Automobile Club of America, and are looking to include a representative number of the automobilists in their respective districts. There will be more to say about them before the winter is far advanced.

The initial run of the Worcester Automobile Club referred to took place August 19, 1900, when twelve carriages were in procession.

THE COST OF MOTOR VEHICLES

"When automobiles are cheaper I'll get one," is heard on every hand, and there is little doubt that the numbers in use will largely increase as the prices gradually go down. But people do not realize the reasons for high prices and fondly imagine that next year—or the next, at most—a first-class machine can be had for two or three hundred dollars. We fear they are doomed to disappointment for various reasons.

The cost of building and selling a good machine is more than most people imagine, and add to this the demand in excess of the supply, and there is very little reason for a drop in price at present. The cost of new designs, of experiments in new directions and of demonstrating the machines, must all be added to the actual expense of manufacturing. When the standard typewriters are considered and the fact that their price has been practically the same for years, the chance of automobiles being sold very low is extremely remote.

Automobile Club of Long Island

THE Automobile Club of Long Island was recently organized and incorporated under the laws of New York for the express purpose of fostering and encouraging social relations among members, to promote and encourage the construction and maintenance of good roads, the obtaining and upholding of whatever rights automobilists have, either as owners or users of all kinds of self-propelled vehicles; to investigate the development of motor vehicles; the giving of race meetings, parades, touring and other sporting meets incident to motor vehicles; for the general good of the sport, as such, and as a pastime. The club is strictly a social club, supported by members' subscriptions, and not for profit. There are three classes: honorary, resident and non-resident members.

During the winter lectures will be given pertaining to automobiles, papers will be read and members will be advised by the committee respecting the automobile condition of various roads.

The officers are as follows: President, Louis R. Adams; Vice-President, Robert Darling; Treasurer, F. G. Webb; Secretary, Charles W. Spurr, Jr. Headquarters are at No. 104 Flatbush avenue, Brooklyn.

Book Review

There are a number of valuable treatises upon the gas engine, but perhaps one of the most useful is that written by Frederick Grover, copy of which lies before us. The author goes, first of all, into the construction of early and late types of successful gas engines, from which he proceeds to chapters on the practical design of gas engines. Part 2 is devoted to petroleum engines. Numerous illustrations are included, and altogether the book should be of value to all who have to do with the construction and operation of gas engines. It is published by the Technical Pub. Co., No. 31 Whitworth street, Manchester, England.

Run of the Automobile Club of America

SHORTLY after 10.30 A. M., Saturday, November 17, automobiles of all styles began to assemble in Astor Court ready for the run of the Automobile Club. About 11 o'clock the different automobilists took their places; the buzz of wheels was heard, and one by one the motor vehicles drew away. Mr. Bostwick in his Winton racer acted as pacemaker until the Harlem river was reached. After leaving this point good time was made by several of the vehicles, although one or two were obliged to stop on the road owing to slight mishaps. There was not, however, any serious accident.

The route lay through Yonkers, Dobb's Ferry to the Ardsley Club-house, where lunch was served. About thirty-six sat down, the number of vehicles in the run being 15 or 17. Among those present were: A. C. Bostwick, C. J. Field, Grant Lyman, G. F. Chamberlin, Howard Willets, Paul Thebaud, Robert Graves, W. E. Buzby, M. W. Ford, J. D. Wright, C. C. Wridgway, S. T. Davis, Jr., and F. W. Tousey.

After lunch the run continued to Tarrytown, through White Plains to Marmaroneck Village, along the Post road to New Rochelle back to the city. The run was a decided success.

It was noticed that upon reaching Ardsley certain of the automobilists thoroughly inspected their vehicles, saw that oil cups were filled, nuts were tightened, tires were in good condition, while others seemed quite indifferent. Perhaps we would hear of fewer accidents if automobilists, when they come to a halting place, would inspect their machines before continuing on their way.

M. Lenoir, who is credited with having been the father of the modern automobile, died recently in Paris in poverty. Lenoir was a chemist, and in 1860 took out a patent for a motor driven by an explosive mixture of air and gas, and even used electric ignition. He seemed to have anything but good fortune in the promulgation of his invention, as most of those to whom he explained his idea considered that it was not of any value. In 1862, however, his carriage made a number of short trips through the streets of Paris.

Automobile Club Directory

Under this heading we shall keep a record of the motor vehicle clubs both of this and other countries, and we hope to have the co-operation of club officers in making it accurate and complete.

Automobile Club of America, Malcolm W. Ford, Secretary, 203 Broadway, New York; representative on International Racing Board, Clarence Grey Dinsmore; Substitute, John H. Flagler.

Automobile Club of New Jersey, President, Kirk Brown; Vice-President, W. J. Stewart; Treasurer, H. W. Whipple; Secretary, Dr. H. Power.

Automobile Club of Baltimore, W. W. Donaldson, Secretary, 872 Park Avenue, Baltimore.

Automobile Club of Columbus, O., C. M. Chittenden, Secretary, Broad Street.

Chicago Automobile Club, Secretary, H. M. Brinkerhoff, Monadnock Block, Chicago.

Automobile Club of Long Island, Secretary, Charles W. Spurr, Jr., 104 Flatbush Avenue, Brooklyn.

Cleveland Automobile Club, L. H. Rogers, Secretary, Cleveland, O.

North Jersey Automobile Club, E. T. Bell, Jr., Secretary, Paterson, N. J.

Automobile Club of Rochester, Frederick Sager, Secretary, 66 East Avenue, Rochester, N. Y.

Massachussets Automobile Club, President, J. Ransome Bridge; Treasurer, Conrad J. Rueter; Secretary, L. E. Knott, 16 Ashburton Place, Boston, Mass.

Pennsylvania Automobile Club, Secretary, Henry J. Johnson, 138 No. Broad Street, Philadelphia.

Philadelphia Automobile Club, Frank C. Lewin, Secretary, 250 No. Broad Street, Philadelphia, Pa.

San Francisco Automobile Club, B. L. Ryder, Secretary, San Francisco, Cal.

Columbia College Automobile Club, Lewis Iselin, Secretary, Columbia College, New York, N. Y.

Buffalo Automobile Club, George S. Metcalf, Secretary, Buffalo, N. Y.

Worcester Automobile Club, Worcester, Mass., President, J. E. Farwell; Vice-President, J. W. Bigelow; Marshal, W. J. H. Nourse; Secretary-Treasurer, H. T. McKnight.

AUSTRIA.

Budapest—Magyar Automobil Club, 31 Musem Korül.

Innesbruck—Tiroles Automobil Club, Rudolph-Strasse 3.

Prague—Prager Automobil Club.

BELGIUM.

Antwerp—Automobile Club Anversoir, 34 r. Longue de l'Hopital; President, Baron de Bieberstein.

Brussels—Automobile Club de Belgique, 14 Pl. Royale; Moto-Club de Belgique, 152 Boul. du Nord; Touring Club de Belgique, 11 r. des Vauniers.

Charleroi—Automobile Club de Charleroi, Hotel de Esperance.

Ghent—Automobile Club de Flandres.

Liege—Automobile Club, Liegeois, 2 r. Hamal.

FRANCE.

Amiens—Automobile Club de Picardie, 36 r. de La Hotoie.

Avignon—Automobile Club de Avignon.

Bordeaux—L'Automobile Bordelais.

Dijon—Automobile Club, Bourguignors Cafe Americanie.

Lyon—Bicycle et Automobile Club de Lyon; Motor Club de Lyon, 3 pl. de la Bouise.

Marseilles—Automobile Club de Marseilles, 61 r. St. Fereol.

Nance—Automobile Club, Lorrain, Thiers pl.

Nice—Automobile Velo, Club de Nice, 16 r. Chauvain.

Paris—Automobile Club of France, 6 pl. de la Concorde; Motr-Club de France; Touring Club de France, 5 r. Coq-Héron.

Pau—Automobile Club, Bearnais Ave. de la Pau, President, M. W. K. Thorn.

Périgueux—Veloce Club, Perigourdin, Hôtel de Commerce.

Toulouse—Automobile Club, Toulousain Café Riche, pl. St. Etienne Société des Chaffeurs du Midi, 25 r. Roquelaine. President, M. Gay.

GERMANY.

Aachen (Aix la Chapelle)—Westdeutscher Automobile Club, Hotel Grand Monarque.

Berlin — Mitteleuropaischer Motor Wagen Verein, I. Universitatstrasse, Herr A. Klose; Deutscher Automobil Club, Luisenstrasse, 43-44.

Dresden—Radfahrer-und Automobilisten Vereinigung; Dresdener Touren Club.

Eisenach—Mitteldeutscher Automobil Club; Motorfahrer Club, Eisenach.

Frankfort am Main — Frankfurter Automobil Club, Restaurant Kaiserhof.

Munich—Bayer. Automobil Club, 33 Findling Strasse.

Stettin—Erster Stettiner Bicycle und Automobil Club.

Strassburg—Strassburger Automobil Club.

Stuttgart — Suddeutscher Automobil Club; Wurtembergischer Motor Wagen Verein.

GREAT BRITAIN.

Birmingham—Motor and Cycle Trades Club, Corporation street.

Edinburgh—Scottish Automobile Club.

Liverpool—Liverpool Self-propelled Traffic Association, Colquitt street. Secretary, E. Shrapnell Smith.

London—Automobile Club of Great Britain and Ireland, 4 Whitehall Court, S. W. Hon. Secretary, C. Harrington Moore.

Nottingham Automobile Club, Secretary, A. R. Atkey, Nottingham, England.

HOLLAND.

Nimegue—Nederlandsche Automobile Club.

ITALY.

Milan—Club Automobilisti Italiani 6 via Guilini.

Turin—Automobile Club d'Italie Via Vittorio Amedeo II, 26.

RUSSIA.

Moscow—Moskauer Automobile Club, Petrowka, Hauschnow.

St. Petersburg—Automobile Club de Russe, President, M. Delorme.

SPAIN.

Madrid—Automobile Club de Madrid.

SWITZERLAND.

Geneva—Automobile Club, de Suisse, 9 boul. de Theatre.

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MAGAZINE

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ABOUT INDEXES

Some one has said, "A good book deserves a good binding." We go further and say, "A good book or paper deserves a good index," one as full and complete as it is possible to compile. There are a great many works of reference which contain veritable mines of information, but have extremely incomplete indexes. This fault in so many books is a real one, and the source of a great deal of annoyance.

In these days men want to get their information in the minimum of time, and when it is necessary to consult books for it they do not feel as though they can afford to wade through page after page when they could be cited to what they are looking for almost immediately if the index in the book were just as it should be.

What is true of books is also true of journals which are likely to be after referred to. To cite an instance: The other day we desired to find an article describing a certain form of gasoline motor. We knew the article referred to had appeared in a cer-

tain journal devoted to the automobile industry. Naturally we turned to the index and looked under the words " gasoline " and " motor," but found that the article had not been indexed under either. After looking for some time it was found indexed under the word " the," the title of article having read " The Gasoline Motor." We think there is no excuse whatever for a thing of this kind.

No two men compile an index in exactly the same way, and the only safe rule for an indexer to follow is to put himself in the place of as many of the readers as much as possible.

It is our intention to compile and send out with the January issue of the AUTOMOBILE MAGAZINE a very full and complete cross index of every number of the magazine since its inception, October, 1899.

No pains will be spared to make it thorough, each article being cross indexed, so that should a reader fail to find a given article indexed under one word he will under another.

This index will not, as heretofore, be bound in with the other pages of the journal, but will be separate, so that in case readers should for any reason wish an extra copy it can readily be supplied.

AUTOMOBILE CLUBS AND THE DEVELOPMENT OF THE AUTOMOBILE INDUSTRY

In the early days of the bicycle there was perhaps one factor more than any other which contributed to the great demand for wheels, and the general desire to know more about the bicycle and the pleasures to which it gave birth. That was the bicycle club.

When you can bring men and women together who are interested in a common theme, and bent on one specific purpose, you have, perhaps, the strongest force necessary to further any given object. When the bicycle club first became popular men began to form themselves into clubs and to talk about their respective clubs; bicycle runs were instituted between the various clubs, and by this means the bicycle was the connecting link between circles of men interested in the wheel. This undoubtedly contributed, in a large measure, to an increased demand for wheels.

We cannot help ourselves from influencing others. It is a law which exists in spite of ourselves, and we all bow to it.

As it was with the wheel so will it be very largely in the case of the automobile. As the members of one club meet with those

of other clubs, it is fair to assume that the principal topic of conversation will be the automobile in all its bearings. This interchange of opinions cannot help but be beneficial to the growth and development of the industry.

Automobile clubs are being formed in many sections, and the social intercourse which one club has with another will lead to a more general desire to know more about the new mode of conveyance, resulting in increased sales.

The Personal Factor in the Success of Automobiles

ONE of the conditions that must be considered by builders of automobiles is the effect of different methods of handling due to the difference in people's natures. A machine that gives excellent service when properly handled by an expert may fail completely in the hands of another, due to different manipulation. This is true of any machine and also of horses. As Mr. I. B. Rich so clearly showed in his brief but pointed article in the October issue, a man who is careful gets along nicely where his neighbor—who, in this case, killed three horses in one summer—gets into trouble.

There would seem to be two ways of dealing with this phase of the question. One to make every part of the carriage and motor so that it cannot be used wrongly, and the other to allow a wide margin of variations in handling without damaging either the machine or the rider. The first would be preferable if it were not well nigh impossible, but the latter seems the most feasible course to pursue. If it were possible to so build a motor that it couldn't help running right under all conditions, there would remain but the one or two personal features—the steering and the regulation of speed. The latter is amenable to law, whether accidents happen or not, but the former depends largely on the nerves of the man behind the lever. If he is an individual who loses his nerve easily, there is no telling what may happen, and a nerve tonic is in order.

The Final Automobile

Hugh Dolnar

III.—CLUTCHES

SUPPOSING a motor wagon to be fitted with a suitable motor, cylinder-fired, the motor being small and certain to run when desired, and that the motor cylinders are supplied with a fixed quantity of fuel for each working stroke, this amount being capable of ready variation at the will of the driver, so that the motor will work strongly or feebly as may be required. If this motor has sufficient piston area and is suitably geared to the driving wheels, it will drive the wagon forward with more or less power according to the amount of fuel supplied for each cylinder charge. As so far specified, this motor will not drive the wagon backward, because the cylinder-fired motor is not capable of being reversed in any approved form now known.

Again, such a motor is strongest when it is given all the fuel it can burn, and is also run at its highest speed at all times. Hence, if it is desired to have the motor do its uttermost to drive the wagon at either a fast or slow rate of advance, speed change gearing must be placed between the motor shaft and the driving wheels, and if the wagon is to be capable of running backward as well as forward, a reversing gear must also be supplied.

A common arrangement of motor gearing gives two speeds or three speeds forward and one speed backward. As to the need of a backing gear, there can be no question. Although the backing gear is but seldom required on country roads it is an essential requirement in crowded streets, and is not unreasonably demanded by law in some countries, because it may be the means of avoiding accident and even saving life itself.

It is a very easy matter to apply any desired speed gear changes to an automobile, and if the teeth of the gears are spiral, the change gears will run without much noise. Spiral gear teeth cause an end thrust on the supporting shaft which is regarded as highly objectionable, and because spiral gearing is not much used it is more costly than plain speed gearing. If such bearings as are shown in the first paper of this series are used, then the end thrust will be perfectly taken care of without any trouble. The angle of the spiral gear teeth can be quite small, as little as from seven to ten degrees angularity being enough to make the gearing run quietly.

Some systems of motor wagon gearing include bevel gears. The bevel gear is always troublesome. It is costly, and demands absolute precision of location, and gives a heavy end thrust and is noisy at high speeds. These faults belong to the bevel gear, and neither skillful designing nor good workmanship will avail to remove them, and because of these faults the bevel gear will not appear in the final automobile as a principal element of the driving mechanism.

Epicyclic trains of motor wagon gearing are often shown, and are often shown with pinions of extremely small radius. The epicyclic gear train has a certain fascination for the ingenious mechanic who has small experience in practical machine operation, because of the curious and often surprising effects which may be obtained by its use. Epicyclic gear trains are, however, very seldom seen in machines of established and widely accepted design.

Worm gearing has also been proposed for road wagon speed changes. It is generally supposed that the worm gear in any form is subject to great loss of power by friction, and consequently to rapidly destructive wear; while this is true of worm gearing having a low angle of worm thread inclination, it is not true if the teeth angles are made larger, and very compact, easily covered and readily lubricated arrangements of worm gearing suitable for wagon driving can be had. Worm and worm wheel gearing is subject to end thrust; this end thrust must be taken care of, and can be easily resisted by ball bearings either of the form shown in "Permanent Bearings," or by a ball thrust bearing arranged as in Fig. 11, which with 5/16-inch balls will resist any thrust set up in light automobile driving. Worm gearing is perfectly still and smooth in action at any speed, gives velocity changes without diameter changes and is in every way docile and tractable in the hands of the designer. If made with proper worm angles it is very durable, and operates with no more loss by friction than is due to good spur gearing, and cast-iron and machine steel work together extremely well as worm gears and worms in correctly designed systems which are protected from dust and abundantly lubricated.

It must be remembered that the friction on all gear teeth is constant and severe, and the longer the tooth addendum, the more extended the rubbing action. The worm gear has great advantages for automobile speed changing, and will undoubtedly appear in the final types of vehicles, especially for heavy work, where its great speed reductions with small diameter variations make it peculiarly suitable.

Supposing a satisfactory change of gear is placed between the motor shaft and the driving wheels, then it becomes needful to introduce some other devices which will enable the driver to place one of these speed changes in action and make it drive the wagon at its own special rate, while the speed of the motor remains unchanged and all the other speed change gears are idle.

Here the necessity for the clutch in some form appears. It is true that a speed change gear has been much used in automobiles, in which a shaft carrying various gears rigidly fixed thereto is moved endwise so as to successively place the gears it carries in mesh with other gears rigidly fixed to a shaft which has no endwise movement. This arrangement is simply barbarous. It avoids the clutch, is cheaply made, and is not easily disarranged. It is also certain in action; it has the vast and all overshadowing fault, however, of being incapable of speed change engagement except at very low rates of revolution, and this single fault is quite enough to utterly condemn the whole arrangement. No device which cannot be operated safely and easily at any rate of speed, from the highest to the lowest and from the lowest to the highest, has any place in a road wagon, because life may depend upon the quickness and ease with which the operations of the wagon can be varied. If this dogma be accepted, and it is certainly true, then a lot of requirements, some of which are not too easily met, are at once introduced in the automobile speed change problem.

First, all the speed change gears must always be in full engagement with each other, because toothed gears cannot safely be slipped or dropped into mesh with each other at high speeds.

Second, the change from one speed to another must not be by elements having a rigid and positive engagement, and yet the change must be made in the smallest fraction of an instant, and must become effective as soon as made, while at the same time there must be sufficient slipping and yielding between the engaged parts to make the speed change without shock or danger of breaking the gear teeth.

These two imperative conditions make the use of friction clutches in cylinder-fired automobiles unavoidable. Nothing else can possibly meet the conditions.

To be perfectly suitable for wagon work the friction clutch should be operated with very little muscular exertion, certain to engage, certain to release, and should be locked in full engagement without a locking movement of the driver's hand, and should occupy no space whatever. The clutch should also be effective when only partly engaged, and should drive the wagon

strongly and safely while slipping. All of these requirements can be fully met, except that of occupying no room, and this seeming impossibility can be nearly obtained if the clutch is placed wholly inside of the gear which it controls, only the lever connection end projecting outside of the gear journals.

The elements of the friction clutch are shown in Fig. 12, in which *A* is the driving member constantly turned by the prime mover, and *B* is the driven member, while *C* is a hand lever by which *A* can be moved toward or from *B*.

It is clear that if *A* is pressed with sufficient force against *B*, then *B* will be caused to revolve by the friction set up between

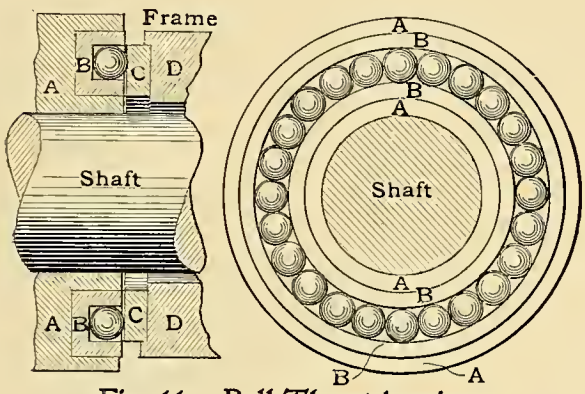


Fig. 11. Ball Thrust-bearing.

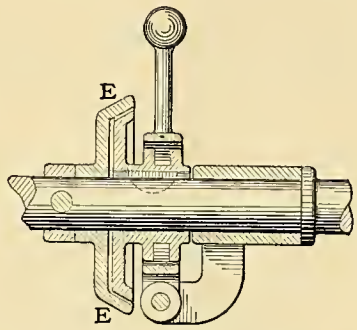
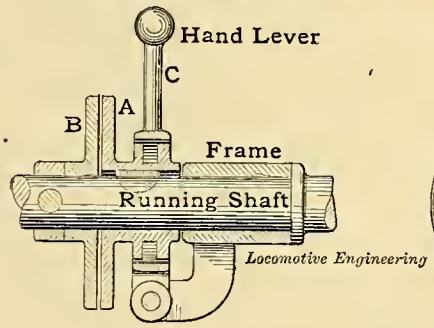


Fig. 13. Conical Clutch Faces.



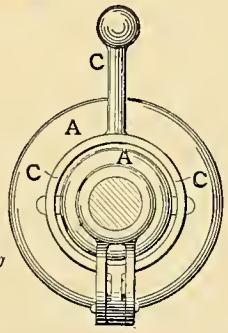


Fig. 12. Friction Clutch Elements.

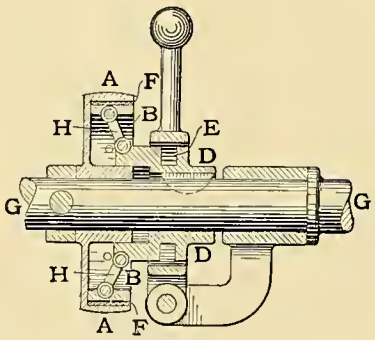


Fig. 14. Toggle Joint Clutch.

the meeting faces of *A* and *B*. The pressure must be great, and it is hard to hold the hand lever up all the time. These difficulties are often met by changing the shapes of *A* and *B*, as shown in Fig. 13, where the meeting surfaces are changed from disks to cones at *E*. This is a common form of clutch, much used in automobiles. It is very simple and cheap, is not very easily operated, and must be well oiled to prevent it from cutting and sticking. This clutch can be used, but it is very far from wholly satisfactory, as it may be difficult of disengagement and is not a good partial engagement driver. If oiled too freely it may not drive, and if not oiled enough it may refuse to let go, and may

and often does " cut " or " seize," so that no effort of the driver can release it.

In Fig. 14, an anti-friction element is placed between the clutch engaging surfaces. The introduction of this anti-friction element, *F,* is extremely beneficial, as it makes it certain that the engaging surfaces of the clutch will not cut and so destroy each other. At the same time, the anti-friction element is a great drawback to the effectiveness of the clutch as a whole, because it operates beneficially wholly by reducing friction, while the entire operation of the friction clutch demands the installation and maintenance of a very great friction. Hence if the anti-friction element is introduced much more powerful means of forcing the engaging parts of the clutch into contact with each other must be used than are required where the coacting surfaces of the clutch are of plain cast-iron, which is the material most commonly

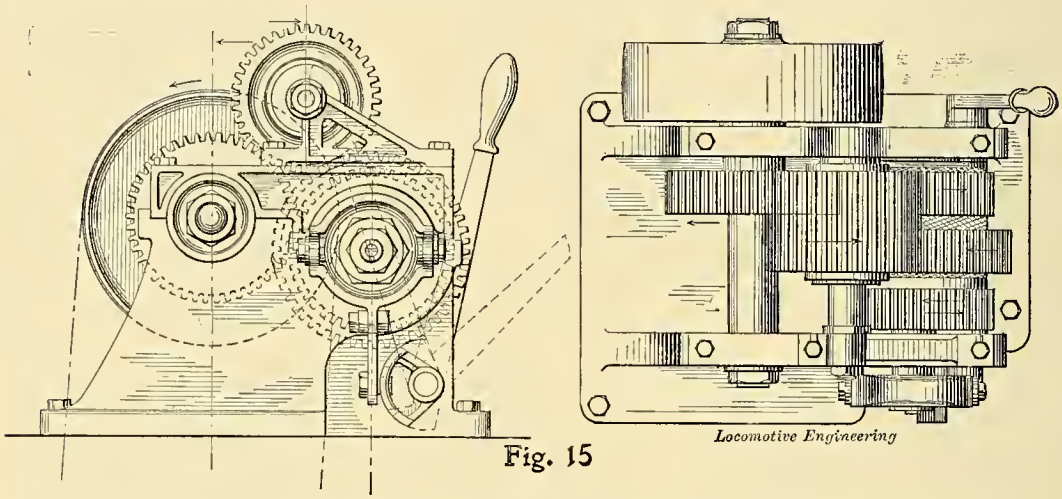


Fig. 15

used. Friction clutches are much used in machine tool countershafts and headstock spindle drives where it is desirable to change the speed of the main spindle very quickly. These machine tool friction clutches, which have been the subject of much thought and are very satisfactory in operation, commonly have cast-iron coacting or engaging surfaces, and are often operated by hand moved wedges, this simple arrangement being satisfactory where only small power transmissions are demanded and skilled attendance is always expected, and a slipping clutch power transmission is not only not demanded but it is inadmissible. The ideal automobile clutch must meet very different conditions. It must operate with ease and certainty without attention through long periods of action, and it must also be efficient as a slipping drive, by which a less speed may be transmitted than is normal, and a brake effect may be had. Because of these conditions the coact-

ing parts of the road wagon clutch should always be separated by an anti-friction element, vulcanized fiber, a well-known preparation of cotton, serving well in this position. Again, neither the plain lever nor the wedge nor cone serve exactly to fill the requirements of the automobile clutch, though both are in common use. The plain lever must be fitted with some locking device to maintain the pressure, and this is a very objectionable feature. The wedge sets up an enormous friction at a non-effective point, and may be very difficult of release. The screw, which is merely a continuous wedge wound about a cylinder, is open to the same objections as the wedge, although De Dion uses a screw operated friction clutch in an important capacity. The friction of a screw increases so rapidly with the load that the screw is quite unsuitable for actuating a friction clutch in automobiles, where delicate variations of a very heavy pressure are required to be made both quickly and easily.

There is another form of positive clutch, which consists in a sliding key traveling in a keyway cut in a shaft which supports the change gears, this sliding key having a projection which may be made to engage with any one of the notches cut in the hubs of all the loose change gears. Such a key in the form known as a "push-pin," is often used for changes of machine tool feed gears, and answers well where only very slow speeds are required. In the case of the automobile, the sliding key is almost the exact equivalent of the sliding shaft having the change gears fixed upon it. The sliding key has the advantage of permitting the change gears to be constantly in mesh, and operating on the hub of the gear, which has a much lower velocity than its teeth. The sliding key is, however, always a positive engagement, and hence cannot be used to obtain a brake effect, and is always likely to cause a breakage if used where the gears are running rapidly, and hence is wholly unfit for automobile use. In spite of these radical and prohibitive defects the sliding key has appeared in many late patents on wagon gears, and appears to find some favor in England, where automobile drivers seem quite resigned to facing accident and death whenever the brake fails to act on a down grade and the gearing turns too fast to prevent using the clumsy speed change clutches fitted to their vehicles. Serious and fatal accidents have occurred in many instances, solely because the speed change clutches were of such miserably unsuitable design that they could not be used when most urgently required.

Supposing a road wagon to be fitted with three speed changes for forward motion and one backing speed, and to be at rest on the road, with the motor in operation and all the speed change

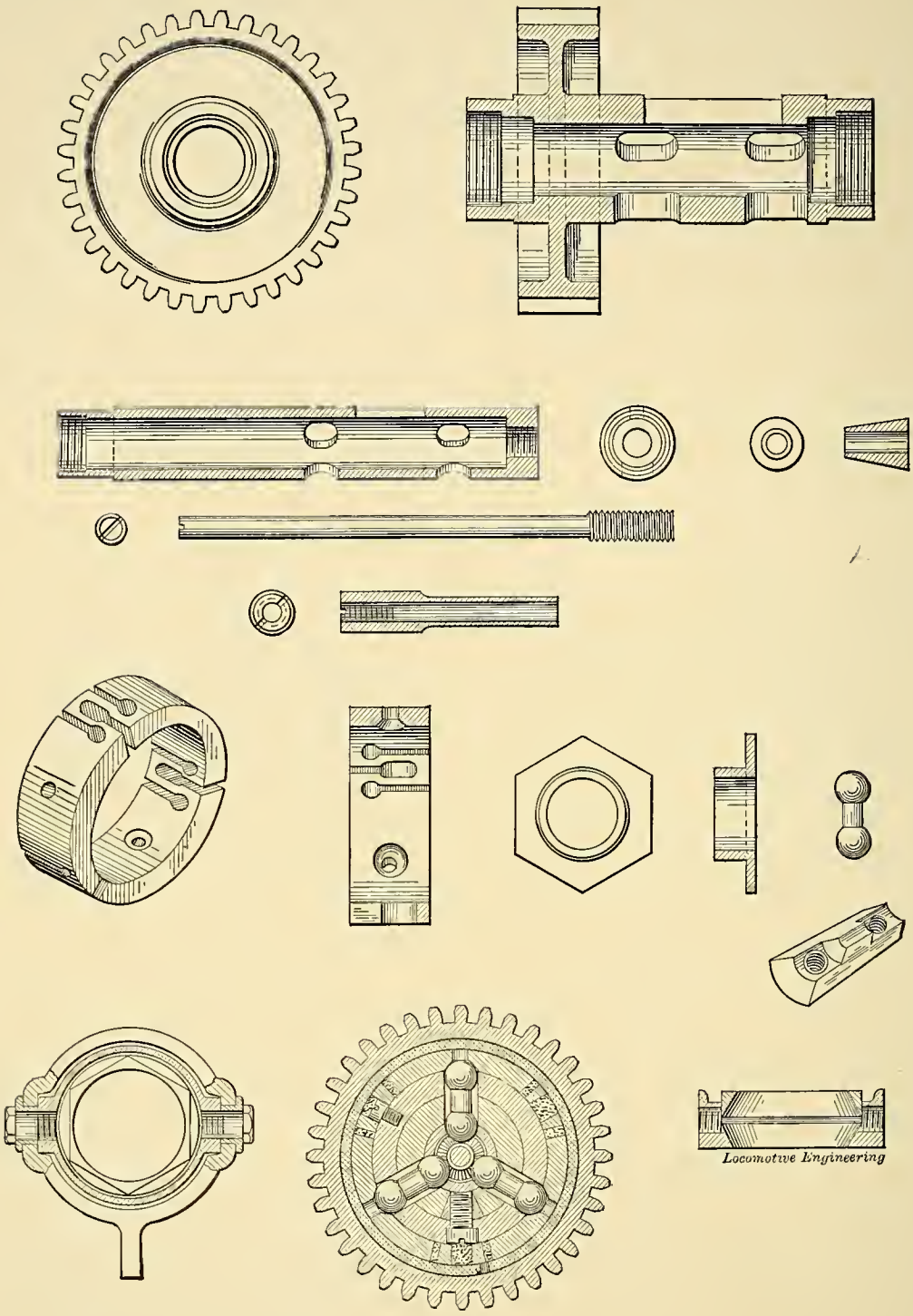


Fig. 16.

gears running at their normal rates. To start this wagon forward, a continuous motion of the speed controlling lever in one direction should successively bring all the forward driving gears into action, beginning with lowest speed and proceeding to the highest speed desired by the driver; the clutches should be so actuated that the slowest speed change gear would have a momentary engagement which should powerfully overcome the friction of rest of the wagon, which offers vastly more resistance to the initial movement of the vehicle than that due merely to the load and road surface. Then by a continued movement of the speed lever the next higher speed should be brought into action. This procedure gives the best acceleration possible with a constant speed motor and change gearing, and many patents have been taken out on this successive engagement feature, which is of the highest importance where speed change gears are used. For the backing action, it is needful that the speed and direction controlling lever should be capable of being moved instantly from its engaging position for any of the forward speeds to the backing speed, without engaging any of the intermediate lower forward speed changes. The Duryea Brothers have patented some ingenious belt drive operating devices meeting these automobile operating requirements, and other inventors disclose means of meeting these conditions, none of these patents being basic, all covering details only, and none of them, so far, giving wholly satisfactory results in operation.

Toggle joint actuated friction clutches are very widely used, and seem more suitable for the automobile than anything else, as by means of toggles heavy pressures may be established and removed with less friction of operating parts than by wedges or screws.

Fig. 14 shows a simple arrangement of members in a toggle joint actuated friction clutch, in which *A* is the constantly revolving driving member, *B* is an expansible metal ring fixed to the driven shaft *G*, *F* is an expansible ring of vulcanized fiber placed on the outer surface of *B*, and *D* is the sliding member splined to *G*, which is the member to be driven or released at will. The hub of *D* has a groove *E*, to take a lever fork, and is provided with opposite lugs to which the toggle members H, H^1, are jointed, the outer ends of H, H^1, being jointed to the expansible ring *B*. To operate this clutch the hub, *D*, must be moved to the left, so as to straighten the toggle links and expand the ring *B* and cause the fibre ring, *F*, to be very strongly pressed against the interior surface of the driving member, *A*. Such a clutch is self locking in position when the toggle members H, H^1,

are brought into a straight line with each other. The clutch is released by moving the sliding member, *D*, to the right. This is an extremely simple and reliable mechanism in the elementary form shown. It is very old, and open to the use of all. By giving the sliding member, *D*, only part of its total travel to the left a slipping engagement is readily, certainly and safely secured, and the toggle link pins are small and do not set up a heavy friction in action, so that this form of clutch is fairly easy to operate.

In practice this clutch, Fig. 14, gives trouble at the groove, *E*, where the lever fork engages the sliding member, *D*, where there are sliding surfaces difficult to lubricate efficiently. The length of the toggle links, H, H^1, must always be exactly such as will permit the links to stand in a straight line when the clutch is fully engaged, and as this length varies through wear of the parts it is found convenient in practice to make the links adjustable in length, the links being often made with threaded turn-buckle bodies fitted with check nuts. Obviously each link must be of correct length, and because the link adjustments are separate it is a matter of some delicacy to adjust them for harmonious operation. As shown in Fig. 14 the toggle joint friction clutch takes up room in the length of the shaft, and if a number of these clutches are placed on one shaft it is no simple matter to arrange a single clutch lever so as to handle the clutches in the sequence previously specified, so as to operate first the low speed, then the intermediate speed and then the high speed clutches, and yet be free to go at once to the reversing speed, not shown in Fig. 14, and it is common to fit a separate hand lever for each speed. This greatly simplifies the problem of the speed change clutch for the designer, but it does not simplify the labor of the driver, who must have his wits about him, and pick out the right lever for manipulation, no matter how imminent his danger of bodily injury may be.

Endless detail variations in the construction of the toggle actuated friction clutch are possible. Some of the latest of these variations are shown in Figs. 15, 16 and 17. This is a very elaborate toggle clutch design, particular care being taken to avoid friction and secure ready adjustments, and it includes the reversing gear and reversing action, thus giving a sure control of all the parts required for what is here spoken of as the "locomotive drive," in which no speed change gears are employed. One gear on the prime mover shaft drives one of the loose clutch gears, and also an intermediate gear which drives the other clutch gear in the opposite direction. A fourth gear, having a long hub on which the two clutch gears are mounted, is meshed with

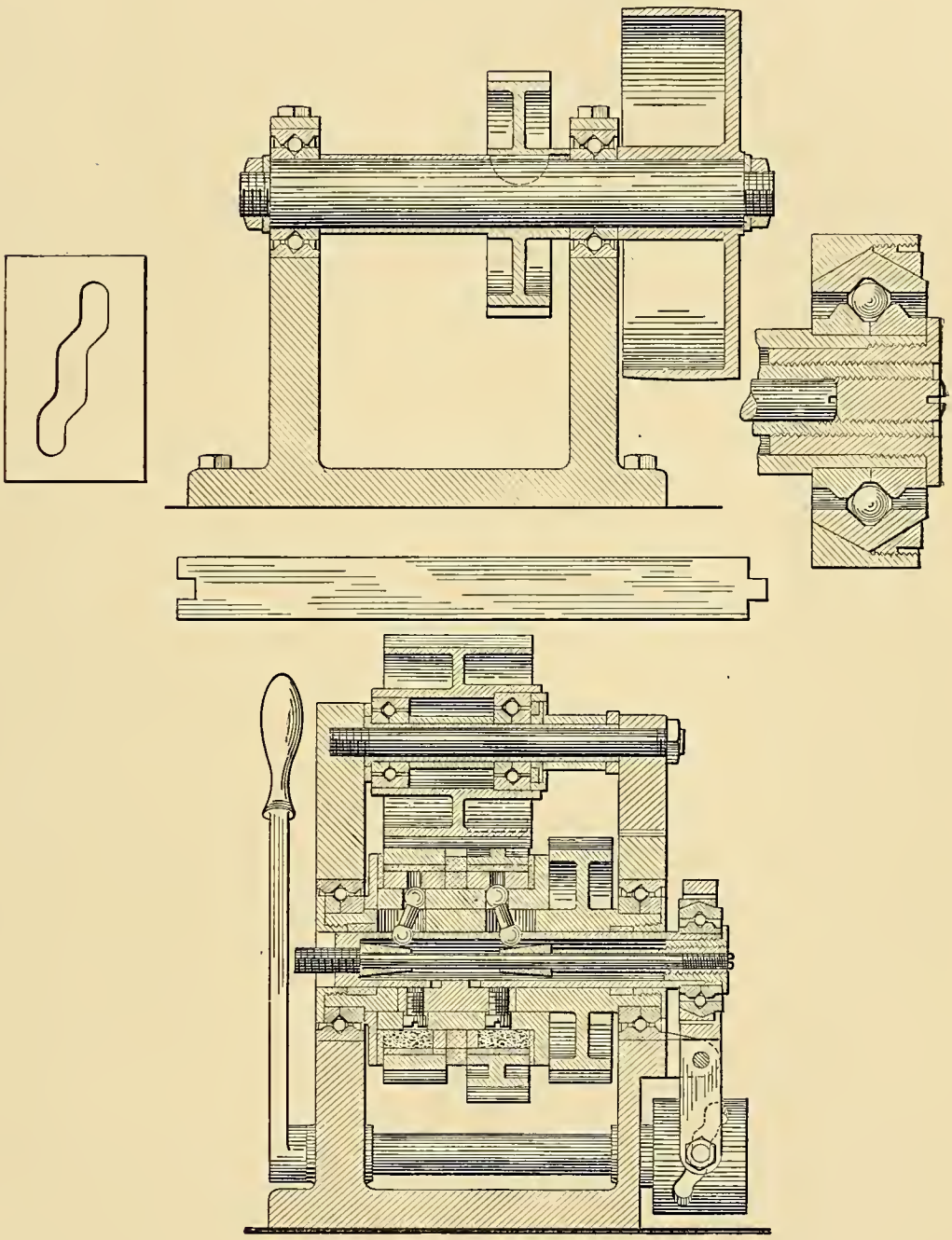


Fig. 17.

the balance gear drum, and is the member which is either left free or turned in either direction by the action of the clutch hand lever. The clutch hand lever is fixed to a rock shaft which carries a cam slotted segment for operating the clutch fork, the clutch fork being connected to the toggle actuating member sliding in the hub of the balance gear driving pinion, to actuate the two sets of toggles which respectively cause the engagement of either the forward or backward moving pinion with the balance gear driving pinion hub. As shown in the engravings neither set of toggles is in action. A quarter-inch of motion of the toggle actuating slide makes one or the other set of toggles effective, and so drives the balance gear drum driving pinion either forward or backward. The toggle members have globe ends, not pins, and are hardened, and are adjusted simultaneously, each set independently, by moving the hardened cones on which the inner ends of the toggle members are supported, by means of screws. The writer has carefully examined a clutch constructed in accordance with these drawings, Figs. 15, 16 and 17. It is very easily operated, is perfectly still, capable of action at any speed, and absolutely sure of release. The partial engagement gives a uniform slipping friction, great or small at the will of the operator, thus affording a reduced speed drive or a brake effect, as may be desired. It will be noticed that ball bearings are applied to this reversing clutch throughout, and that vulcanized fiber, distinguished by the cross-hatched sections, is interposed between all sliding surfaces. Felt oiling pads are so placed as to lubricate the clutch for a long period of time. All of this clutch is placed inside the gears, which are no larger in any dimension than their driving function demands, and are set as closely together as they will run, so that this clutch may be fairly said to occupy no space whatever, except that for the hand lever and its shaft, and the cam segment and the fork. The fork has a ball bearing connection with the toggle actuating slide, and so needs no lubrication.

The vast importance and significance of a reversing clutch of perfect action will now be set forth.

Returning to the initial supposition that the final automobile is equipped with a cylinder-fired motor running in one direction only, and measuring a definite variable bulk of fuel and of air to its cylinders for each working piston stroke, it is very clear that if suitable change gearing and clutches can be had the hitherto intractible Otto cycle internal combustion motor becomes an ideal agent for road wagon driving, if a sufficient number of cylinders are introduced to give a constant motor shaft torque. It is common now to use four motor cylinders, giving something near the

same crank shaft torque which is given by a single cylinder, double acting steam engine. Go a step beyond, and use five or six cylinders, and the turning impulse given to the motor shaft will be nearly constant, and no fly-wheel need be used. If the motor has no vibration and so can be run constantly whether the wagon is standing or going, it then becomes as constant and certain a producer of motive power as a steam boiler, and has the vast advantage over a steam boiler of being able to instantly vary the fuel consumption and power production, from barely enough to keep the motor shaft turning to the maximum, all as long and vainly sought by the flash and hot bath fired boiler makers, who have endeavored to produce boilers which would instantly vary the pressure and volume of steam production to suit the immediate demands for motive power.

With steam, the difficulties lie wholly with the fire and the water; after the steam is once produced it is easy to make it drive a wagon to suit the occasion. The cylinder-fired motor has no boiler and needs no water renewals. With liquid fuel the steam boiler fire can be instantly varied in any degree either up or down, and if the boiler tubes are thin enough, and are also numerous enough to nearly fill the boiler shell, then the steam production will very closely follow the fire regulation, and the power production can be varied almost as readily as with the cylinder-fired motor. Friction clutches are, however, far more docile and easily managed and maintained agents than are the demons we bottle up in steam boilers, and it is next to impossible to produce a steam driven motor wagon which is really safe against self-destruction by fire, while it is an easy matter to make the cylinder-fired motor absolutely incapable of burning anything outside of the fuel charges fired safely in the hidden recesses of its own cylinders.

Because of all this the clutch becomes the most important feature of the final automobile, after the motor.

Given a constant shaft torque, varied in power instantly and at will of the driver, and satisfactory transmission elements between the motor shaft and the driving wheels, the cylinder-fired motor becomes exactly what a steam motor would be if always supplied with much or little steam as desired, without having to use any boiler or water whatever, and these ideal conditions will almost certainly be met in the final automobile by the use of reliable friction clutches.

The fact that the cylinder-fired motor is instantly made strong or weak by fuel charge variations is perfectly well known, and it is also well understood that each working stroke of a cylinder-

fired motor is an event by itself, commencing with the stroke and ending with the stroke, and that there is no reserve of motive power, or aggregation of motive power producing elements in constant action, in the case of the cylinder-fired motor as there is in case of the steam boiler. It is also generally believed that this lack of a power reservoir makes the internal combustion motor greatly less certain in wagon-driving action than the steam boiler.

Hence it is not generally believed that the cylinder-fired motor can be a more easily and perfectly controlled heat motor than the steam boiler, because the fired steam boiler is always alive and eager to find an outlet for the pressure which it generates.

The truth is, that the continuous action of the water filled steam boiler makes it impossible to regulate its power production exactly to the requirements of the instant. The boiler keeps on making steam whether the wagon needs steam or not, and with ordinary steam boiler elements of control, more steam is sometimes made than can be used. By the introduction of diaphragm regulators operated by steam pressure, needle valve fuel admission, and the use of the lighter hydrocarbons for fuel, with the fuel in the fuel tank under an air pressure of from 25 to 40 pounds, also maintained by the use of the diaphragm to automatically control the operation of an intermittingly working air pump, the steam production of a steam boiler may be regulated to the greatest nicety, without care on the part of the wagon driver, provided the boiler water level, the fuel needle valve, and the fuel tank air pressure are all automatically controlled. When these functions are so controlled, it is at the expense of a vastly complicated aggregation of delicate parts, which are so highly objectionable as to be rejected altogether by some steam wagon users, and which the flash boiler advocates avoid by other highly objectionable methods.

In the case of the cylinder-fired prime mover, the fact of the self-terminating action of the working stroke obviates all of these difficulties, because it is only needful to measure a variable quantity of cold fuel and cold air to the motor for each working stroke to produce an instantly variable power production; this highly desirable effect cannot be had in full perfection, however, without a fairly constant torque on the motor shaft, which must be gained either by the use of a heavy fly-wheel or by providing from four to six cylinders. The fly-wheel introduces weight and the four, five or six cylinders vastly increase the number of working parts, but even with the extreme number of six working cylinders, the internal combustion motor is a much less delicate and less com-

plicated prime mover than the full automatically regulated steam boiler.

Because of all this, the cylinder-fired motor is more suitable for wagon driving at large, both for heavy and light service, than the steam motor, provided that a perfectly suitable clutch can be had capable of performing the more important functions of the link valve motion.

The Sargent Gas Engine Oiler

OF oilers for engines of different kinds there are quite a variety and many to choose from. The Michigan Lubricator Company, of No. 257 Beaubien Street, Detroit, manufactures an oiler which has proved eminently satisfactory for lubrication of the cylinder and piston of gas or oil engines, which, of course, is one of the essential conditions of successful operation.

In the case of automobile engines the amount of oil should be in proportion to the number of revolutions made per minute, and should stop feeding oil when the engine stops, as too much oil means smoke, and too little a cutting of the cylinder or piston.

The oiler referred to consists of a glass reservoir, which is filled through a hole in the top normally covered by a slide; a needle valve adjusts the feed into the air-tight bullseye below and a check valve held to its seat by a spring, the compression of which is adjusted by a nut, which can be turned with a screw-driver.

When this oiler is used for admitting oil to the cylinder of a gas engine or air compressor the check valve spring is so adjusted that the valve seats when the air pressure above and below the check is the same, but if the air pressure below the check valve is rarified or slightly reduced the check will open and allow the air in the bullseye inclosure to pass into the cylinder, whereupon the atmospheric pressure on the oil in the reservoir will force it down through the needle valve to the bullseye chamber from which it will pass into the cylinder every time the check valve opens. When the engine stops rarification in the cylinder ceases, the check valve remains seated and the oil stops feeding through the needle valve, because oil cannot drop into the bullseye chamber if air and oil are not drawn out. The reservoir can be filled while the engine is stopped or running without opening or closing a valve or changing the adjustment of feed.

The Automobile Index

Everything of permanent value published in the technical press of the world devoted to any branch of automobile industry will be found indexed in this department. Whenever it is possible a descriptive summary indicating the character and purpose of the leading articles of current automobile literature will be given, with the titles and dates of the publications.

Illustrated articles are designated by an asterisk (*).

Autocar for Heavy Traffic, The—

*An article devoted to the pointing out of the great advantages to be obtained from the use of motor vehicles in the transportation of merchandise. "The Autocar," London, October 20, 1900.

Automobile—

*A description of the Meynier and Legros electric automobile for four passengers, shown at the Paris Exposition. The weight is 2,750 pounds. The battery consists of 48 Fulmen cells. The motor has two independent ring armatures outside of the field. Four different speeds are obtained by series parallel control of the two halves of the battery, by series and parallel connection of the two armatures, and by shunting the series field for the highest speed. "L'Ind. Elec.," September 10, 1900.

Automobile, The Gillet-Forest—

*A very complete article devoted to the description of an automobile which contains a number of interesting points. "La Locomotion Automobile," Paris, October 25, 1900.

Bicycle Motor—

*An article upon a motor bicycle having a number of new features. "The Bicycling World," New York, October 25, 1900.

Canal Boat Haulage, Motor Cars For—

*Description of a carriage of curious construction intended for towing canal boats. "The Motor Car Journal," London, October 27, 1900.

Engines, Four Cycle Internal Heat—

An article devoted to the subject of the efficiency of port-valves. "The Motor Car World," London, October, 1900.

Exposition, Automobiles at the Paris—

An article by G. F. Desjaques, devoted to the description of the different motor vehicles on exhibition. "Engineering," London, October 19, 1900.

Fire Engine, Self Propelled—

*A description of an engine constructed by Messrs. Merryweather & Sons, Ltd. "The Motor Car World," London, October, 1900.

Gasoline Motor—

*A description of the Howard motor, which is of the four cycle type. "The Motor Age," Chicago, October 25, 1900.

Gears, About Change—

Second article of a series by M. C. Krarup, on the problems connected with the regulation of the speed of motors. "The Motor Age," Chicago, October 25, 1900.

Gear, The Anil Two Speed—

*Description of a new form of gear more particularly suited to quadricycles and tricycles. "The Autocar," London, November 3, 1900.

Locomotion, Road—

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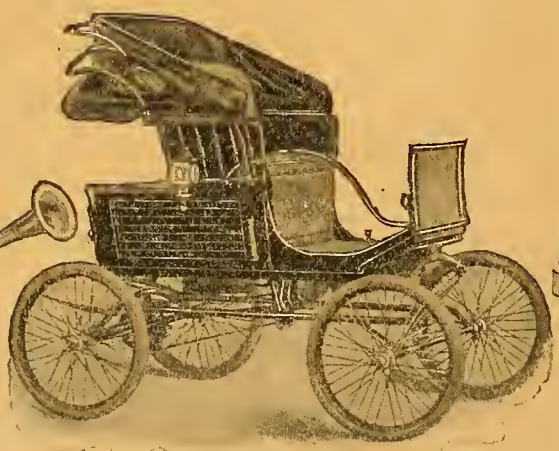

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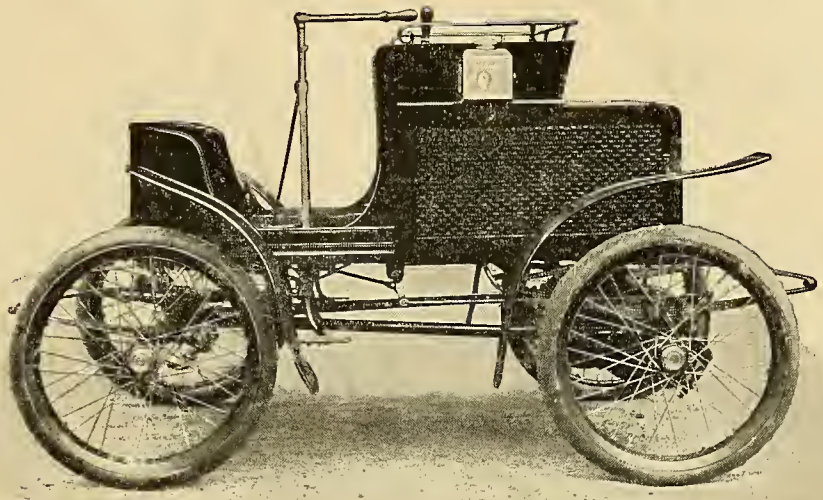

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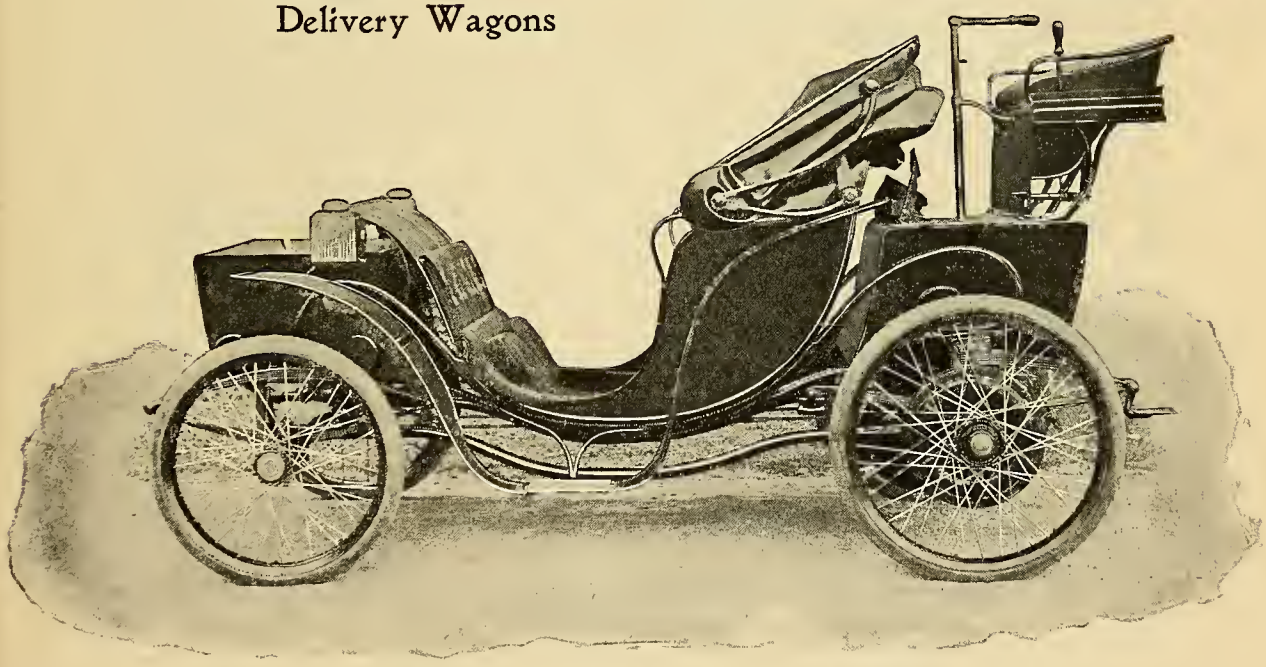

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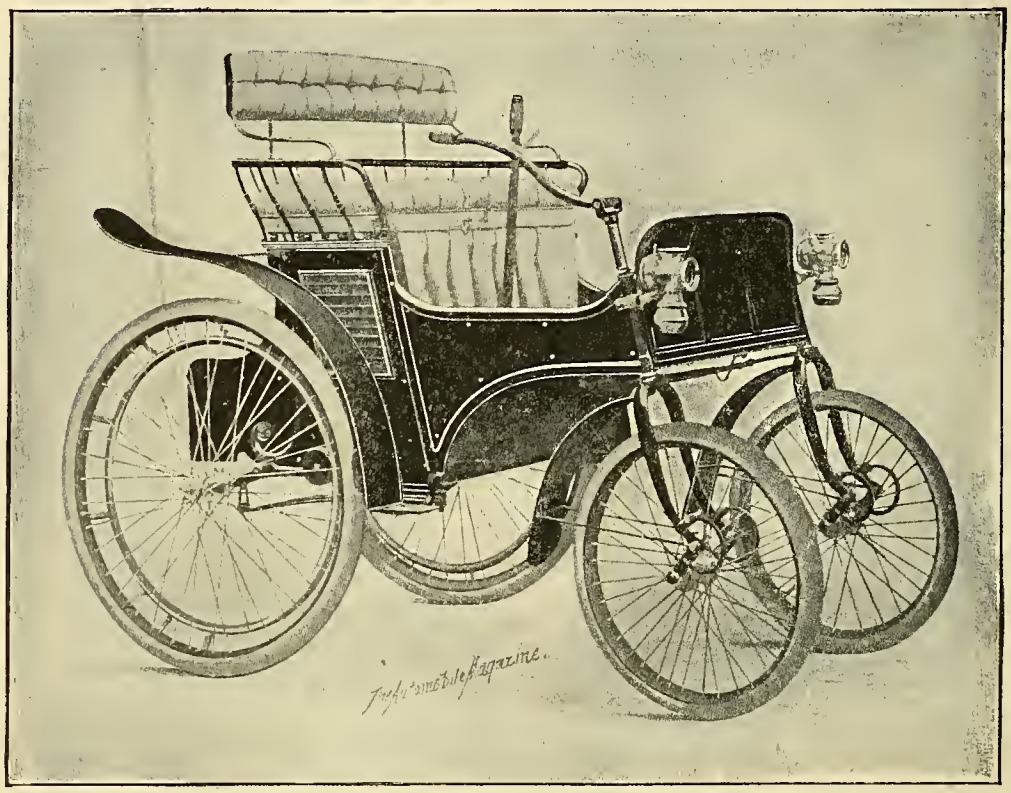

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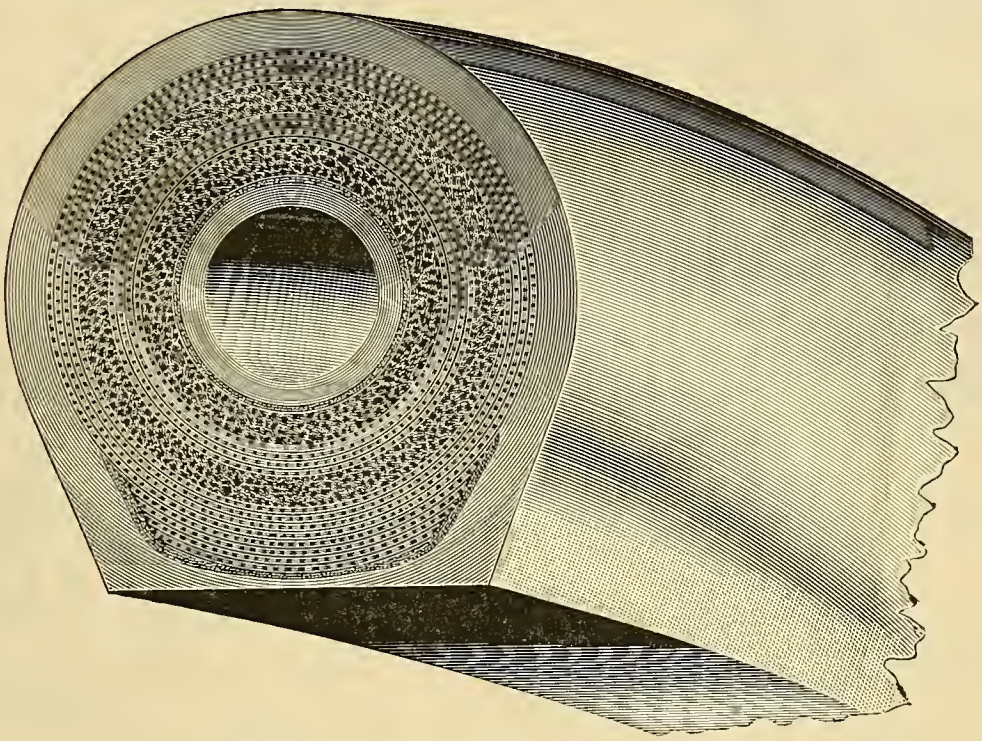

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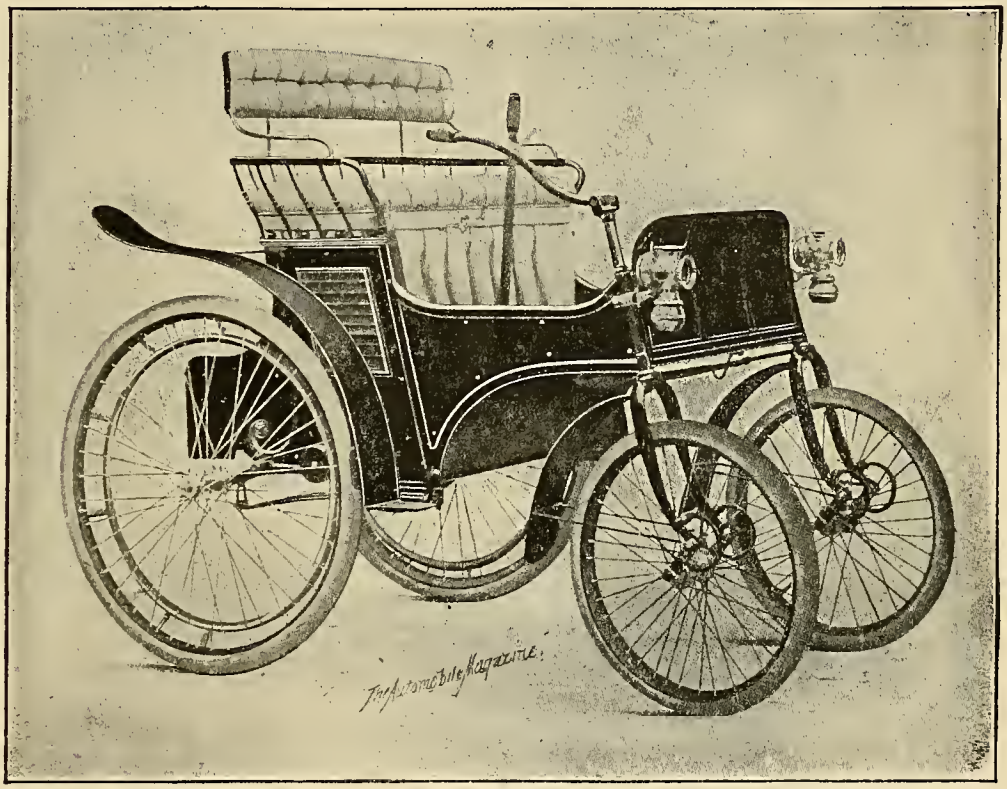

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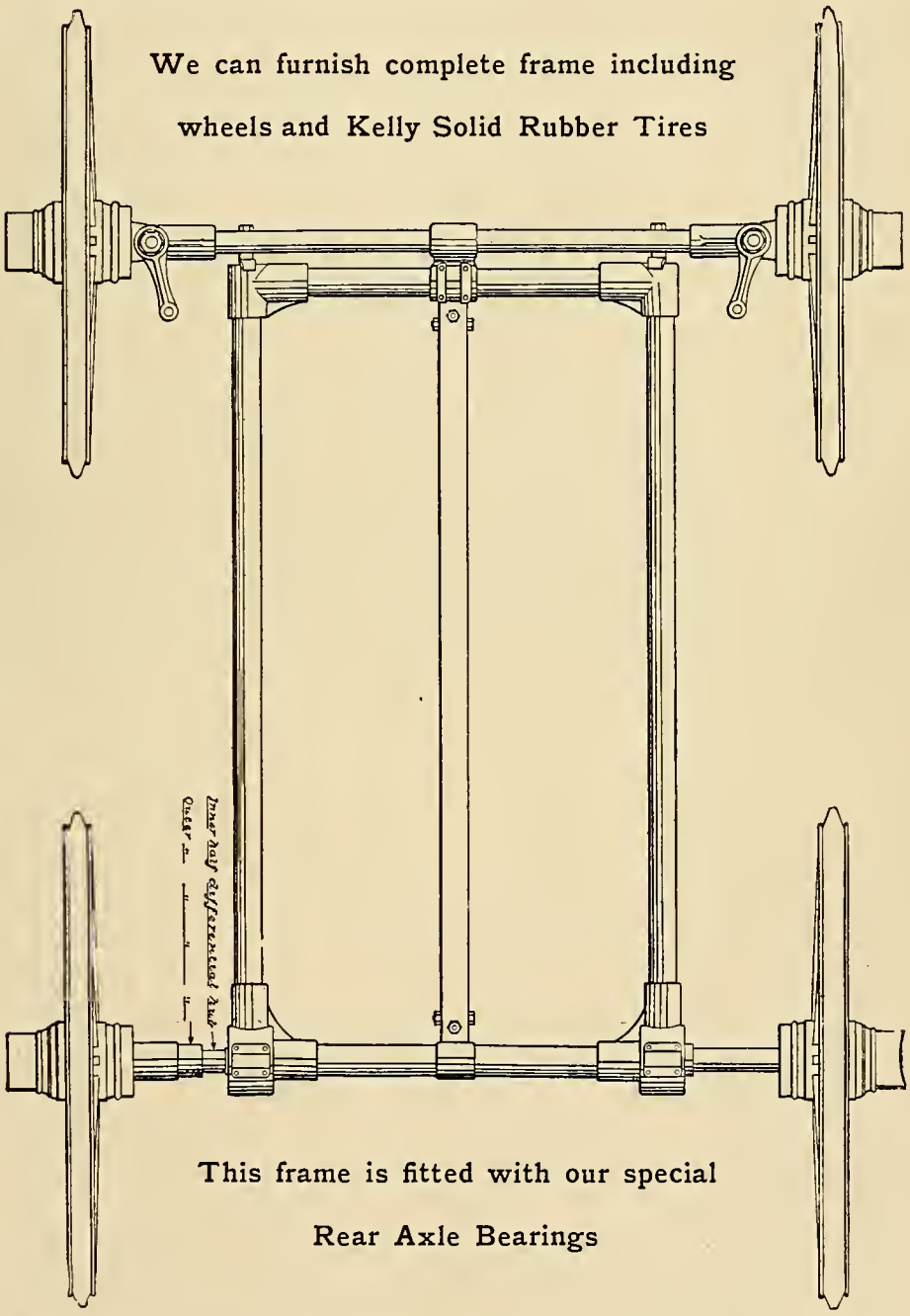
Especially adapted to Automobiles

We can furnish complete frame including wheels and Kelly Solid Rubber Tires



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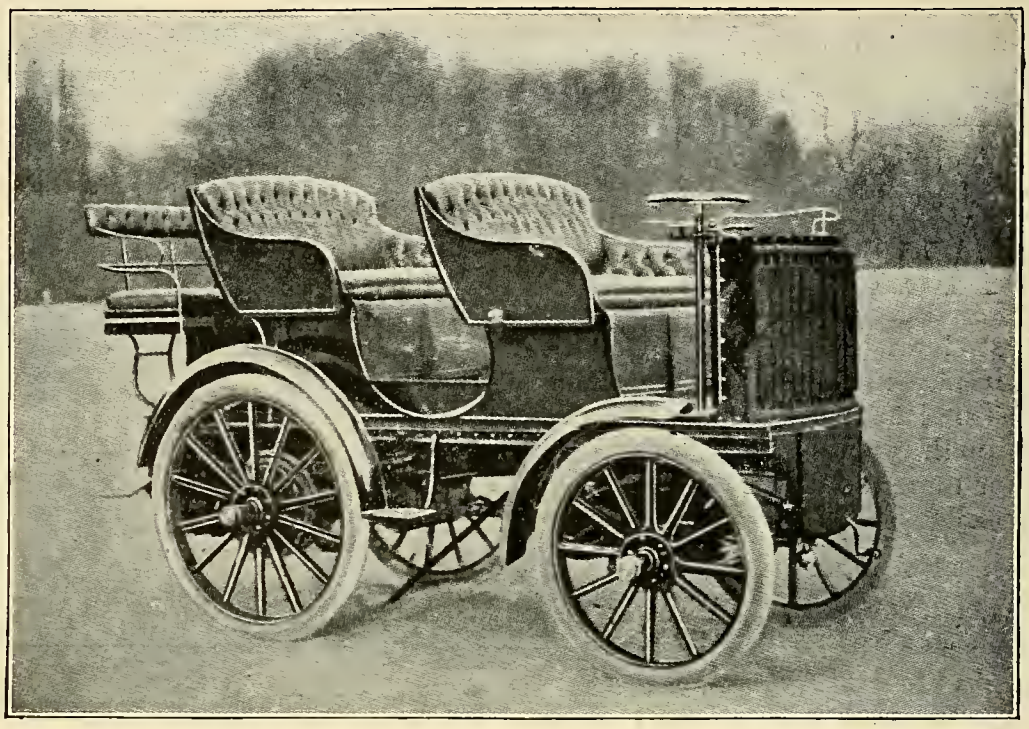
Makers of Petroleum-Motor Automobiles



LA SOCIÉTÉ DE DIETRICH & CIE., whose works for the building of railway rolling-stock, foundries, etc., are the oldest established in France and among the first in importance, have recently purchased the patent-rights of the AMÉDÉE BOLLÉE FILS carriage.

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A flat frame which permits the use of different carriage bodies; the motor can be used for any other purpose (in the work-shops for pumping and the like); automatic carburetter; simple mechanism; no water-circulating pump; no sprockets and chains; the system can be applied to all kinds of carriages without any change; horizontal motor self-lubricating by the movement of the piston-rods in a casing; motors of $6\frac{1}{2}$ and $9\frac{1}{2}$ horse-power can be substituted, the one for the other, without changing the power-transmitting mechanism; cooling of the cylinders is effected by water stored in a tank and cooled automatically by means of a float without the use of a pump; the vapor is condensed by radiation, thus reducing the use of water almost to naught; the carriage is perfectly balanced, the motor being located in front, and the gears and speed-changing mechanism in the rear; the power-transmitting belts are very long, run with great smoothness, and can be readjusted in tension at the end of several months, without taking them off the pulleys; steering gear operated by a hand-wheel with no fatigue; changing of speed and throwing the mechanism out of gear can be effected with the same hand; all types of wagon-bodies can be used on the frame; the Dietrich Works built 85 trucks for la Société des Transports Automobiles du Soudan.

Compagnie des Automobiles et Moteurs Henriod

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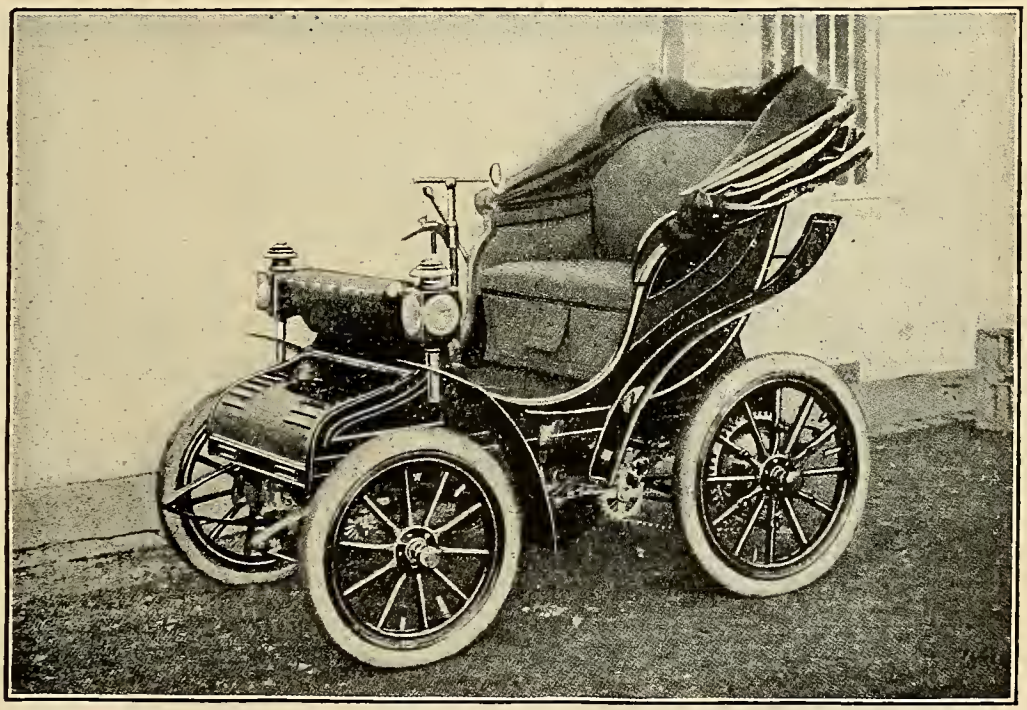
Carriages with 5 to 12 horse-power motors with flange-cooled cylinders.

Three-seat carriages with 4 horse-power motors with flange-cooled cylinders.



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These motors are vapor, petroleum, and alcohol engines.

Carburation is effected by means of a vaporizer.

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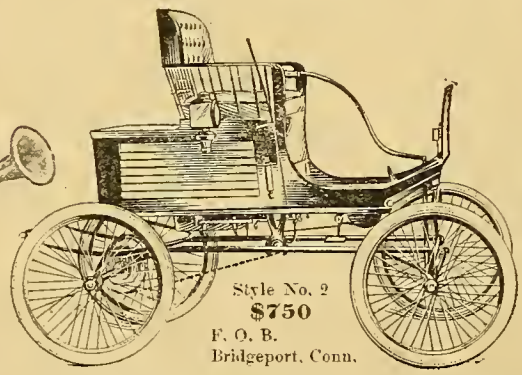

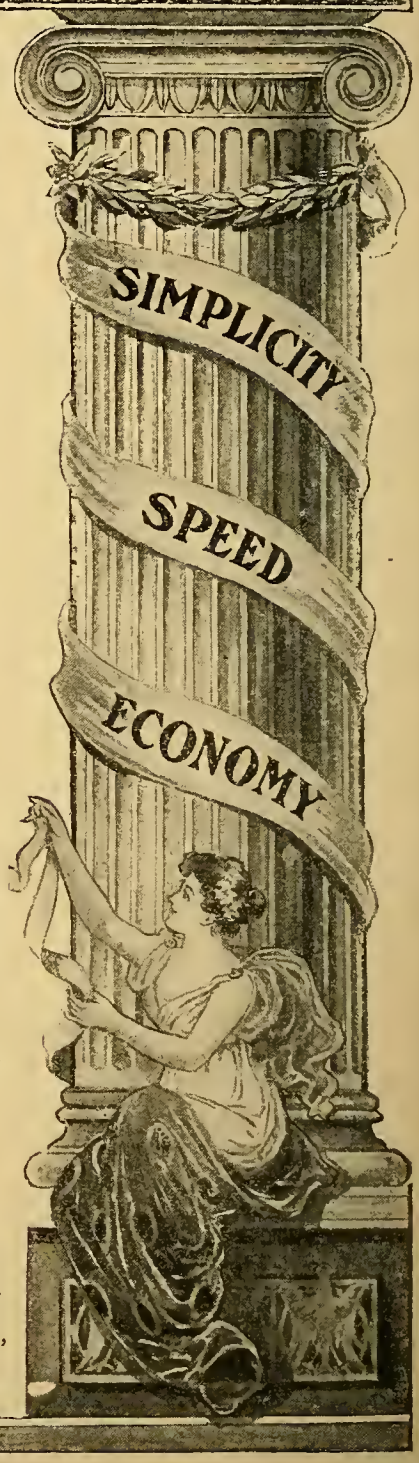

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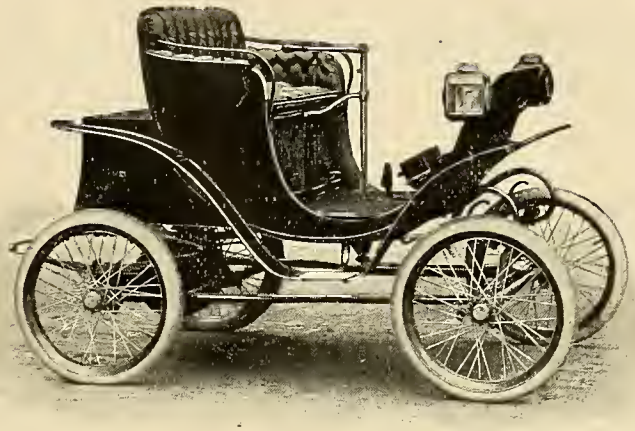

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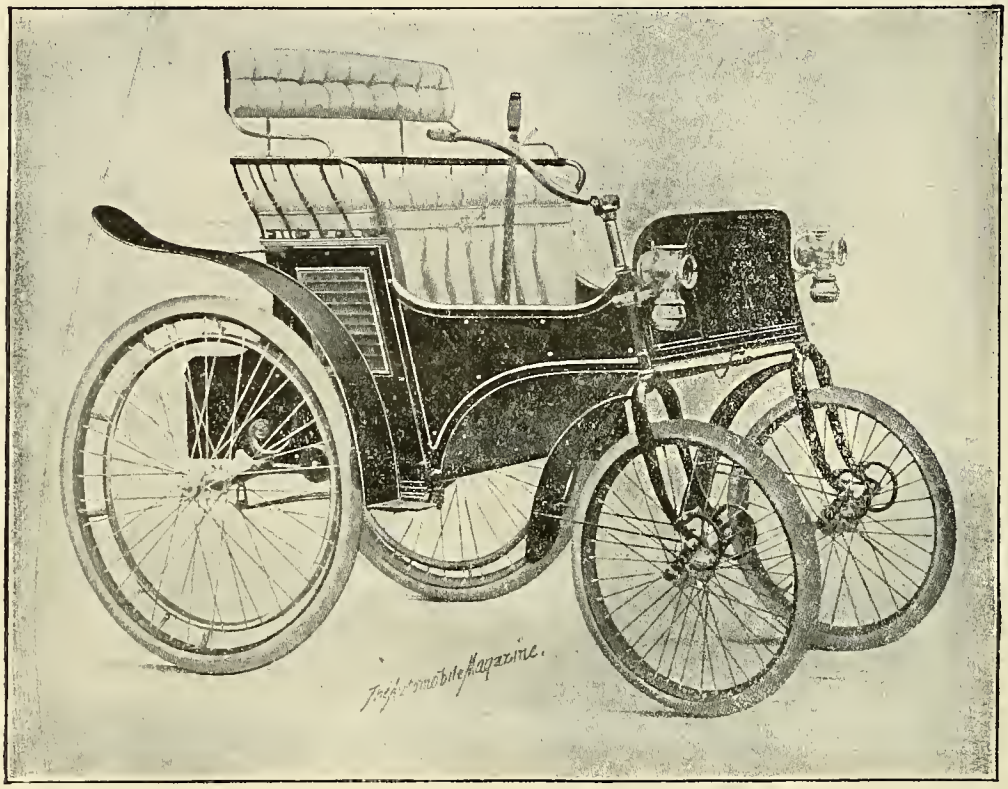

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The allotment of spaces will be made on August 1st.

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Electric charging station on the Fair Grounds.

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ON THE HALF MILE DRIVING TRACK, 66 FEET WIDE,

Under the Racing Rules of the Automobile Club of America.

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No Race of less than three competitors.

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All entries to be accompanied by entry fees, and to be addressed to M. R. Margerum. Secretary, Inter-State Fair Association, Trenton, N. J. Entries to close September 1st (noon).

The Fair Grounds at Trenton are reached from New York by the Pennsylvania R. R. in 1 hour and 10 minutes; from Philadelphia in 40 minutes.

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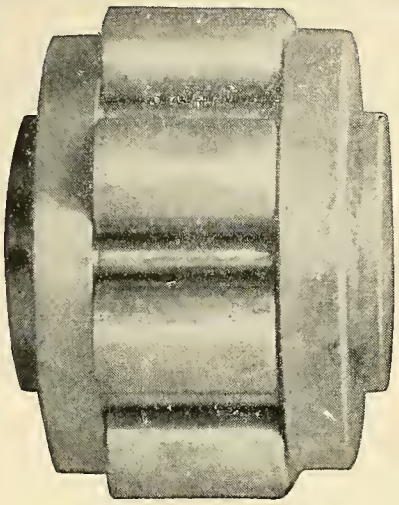

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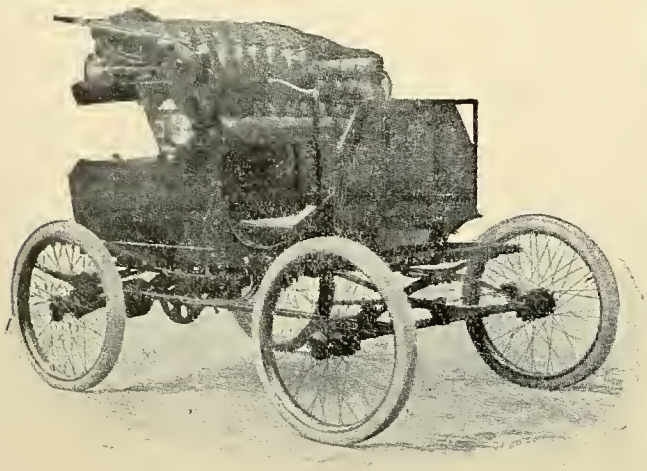

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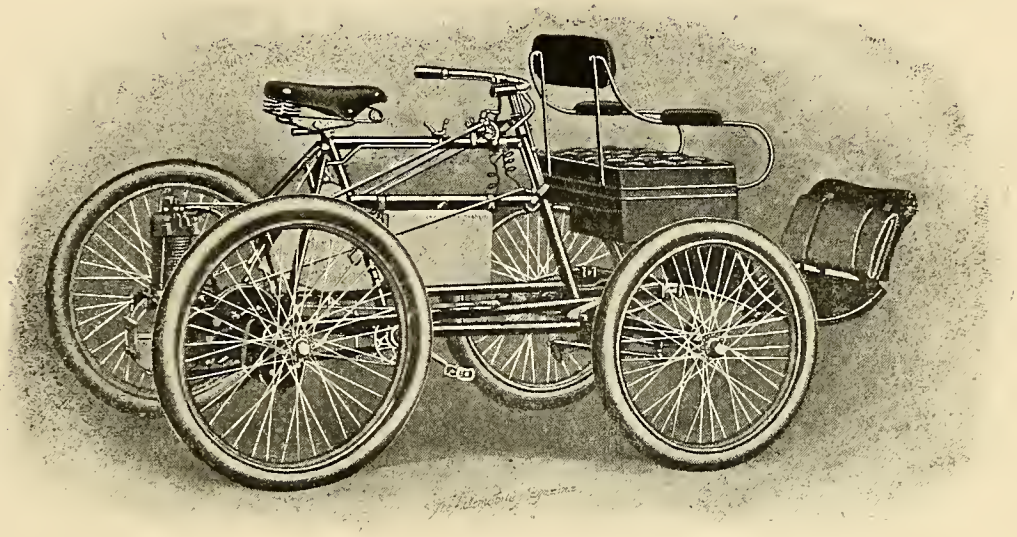

Fitted with a two-speed gear, of extremely simple construction, by which means almost any hill can be ascended when the machine is carrying two persons. This gear also allows of the motor being entirely thrown out of gear when not required, and the machine can then be easily pedalled or moved about, an advantage that cannot be too highly recommended, as the motor can be kept running when in heavy traffic, or in any circumstance requiring a sudden stop. The motor is a genuine "De Dion," with electric ignition, and capable of travelling at a high rate of speed. The frame is very strongly constructed and is made of metal throughout. Both front and rear seats are extremely comfortable, and the steering very easy, and the cost of spirit for driving can be taken at about ¼d. per mile. The front seat is comfortably upholstered and provided with a leather apron. The front wheels are 26 in. diameter and the rear 28 in.

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