THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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THE HORSELESS AGE

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Compulsory Lights for All Vehicles.

A movement is now on foot in various sections of the country, particularly in Massachusetts, to have more stringent legislation enacted with regard to the compulsory carrying of lights on all road vehicles at night. A number of collisions have recently occurred at night between automobiles and unlighted horse vehicles, and also a number of cases where automobilists were forced to steer into the ditch or assume other risks in order to avoid collision with an unlighted cart or truck suddenly looming up out of the dark. The same question is being agitated in England, owing chiefly to the recent rather serious accident to a member of the royal family while traveling in his car in the vicinity of Edinburgh.

It appears that there is a law on the statute books of most States requiring road vehicles to carry lights after dark; but the enforcement of these laws is very lax, and they are often disregarded. In order to remedy the present evil it would be well to have these laws revised, fixing, perhaps, more severe penalties for violations, and above all to urge a strict enforcement. A universal vehicle light law of this nature, strictly enforced, would be even more of a blessing to horse drivers than to automobilists, because the latter almost invariably carry powerful lights when driving at night and usually spy an unlighted horse vehicle soon enough to avoid it, so that collisions between horse vehicles and autos at night are comparatively rare. There must be many more such collisions between horse vehicles, but these, of course, do not receive the attention in the press that a collision of a horse vehicle and an automobile would, and one does not hear so much about them. This also disposes of the argument that if automobilists carry sufficiently strong lights and keep close watch of the road ahead they will always notice an approaching vehicle in time. In order to insure the greatest degree of safety to road traffic in general, all vehicles should be compelled to carry lights, as in marine practice. It is therefore to be hoped that the efforts now being made in Massachusetts to have a general vehicle lighting law passed may prove successful, and that automobilists in other States may follow suit and urge the passage of similar laws.

The Dangerous Electric Cabs.

The electric cabs operated in New York city have lately been forcibly brought to public notice through a series of accidents in which they have figured, accidents sometimes of a serious nature. Within the past few months at least two pedestrians have been knocked down and killed by them, and on one occasion two cabs came together in a head-on collision, which resulted in the serious injury of the occupant and operator of one.

At the time these cabs were new they may have represented advanced ideas in methods of transportation, in spite of their great weight and bulk, and their general clumsiness, but that was some years ago, when motor vehicle design was still in a relatively undeveloped state. Today conditions are changed, and the cabs have become a relic of an earlier period of automobile development, and appear freakish in comparison with the many examples of modern construction to be seen on the streets. The great objection to them, however, resides in the fact that they are dangerous.

These cabs have a seating capacity of only two passengers, in addition to the operator, and weigh, empty, 2½ tons; they have a 5 foot wheel base and a very high centre of gravity, and most of them are equipped with lever steering without the

back-lock feature. Considering that they are capable of attaining a speed of about 15 miles per hour on the level, and often run faster than this, owing to favorable grades, it will readily be seen, as is proven by their records, that they are vehicles too dangerous to be operated in crowded city streets. The average modern two passenger vehicle weighs about 1,000 pounds, and has a larger radius of action than these cabs; it has a longer wheel base, a lower centre of gravity and improved means of control, all of which make it a much safer vehicle. For a three passenger car there is no reason why the weight should exceed 1,500 or at most 2,000 pounds, and even if the present cab construction were to be retained the greater part of this weight should be brought much nearer the ground than it is in the present cabs, by suitable modifications in design, particularly lengthening of the wheel base. In view of the above noted facts and of the record of the cabs, it would seem to be time that some measures were taken to force these antiquated vehicles off the streets.

Speeding to Be Repressed in Connecticut.

In his inaugural address delivered in Hartford last week, Governor Roberts, of Connecticut, referred to the speed excesses of automobile tourists in that State, and recommended a revision of the present State automobile law, particularly with reference to an increased severity in the penalties for violations. He said that he had been informed that automobilists from other States (by which he undoubtedly referred to New Yorkers) regarded pursuit by officers of the law as part of the fun of a tour through the State, and that when caught and fined they would boast of the matter. He recommended jail penalties for the more exasperating cases instead of the present small fines, which are no deterrent for wealthy automobilists.

This, we believe, is the first time the speeding evil has been referred to at an important political function. That there is some justification for the Governor's remarks cannot be denied, as all the law defying New York-Boston record runs, for instance, have led through the State of Connecticut, and many fast touring cars are driven from New York up through that State to the Berkshires and Eastern Massachusetts every summer, frequently, no doubt, at unreasonable speeds. If the Governor's remarks should lead to the adoption of some measure calculated to check reckless driving, it would be hailed with satisfaction by the great body of automobilists. A revision of the present Connecticut State law would be generally welcomed, for, aside from having failed to prevent speeding, it has been an irksome restriction on law abiding automobilists. While the limit of 12 miles per hour in built up sections is quite liberal, the 15 mile limit for the open country is altogether too low, and if a new law be adopted the speed limit should be placed at 20 or 25 miles per hour. Automobile laws are bound to prove failures if they do not permit the reasonable and proper use of the machine.

Obstructed Drivers' Seats.

One serious objection to the present arrangement of the controlling devices on practically all touring cars is that the entrance to the driver's seat is entirely obstructed by the brake and change gear levers, and that both occupants of the front seat are therefore forced to enter and alight at the left hand side. Since under ordinary conditions, and in accordance with road rules, a vehicle is always drawn up with its right side to a curb, the occupants of the front seat must walk around the vehicle, perhaps through mud, every time they enter or leave. The disadvantage of this arrangement is obvious, and it seems certain that something more practical will be found in the future. In some cars this objection is overcome by mounting the change gear lever on the steering column, and placing the brake lever comparatively far back, at the side of the seat. Another possible solution of the problem would be to make the left hand seat the driver's seat, and arrange the levers in the middle of the car, though in this case the driver would still have to enter and leave at the off side. The left hand control, properly speaking, does not seem to "catch on," in spite of the determined efforts of some manufacturers to popularize it, but the arrangement referred to would really be a right hand control. The present arrangement of the controlling devices, when the steering column has the proper tilt and height, and the levers are at a suitable distance from the seat, seems to be an ideal one so far as convenience of operation is concerned, but it should be quite possible to find an equally convenient arrangement that is also free from the objection of obstructing the most convenient entrance to the front seat.

Catalogue of Vehicles Exhibited.

In the present issue we print again a catalogue of vehicles to be exhibited at the Madison Square Garden Show, a feature that was inaugurated by us last year. The vehicles are arranged in the order of price, which, we believe, is the most practical for the purpose of visiting purchasers and agents. The Show will this year be larger than ever before, and what has been said with regard to former Shows applies therefore even more strongly to this, namely, that the number of exhibited vehicles is so large that the average visitor becomes confused, and when finishing his visits has no more definite idea as to what vehicle is best suited to his needs than when he first arrived. It is therefore desirable for the visitor to know beforehand just what vehicles may suit his requirements, so that he may confine his attention to them, and not waste his time in searching over the whole Show.

With the majority of purchasers the leading factor determining whether a car comes within the range of their possible choice is the price, and we have therefore arranged the vehicles in that order; but some purchasers, especially experienced ones, have very determined notions regarding the practicability of certain mechanical features, and might not want to consider certain vehicles that do not suit their fancy with respect to mechanical design, even though right in price. We therefore give a brief specification of each vehicle, which will enable a visitor to select the vehicles that come nearest to meeting his requirements in many important particulars.

We believe a visit to the Show can be made most profitable in this manner; that is, by selecting beforehand a limited number of apparently suitable vehicles and thoroughly investigating these as to workmanship, design of details, mechanical finish, comfort, etc. The visitor will then carry away with him a pretty definite idea of the merits of the different cars, which will greatly aid him in his final selection.

While we have made every effort to make the catalogue complete, it may be that there will be shown a few vehicles not listed therein, or some of the vehicles listed may not appear, as exhibitors sometimes change their plans at the last moment. All exhibitors mentioned in the first published list were asked for information, and the replies received from all, except a few who had decided not to exhibit, have been incorporated in the catalogue.

Structural Considerations in Motor Cars.

By Thomas J. Fay, E. E.

The first cost of a motor car should be high enough to insure a low cost of maintenance. The best "coefficient of economy" is that which represents primarily the lowest possible cost of maintenance, not per gross ton-mile, as it is oftentimes considered, but per unit of useful results; and in the second place the lowest possible first cost. The least expensive to maintain of two "white elephants" would be a bad bargain at any price. Likewise we may say that a motor car, to be economical, must not only operate at a low cost of maintenance but operate well with a maximum burden. Another way of putting it is to say the first cost is a matter of no serious moment, provided the cost of the useful result is quite within bounds.

There are many details in a motor car, each one of which must be thought out with a degree of care wholly at variance with the demands of any other class of machinery. A car may be well built and prove to be very serviceable indeed, and still be a very bad choice, for the reason that the design may not be in accord with (a) the materials afforded by the market; (b) the methods in vogue in the up to date shop. Hence the first cost may be inflated. To illustrate: A coin, for instance, might be gold, of full weight and flawless; yet the methods of manufacture might be such as to make the cost of production more than the value of the coin.

Motor cars up to the present time have successfully eluded the grasp of the poor man, and it is believed that the poor man will never be rich, so that "Mahomet must go to the mountain." Sometimes it does seem as if motor cars would ever be costly, both first and last, but history repeats itself, and it has ever been a trait of history to see the unexpected.

On the Continent the "poor" man receives no consideration, hence no attempt is made to make the cost of the car conform to the man's pocket. In America the poor man has greater wants, and demands every innovation—at a price. It is for this reason that "cheap," half baked cars are not the product of successful makers; and, also, on this very account American manufacturers are bound to lead in the long run, because the majority of buyers (a) cannot pay a high price; (b) will not buy an inferior product; (c) do offer a wholesome opportunity to makers of cars who continually strive to lower the cost, but who positively will not lower the standard of quality.

It costs approximately $25,000 to design and construct one single runabout, provided the design is new and worked out in promoting and jobbing shops. On the other hand, cars of this class are furnished to buyers by responsible makers for not far from one-fiftieth of that cost, while in so far as quality is concerned the experiment car, notwithstanding its enormous cost, is likely to prove a flat failure.

To a limited extent the commercial field has been invaded, but the road ahead is long and rough. Critics are wont to complain about tires. As a matter of fact, tire troubles are brought about to a vast extent through the wholly bad practice of making cars much heavier than need be. A setting hen will bring out a brood of chickens and not fracture a single egg, while a small boy and a brick would shorten the chicken crop. Tires, too, will wear depending upon treatment; that is to say, tires are thoroughly commercial just as they are, but heavy, cumbersome cars are not. Improvements in cars have been marked, and many more improvements may be expected. The first big electric truck the writer had to work upon weighed something like 7,000 pounds, and felt very much abused under a burden of 1 ton. The first big steam truck the writer was connected with weighed nearly 6,000 pounds and refused to run at all.

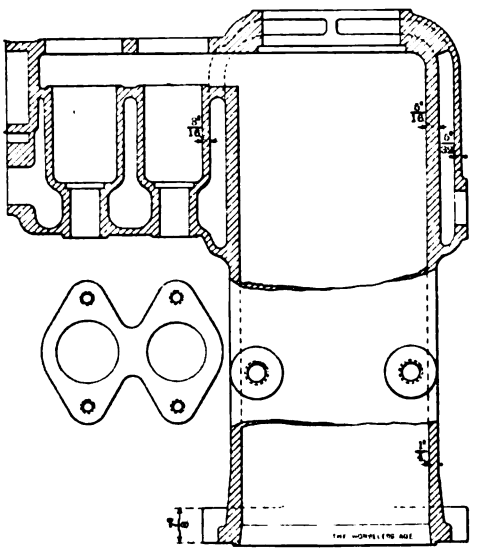


Fig. 1.

It cost a lot of money to learn that conventional machinery designs would not suit in motor car work; and it was hard to forget that a bridge building factor of safety was not a factor of safety at all in automobile construction. As illustrative of the changes wrought, consider the following: According to Seaton the thickness of cylinder walls should be:

$$\frac{P \times D}{5000} + 0.6 = \text{inches},$$

in which P is the maximum pressure on the piston in pounds per square inch, and D the diameter of the cylinder in inches. For a 6 inch cylinder this would give (for cast iron)

$$\text{Thickness} = \frac{340 \times 6}{5000} + 0.6 = 1.008 \text{ inches}.$$

Now let us compare with this the actual present practice in automobile gasoline motor construction, which is to give the cylinder walls a thickness

$$T = \frac{P\,D}{7200} \text{ inches},$$

so that for the case in point

$$T = \frac{340 \times 6}{7200} = .28 \text{ inch}.$$

Considering cast iron with an ultimate tensile strength of 18,000 pounds per square inch and 3,600 pounds per square inch non-shock working load, it would be impossible to build a commercial motor car and at the same time take Seaton's advice. On the other hand, there are a vast number of cars in which the motor cylinder walls are quite as thin as that given by the above formula. It is believed that, notwithstanding the apparent safety of the above formula, some allowance should be made for deformities in the casting, and with this in view the formula stands revised, as follows:

$$T = \frac{P\,D}{7200} + 0.125$$

$$= \text{thickness of walls in inches}.$$

Illustrative of the use of this formula reference may be had to Fig. 1 of a cylinder in which

$$T = \frac{379 \times 4.75}{7200} + 0.125 = 0.375 \text{ inch}$$

thickness of walls about the piston in its bottom position. The thickness of the wall below the piston head with the piston at the bottom of the stroke was left

$$T = \frac{379 \times 4.75}{7200} = 0.25 \text{ inches}.$$

This cylinder was tried out at some length in a runabout type of car during the year 1903, and, in so far as this phase of the problem was concerned, the results were very satisfactory. It is possible, of course, to consider a slight thinning of the cylinder walls, without assuming great risks, but for thoroughly good work it is believed the walls are thin enough.

The maximum pressure given, i. e., 379 pounds per square inch, is none too high when the shock effect is taken into account. Referring again to Fig. 1, it will be found that the port walls are three-sixteenths inch thick. This thickness is very much more than what a calculation would dictate, but here the "foundry question" is paramount and the port walls are made just as thin as possible consistent with the foundry chances. In the case of this particular cylinder the head is covered by "combustion chamber covers," and is so proportioned that, considering the strength of machine steel covers, a rupture of the head would not be imminent. If, however, the head of a cylinder is made integral the shape of the head must receive consideration, else deformation, due to pressure, may become a source of trouble, at least in cylinders of large proportions.

A very good shape, economical both in point of weight of metal required as well as space occupied, is that represented by a flattened ellipse. The thickness of the head

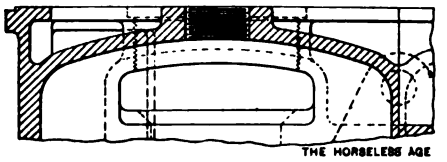


FIG. 2.

should be great enough at the point of intersection to resist shearing, but considering the shear at the intersecting point, the head wall will stand thinning down as the centre is approached, according to the following formula:

$$T_1 = .005\ D \sqrt{P},$$

in which T_1 is the thickness in inches of the wall at the intersecting point; D the bore of cylinder in inches; P the maximum pressure in pounds per square inch. This is a contraction, or Thurston's formula. The thickness of the head at the middle might be

$$T_2 = \frac{P\ D}{7200 \times .75},$$

in which P is the maximum pressure in pounds per square inch, and D the bore of the cylinder in inches. The change from the thick to the thin portion is to take place gradually. (See Fig. 2.)

Cast iron seems to be the best metal for cylinder construction, although steel castings as well as drawn steel tubes have been used. Cast iron for this purpose should be of an extra good quality, sometimes called "gun iron." The analysis is about as follows:

Silicon	1.125
Phosphorous	0.175
Sulphur	0.120
Manganese	——
Carbon fixed	0.67
Carbon graphitical	2.90

Everything depends, however, upon the grade of "pig," the quality and quantity of "scrap," the mold and the molder, the heat, the coke, time and location in the cupola. It is better by far to pay a responsible foundry man for good castings than to tell him how to "mix" for them and demand castings of the best quality at a price that will barely suffice for "window sash weights." There are various receipts for gun iron mixtures, each of which may be good, in view of the respective base metals.

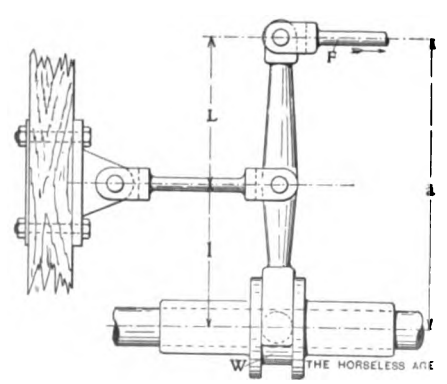


FIG. 3.

The finished product in any event should test about as follows:

	Pounds per Square Inch.
Tensile strength	27,500
Elastic limit	10,850

The grain should be close, with no "chill," while cutting should indicate softness. It would not be advisable to figure upon the above strength in designing, but the foundry ought to be able to approximate the value given. Finished cylinders should be subjected to a hydrostatic test of 500 pounds per square inch. Do not use air pressure for this test—it is dangerous. All that is required is a small pump with a long lever, such as boiler inspectors employ in their work; a tested steam or water gauge, and some ammonia, pipe and fittings. These fittings enable one to make tight joints quickly. In subjecting the finished cylinder to the test, the valves should be in place, else the high pressure will bear against the flat, thin walls in the exhaust passageway outside the normal pressure zone—a risk that serves no good purpose.

Cylinders that will not stand the 500 pound hydrostatic test are not suitable for the purpose, but cylinders that will stand over 50 per cent. more than 500 pounds per square inch are too heavy for the purpose and should be made lighter; for, in all truth, there are times when a pound off the weight on the tires may be as good as $100 in the bank. There is just this difference between motor car and general machine practice: that in general machine practice, if a part is overstrong, it is pronounced "good"; but in motor car practice, if a part is overstrong, it is really "bad." What is wanted in cylinder construction is a definite but moderate factor of safety, and it is possible to realize just such a factor of safety.

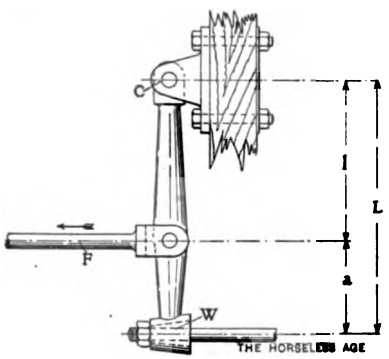


FIG. 4.

In motor cars there are many opportunities to reduce weight, and by exercising skill and judgment it is oftentimes possible to effect large inroads. Among other things the "levers," bell cranks, etc., are generally too strong, excepting in some cases in which they are not harmonious in design, hence too strong in some parts and below the needed strength in others. There are three classes of levers known to mechanics, each of which has its special use, all of which are employed in motor cars in divers ways. Fig. 3 illustrates the principle of levers of the first class.

In this lever the fulcrum lies between the point of applied force and the point of resistance or reaction. Hence:

$$F = \frac{W \times l}{L} = \text{applied force in pounds.}$$

$$W = \frac{F \times L}{l} = \text{resultant reaction in pounds.}$$

$$l = \frac{F \times a}{W + F}$$

= length in inches from fulcrum to resistance.

$$L = \frac{W \times a}{W + F}$$

= distance in inches from fulcrum to pull.

Fig. 4 illustrates the use of levers of the third class, in which the point of applied force is between the fulcrum and the point of resistance or reaction. Hence:

$$F = \frac{W \times l}{L} = \text{applied force in pounds.}$$

$$W = \frac{F \times L}{l} = \text{resultant reaction in pounds.}$$

$$l = \frac{F \times a}{W - F}$$

= length in inches from fulcrum to resistance.

$$L = \frac{W \times a}{W - F}$$

= length in inches from fulcrum to pull.

Fig. 5 illustrates the use of levers of the second class, in which the resisting point is between the fulcrum and the point of applied pull. Hence:

$$F = \frac{W \times l}{L} = \text{applied force in pounds.}$$

$$W = \frac{F \times L}{l} = \text{resultant reaction in pounds.}$$

$$l = \frac{F \times a}{W - F}$$

= length in inches from fulcrum to resistance.

$$L = \frac{W \times a}{W - F}$$

= length in inches from fulcrum to pull.

In the application of these formulæ it is not necessary to confine oneself to inch-pounds units. Any other system of units

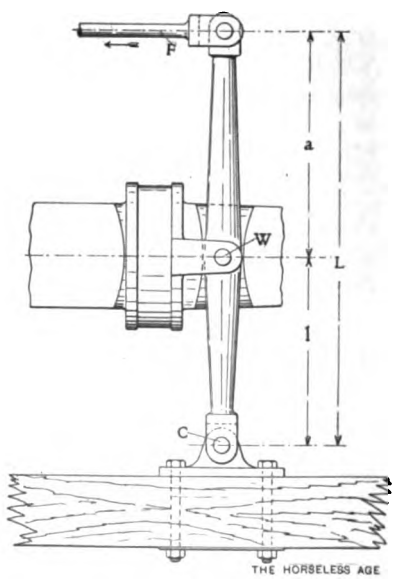


FIG. 5.

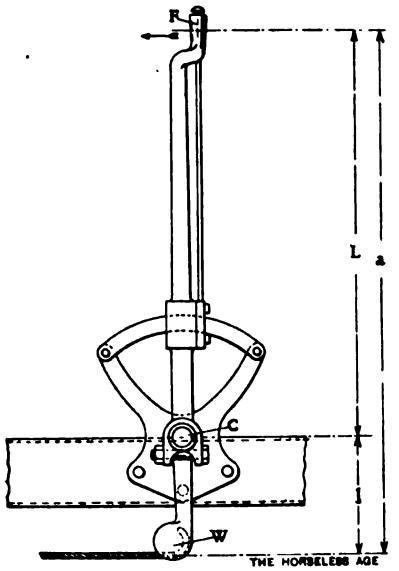


FIG. 6.

may be employed, such as foot, metre, centimetre, millimetre or other measures of length; also tons, ounces, grams, kilograms, etc., or any other measure of pull or resistance.

In lever designs, to be able to proportion the levers so that they will be strong enough but not too strong—for the weight must be kept down—it is necessary to know or to determine the magnitude of the factors, and judgment is sometimes called into play, because while a given pull may be adequate, yet even so a greater pull may be exerted in any such case. The strain upon the lever will be that due to the greater possible pull, rather than to the necessary pull.

Let us assume a case as follows: We will say the motorist can exert a maximum pull of 100 pounds at F, notwithstanding the fact that 20 pounds might be ample for his purpose. We must then provide for the 100 pounds effort. Let us also assume that l is 18 inches; P, 6 inches, and A 24 inches; then

$$W = \frac{F \times L}{l} = \frac{100 \times 18}{6} = 300 \text{ pounds.}$$

The pull will then be 300 pounds at W. Hence (*a*) the cable must be capable of safely withstanding a pull of 300 pounds, thus requiring the use of a three-sixteenths inch diameter pliable steel cable, preferably "plow steel" with nineteen strands. In ordering cable specify circumference in inches, quality and number of strands.

The shape of the lever arm will affect (*a*) its weight for a given strength, (*l*) its rigidity for a given weight. If steel castings are preferred it may be expedient to fix upon an I section; if forgings are used, the rectangular—rounded corners—section works out well. In any case the section must be settled upon, else the strength may not be estimated. Levers are pure and simple "cantilever" beams. Hence formulæ that apply to this class of beams will suffice for the purpose.

Empirical formulæ for use in designing levers will suffice for the purpose, and simplify the problem to a marked extent. A great many designers say the best way is to duplicate a lever that did not give trouble. Indeed! The Pyramids of Egypt did not fall down. They were duplicated. But the Pyramids answered no useful purpose. In any case a "printer's devil" or a "plumber's cub" could figure out a final resting place for an Egyptian monarch in one minute, that would offer equal security and cost but an infinitesimal fraction of the cost of a Pyramid.

NOTE.—The safe working load of wire rope—such as is used on motor car brakes—is given by Klein thus:

$$d = 0.0087 \sqrt{\frac{P}{n}}$$

= diameter of each strand in inches,

In which P is the safe working load in pounds and n the number of wires in cable, or strands. Plow steel cable will do somewhat better than pliable hoisting cable.

The width of levers should be about one-twentieth of the length from the fulcrum to the point of pull, but in cases in which the width, for any reason, is reduced below this ratio, a corrective factor should be applied as follows:

Width of Lever.	Allowable Proportion of Calculated Load.
1/20 × length	Full allowance.
1/30 × length	90 % "
1/40 × length	80 % "
1/50 × length	70 % "
1/60 × length	60 % "
1/70 × length	50 % "

The levers proportioned after these formulæ will be subjected to a very much greater strain than that usual with cantilever beams, because in the working of levers in motor cars the load is not quiescent. When levers are "eccentric" an extra allowance must be made, to compensate for torsion, otherwise permanent deformation may result.

The formulæ contemplate the use of well worked 40 to 50 carbon steel. Mild steel does not offer the desired resistance to deformation, and in the event of the use of mild steel an extra allowance of metal must be made.

The most likely chance of trouble with non-eccentric levers is at the fulcrum, as the fastenings are rarely secure. The best way to avoid trouble is to fasten to a flange, as illustrated in Fig. 7. The next

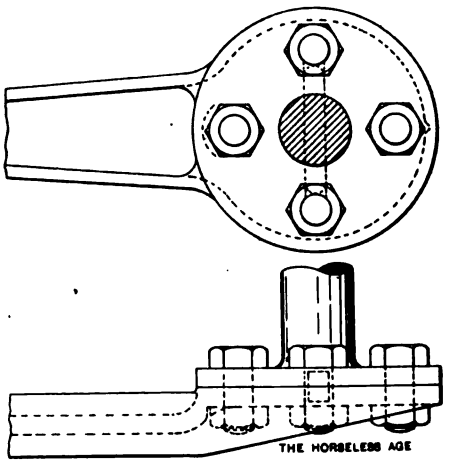


FIG. 7.

best fastening detail is shown in Fig. 8. A large diameter of the shaft to which a lever may be keyed introduces troubles of a serious nature, unless something is done, for a large diameter of shaft means great weight. Hollow shafting is the best recourse, and in this connection it is possible that a résumé of hollow shaft advantages will serve a useful end. The comparative strength of a hollow to a solid shaft is shown by the following formulæ:

For equal torsional strength

$$d = \sqrt[3]{\frac{d_1^4 - d_2^4}{d_1}}$$

in which d is the diameter of a solid shaft capable of performing the required service; d_1 the external diameter of the equivalent hollow shaft, and d_2 the internal diameter of the equivalent hollow shaft. Hollow shafting is extremely valuable in motor car work, because of its great strength per pound.

Assume a hollow shaft, say 2 inches outside diameter and 1¾ inches inside diameter. Then

$$d = \sqrt[3]{\frac{2^4 - 1.75^4}{2}} = 1\tfrac{5}{8}\text{" nearly,}$$

the diameter of the equivalent solid shaft. Somewhat smaller, to be sure, but the story is only half told, for a 1⅝ inch diameter solid shaft weighs 5.05 pounds, while a 2x1¾ inch hollow shaft weighs 2.5 pounds, leaving a difference per foot of 2.55 pounds, thus effecting a saving of almost exactly 50 per cent. in the weight. This, however, is but one advantage, for what we started out to get was a large

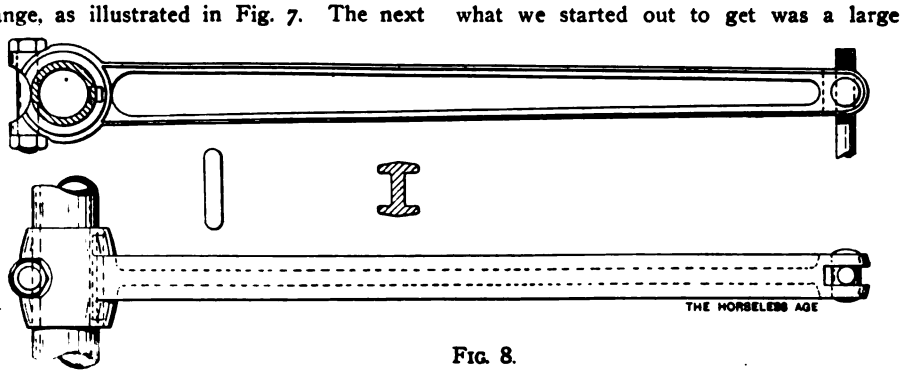


FIG. 8.

diameter of shaft with a view to effecting a secure anchorage for levers.

It is plain enough that shafting will best serve the purpose in motor car construction if it is of large diameter and hollow. But hollow shafting comes as cold drawn tubing—not exactly to size—and hence an allowance must be made for finishing. It is low in carbon, hence it must be of proportions suitable for mild steel.

In one case the writer noted the use of a hollow shaft 50 inches long, 2 inches in diameter with a 1.5 inch hole. This shaft transmitted a load of 400 pounds, quiescent load, measured at 1 foot radius. The shaft was made of 20 carbon steel—not hardened. Assuming a safe torsional strain equal to 1,000 pounds per square inch, the ability of this shaft was

$$Pa = 0.1963 \frac{d^4 - d_1^4}{d} \times S.$$

$$Pa = 0.1963 \frac{2^4 - 1.5^4}{2} \times 1000 = 496$$

= pounds pull at 1 foot radius, in which P is the force or resistance acting to twist the shaft; a the radius in feet of the point of application of the force or resistance; Pa the torsional moment; d^4 the fourth power of the outside diameter in inches; d_1^4 the fourth power of the diameter of the hole in inches; d the outside diameter of the shaft in inches, and S the safe torsional shearing resistance in pounds per square inch. The value of a is taken at 1 foot radius as a convenience in making comparison. The shaft in question was subjected to some bending, and transmitted the power of a 90 horse power motor, including the effect of a flywheel, the rim of which weighed 98½ pounds, at a mean radius of 11 inches. The shaft proved fully capable, and while the torsional shear must have been more than 1,000 pounds per square inch, it is believed, nevertheless, that the walls of the tube could still have been reduced a little.

In a Mercedes 90 to 105 horse power car the solid differential shaft is about 1¼ inches in diameter. There are conditions under which all the power of the motor must be transmitted by this shaft. The shaft is of Krupp nickel-chrome-carbon steel, hence very capable. Nevertheless, the torsional shear is very considerable, because

$$Pa = 0.1963 \times \frac{1.25^4}{1.25} \times 1000$$

= 380 pounds torsional moment at 1 foot radius. Assuming the motor to be capable of exerting 100 horse power at 1,000 revolutions per minute, the pull—torque—at 1 foot radius of the motor is

$$P = \frac{H.P. \times 33{,}000}{2 \pi R} = \frac{100 \times 33{,}000}{6.28 \times 1000}.$$

= 522.3 pounds.

Hence 380 : 522 : : 1,000 × = 1,478.9, the torsional shear assuming a pull of 522.3 pounds at 1 foot radius. Considering shock and allowing that the magnitude of the shock equals the quiescent load the torsional shear becomes 2,957.8 pounds per square inch. This same shaft supports the differential brake, hence it takes the braking strain. Assuming the load on the rear wheels to be 60 per cent. of the total load, and assuming the car to be within the racing limit, i. e., 1,000 kilograms—2,204 pounds—then a pull of

$$\frac{2204 \times 0.60}{2} = 661.2 \text{ pounds}$$

comes at a radius of 1.5 feet, and allowing that the tractive coefficient is as good as 0.5, we have

$$661.2 \times 0.5 \times 1.5 = 495.9 \text{ pounds}$$

equivalent pull at 1 foot radius, thus showing that the effort put upon the differential shaft through the brake is less than the effort on the part of the motor. This result, however, is obtained under the assumption that the braking effort on the two rear wheels is equal. It is also another way for saying that the motor is somewhat larger than the car requires, but it is highly improbable that the torque of the motor in question is as high as the figures would indicate. In other words, 100 horse power, if realized, must be obtained at a higher speed.

It will be noted that in the illustrations no account is taken of bending moments. In this connection it may be emphasized that bending moments should be eliminated in motor car transmissions, excepting the unavoidable moments set up in the crank shaft and that due to gear pressure. In other words, the deformation of the chassis frame should not be transmitted to the shafts.

The Mercedes car above referred to furnishes an illustration of light construction. If we refer to Kent, page 869, we find that for 100 horse power, 1,000 revolutions per minute, prime movers a 2¾ inch diameter solid shaft would be used. We have here, therefore, a further illustration of the fact that ordinary materials and conventional methods of machinery designing will not produce satisfactory motor cars. It would not be feasible to employ a 2¾ inch diameter of the differential shaft in a motor car, even if the question of weight was left out; but the question of weight cannot be overlooked with impunity, nor can we say that the Mercedes results are bad. Hence we must say that motor car designers must solve their problems independently of what has been accomplished in other lines of machine construction.

American designers who accept the dimensions of parts in foreign cars as well chosen must consider the quality of the material used, else the results will be different—possibly disappointing. The best makes of foreign cars are built of special grades of material, which accounts in a large measure for their success; and in this connection it is but fair to say that the most competent American designers are also paying great attention to the question of the quality of material. Some of the well known foreign cars of even a year ago used pressed steel frames made from mild steel. Many of these frames "wilted" in ordinary service and were found to be quite unserviceable for the work required of them. Side frames, to be light and strong, but above all rigid, must be of steel very much better than that produced by cold pressing low grade mild steel. Soft, pliable steel plates may be easy upon the dies used in the process, but deformability in side frames can scarcely be recommended as a desirable quality.

American steel mongers seem to agree that "all grades of steel may be shipped from one pile or lot," and seem to overlook the fact that the purchaser may have views. The writer finds that no matter what kind or grade of metal the order calls for it is rarely ever filled properly; for upon analyzing the metal it is generally found to be "something else."

In Germany the steel makers turn out various brands of metal especially adapted for use in motor cars, thus making it possible for motor car designers to definitely limit the weight of cars, yet allowing a definite factor of safety. True, Germany is not far away, and in case of necessity American car builders can import their raw material. In the meantime it is believed it is a waste of time to figure upon using a special grade of metal unless the metal is tested before using. In motor car construction it is believed constructors should have at their disposal the following metals:

Castings	Gun Iron Steel Aluminum Copper Aluminum Nickel. Phosphor Bronze. Bearing Bronze. Malleable Iron.
Drop Forgings	Mild Steel. Medium Steel. Nickel Steel.
Rollings	Mild Steel. Medium Steel. High Steel. Nickel Steel. Chrome Nickel Steel Tool Steel.

The nickel steel products should be available as follows:

Carbon Per Cent.		Nickel Per Cent.	
From.	To.	From.	To.
0.10	0.20	0.75	1.50
0.10	0.20	1.5	3.00
0.10	0.20	3.00	4.50
0.20	0.30	0.75	1.5
0.20	0.30	1 5	3.0
0.20	0.30	3.0	4.5
0.30	0.40	0.75	1.5
0.30	0.40	1.5	3.0
0.30	0.40	3.0	4.5
0.40	0.50	0.75	1.5
0.40	0.50	1.5	3.0
0.40	0.50	3 0	4.5

The carbon steel products are generally graded as follows:

Carbon Per Cent. From.	To.
.0	0.10
0.10	0.20
0.20	0.30
0.30	0.40
0.40	0.50

The chrome nickel steel products are not so readily classified, yet even so, certain mixtures are known to be very desirable, particularly for crank shafts, transmission gears and other parts operating under conditions of great responsibility with a limited factor of safety. Among other mixtures the following is very useful, especially for gears, and with very slight modifications it will serve extremely well for crank shafts:

Analysis of Chrome Nickel Steel.	Per Cent.
Carbon	.50
Silicon	.11
Manganese	.16
Sulphur	.03
Phosphorus	.04
Chromium	3.26
Nickel	1.26

This metal has a tensile strength of 237,127 pounds per square inch, is soft enough to work with air cooled tool steel, hardens readily, is not brittle and preserves in service. It is superior to nickel steel in almost every way; while in comparison with carbon steel it is beyond the range of vision, so to speak. Various mixtures of this metal serve the various purposes in motor car construction. Nickel steel under 5 per cent. nickel is also extremely valuable, possessing two great points of merit, viz., high elastic limit and the entire absence of "sudden rupture" under an excessive strain. Chrome nickel steel within certain limits possesses these same features of reliability, but it is not necessary to use this high priced, more difficult to work metal in any but the most troublesome members, such as crank shafts, propeller shafts, jack shafts, cam shafts, transmission change gears, connecting rods, differential shafts and a few minor parts, but, as before pointed out, the components in the metal should vary to suit the conditions. Designers who do agree as to the value in general of these mixtures do not agree as to the best percentages to employ.

Alcohol Carburetors and Motors in France.

In spite of official encouragement, it may be said that alcohol motors and carburetors remain today incompletely developed. Many manufacturers have their particular form of carburetor, but I am informed that one device is in greatest demand; yet even of this type, out of 60,000 carburetors sold only 500 were intended for the consumption of pure alcohol, all the others being destined for the use of gasoline or of carbureted alcohol. The sale of alcohol motors has been equally unimportant. Probably 100 petroleum or gas motors are sold to one alcohol motor, for three reasons: (1) The high cost of the alcohol; (2) the greater consumption per horse power hour than of either petroleum or gas; (3) the difficulties arising from oxidation.

The principle upon which the alcohol carburetor referred to operates is the same as of the carburetor for gasoline. These carburetors are manufactured for motors of from 4 horse power upward; they differ from the form intended for use with gasoline, etc., in that the reheating system is more intense. They operate as regularly as the other carburetors. In their application to motors their advantages and disadvantages are thus described to me: Additional suppleness in movement, but increased consumption as compared with gasoline; initial heating of carburetor necessary; possible oxidation of plugs, pistons, and piston rings, unless care be taken to run the motor with gasoline during the last moments of use.

A method of using alcohol has lately been tried, consisting of forcing the alcohol at a desired temperature through a vaporizer in a quantity strictly measured to meet the machine's need at the moment. At the last public competitions for a 6 horse power motor the consumption was 410 grams per horse power hour, as against 578 grams with the carburetor above referred to.

M. Paul Barbier, president of the Technical Society of the Alcohol Industry, informs me that the use of alcohol at the same price as petroleum, and even at a slightly greater price, is more economical, since carburation of the alcohol when well done permits more complete utilization of calorific power than in the case of the petroleum products. M. Barbier adds that all motors operating on the explosion principle may be fed with alcohol if the construction of the cylinder, or rather of the explosion chamber, is modified. He says that injection carburetors and those operating upon the principle of vaporization and circulation give good results.

The Minister of Agriculture prepared a report upon the competitions organized by his department in 1901-2, which contains considerable information on this subject. Nearly all manufacturers have fully realized that, owing to the different properties of gasoline and alcohol, the use of the latter liquid, if rendered not only possible but practicable, would offer certain real advantages in numerous cases, as, for example, in the merchant and military marine, where the use of gasoline is out of the question because of its danger. They have not worked out any system as yet, however, which seems to respond adequately to the various requirements. —Robert P. Skinner, Consul General, Marseilles, France.

Book Review.

"The Anatomy of the Automobile." By "Dr." A. L. Dyke.

A copy of the above book has been sent us by the author and publisher, presumably for review. A first glance through its pages shows that it is nothing but a reprint of manufacturers' catalogues and instruction books, and after a more complete study of the contents we are forced to the conclusion that the title is entirely misleading, and that the book is an imposition on the public.

Reading the preface of the book we were struck by the modesty of the author, in sharp contrast to the publisher's announcement, which describes it as "exceptionally valuable to intending purchasers," etc. Continuing, we come across several passages that seem familiar, and the use of such a distinctly British term as "petroleum spirit motors" aroused our suspicions. Looking over the prefaces of the various works on automobiles in our library, we find that the preface of this book has been reprinted completely from W. Worby Beaumont's "Motor Vehicles and Motors," published in 1900. We know that books are now frequently made largely by means of scissors and paste pot, but that an author clips even his preface has before in our experience never occurred.

The title of the book, "The Anatomy of the Automobile—Practical Treatise on Automobiles, Motor Boats, Airships, Sky Cycles, Aerodomes," etc., conveys the impression that the work contains original, practical matter, systematically arranged, instead of being a reprint of obsolete trade literature.

The manufacturers' catalogues and pamphlets seem in most cases to have been reproduced complete, as may be judged from the following quotations:

Page 119, third paragraph: "No discount will be allowed, except to regular dealers, who carry one or more of our buckboards in stock for sale. Our terms of payment are strictly cash," etc.

Page 301: "The Thomas Gasoline Car—The Ideal Car—The new Thomas 'Flyer' is the nearest approach to this ideal. The closest competitor in its class draws 50 per cent. more weight per horse power. Note: The Thomas is constructed on lines * * *"

A chapter on "The Darracq and Its Management" is a reprint of a whole book with the same title published by Archibald Ford, of Liverpool, England.

An article on page 359, entitled "The Winton Touring Car," being evidently a reprint of the Winton Company's instruction book, is credited to THE HORSELESS AGE. The matter never appeared in our columns.

It is estimated that 60,000,000 pounds of india rubber, valued at nearly $40,000,000, was imported during 1904.

LESSONS of THE ROAD

The First Few Rides With a Kerosene Burner.

By C. S. L.

It is safe to say that not a few operators of steam carriages who use gasoline burners have had experience with fire, showing how dangerous gasoline is, especially to beginners. Because of this danger and the going out of the pilot light after running 10 or 15 miles I decided to change over to a kerosene burner. Naturally one feels a little nervous at first for fear something will go wrong. The pilot light should be lighted with a gasoline torch, and when the pilot light tube is of a cherry red the main fire should be turned on for two or three seconds, then the valve should be closed. Repeat three or four times; then open the needle valve full, but previous to this pump up the auxiliary tank until the gauge reads 50 pounds, then pump the oil until the gauge reads 120 pounds. Do not allow the pressure to get below 100 pounds, for it is necessary to keep the air cushion. When the steam gets to 270 pounds the burner regulator shuts off the main fire. Once started the fuel pump on the engine takes care of the pressure.

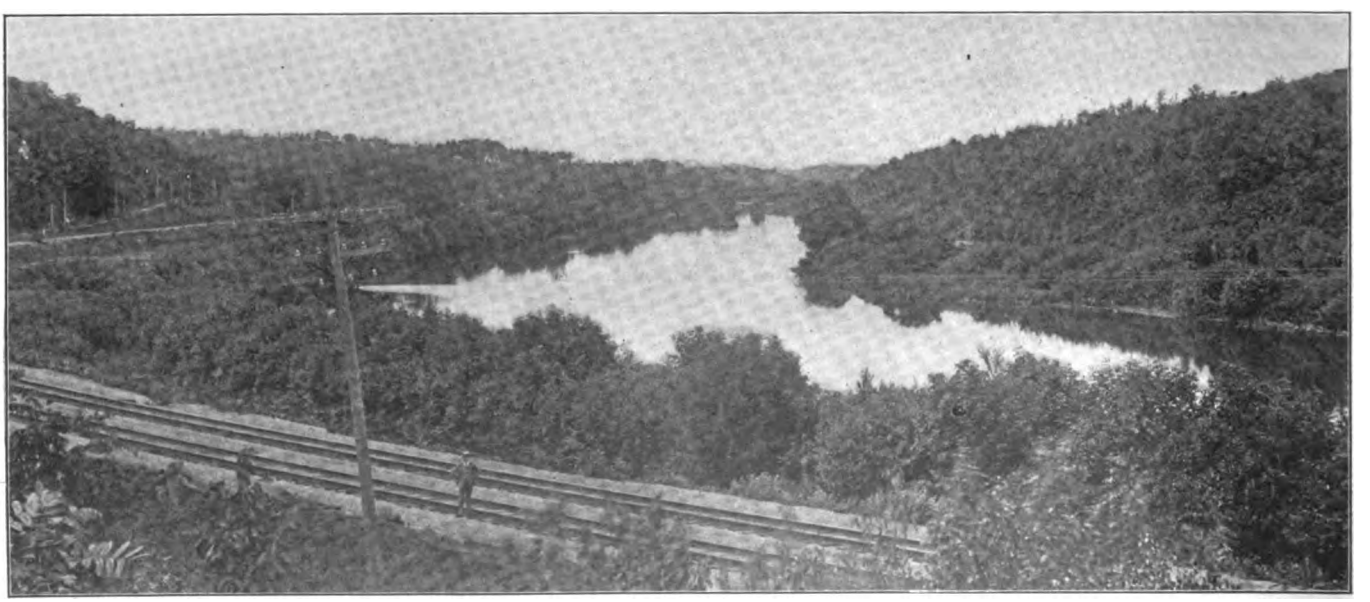
The old system on my carriage was the air system. The first few times I was out I had to stop frequently to pump up the auxiliary tank by hand, as the gauge would read as low as 60 pounds in a short time. I took out a needle valve on the main pipe line between the supply tank and the pump. The pipe entered the centre of the supply tank and then ran down to the bottom inside. I found that when the tank was full the pressure would stay up, but when the oil got below the centre it did not siphon well and I had to stop every three or four miles to pump up by hand. I remedied the trouble by connecting the pipe to the bottom of the tank. The two gauzes in the line to the nozzle should be cleaned before each trip, a matter of a few minutes only. The cleaning steam of the pilot light should occasionally be turned lightly so as to keep the hole in the end of the tube open. I find it works best to leave it open about half a turn so that the flame can be regulated.

As I started to return home from one trip the pilot light was out. I stopped at a house about ten minutes, and soon after I started quite an explosion occurred in the burner, when the burner regulator opened and let the raw oil in. Flames shot out of the stack, so I stopped, shut off the oil, and ran about half a mile to get beyond the houses before I attempted to straighten matters.

I took out the pilot tube and found it filled with dirt. As the hole in the end of the tube is about one hundredth (.01) of an inch in diameter it takes very little to stop it up. If the main fire has been shut off a while and the needle valve is closed it is best to turn on the oil as when starting, also to see if the main coil on either side of the pilot tube is of a cherry red color. I pumped the pilot light tank to 40 pounds. I can go a third farther on a gallon of kerosene, and I do not have the fear of fire that I did with the tubular gasoline burner. The great danger lies in a burner that can be flooded.

When I had the by-pass regulator set to 135 pounds the burner had a loud whistle which was annoying. The maker recommended to put a dozen screws inside. I put some in one side, but I doubt if it

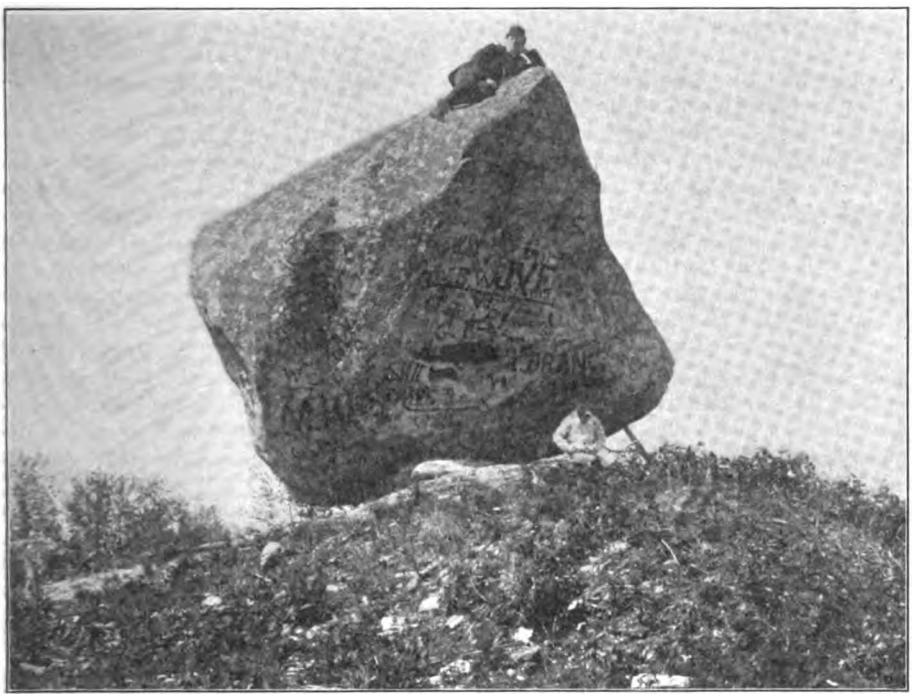
Surf Ice at Lynn, Mass.



The Blackstone River Below Woonsocket, R. I.

did any good. I loosened the nut on the by-pass regulator, reducing the pressure to 120 pounds, which stopped it. I have put on a strainer constructed similar to a union, next to the water pump, which has proved a good thing, as it can be cleaned on the road and keeps dirt from the checks and pump. Its cost is $1. It is not on the market, but I got mine from the man that invented it. If the water fails to reach the boiler in sufficient quantity the trouble probably is the corroding of the by-pass valve. The rod should be taken out occasionally and turned to the right taper. When it becomes necessary to put in a new one I will try brass or bronze.

When I put in the kerosene system, the plan for connecting I obtained from a Boston manufacturer. So far I would not go back to a gasoline burner.



COBBLE ROCK, NORTH SMITHFIELD, R. I.

The accompanying views were taken on one of my trips through Rhode Island. Cobble Rock is quite a natural curiosity, supposed to have been left there during the glacier period. The contact points of the boulder with the rock on which it rests are within a 5 foot circle. It is disfigured by initials, as all curiosities are. Attempts have been made to roll it down into a hollow. The rock is about 5 minutes' walk from the highway between Woonsocket and Slatersville. The view looking up the Blackstone Valley is a pleasing one, showing the bend of the river on the railroad curve. On the distant hill two tanks of the Woonsocket Water Works are seen, elevated about 180 to 200 feet above the city.

Since 1900 the number of horses in U. S. is said to have increased 20 per cent.

Experience of a Season With a Car for Hire.

BY H. T. C.

Since its introduction as a means of conveyance the automobile has been primarily a pleasure vehicle, and, although it is recognized by many that the manufacturer's ultimate success lies in his ability to produce a practical and satisfactory commercial car, as yet little thought is given by the general public to the automobile as an investment for pecuniary returns. In a few cases there are found regularly established automobile transportation lines, and in still less frequent cases, outside of large cities, are found dealers who conduct an automobile livery as an adjunct to their regular line of business.

About a year ago the writer, not feeling entitled to own an automobile for pleasure purposes, took under consideration the possible returns to be derived from operating a car for hire during the summer, it being possible to so arrange other business interests that they should not conflict. There was no automobile livery in operation within 30 miles and the location on the Connecticut coast, being a popular summer resort, together with the knowledge of an existing quality of roads far above the average, with no prohibitive hills, made the project seem feasible. Accordingly I purchased in April an 8 horse power car of the detachable tonneau type, driven by a double opposed motor mounted within the body.

To the experienced motorist the idea of attacking a project of the magnitude of an automobile livery with an 8 horse power runabout would be likened unto pulling a tooth with a silk thread, in that, regardless of the beauty of the equipment, under the stress of actual service the apparatus would break down. In spite of the excellence of this theory the results of the season's work are contradictory. During the time between April 1 and November 20 the car covered over 6,300 miles; carrying, for a large part of the distance, four, and often five, passengers, occasionally six and in one instance seven. During the entire season it was necessary on only one occasion to summon outside aid to help the car home. In this case a broken chain incapacitated it, and the accident occurred when the party aboard was out by invitation. With the exception of three broken commutator springs and the ever to be expected tire troubles, the passengers were always landed at their destination without five minutes' delay from any improper conduct of the car. The absolute dependence which could always be placed in the machine made it possible to keenly enjoy the constant driving and proved an excellent object lesson to that class of critics who thrive on the expression, "Git a horse."

On only one occasion when out with a party did I entertain any misgivings as to how the car would work. Shortly after starting a tendency to fire in the muffler developed, although the batteries were in good shape and the plugs clean when the car was taken out. The drive was completed without undue annoyance, and on returning to the barn an investigation was instituted which disclosed the fact that the primary cable from the coil to the commutator box was rubbing against the frame and the action having chafed off the insulation, occasionally grounded the wire, thereby causing a premature explosion.

A few of the experiences the summer's work afforded may be of interest. Early in the ownership of the car the necessity of affording some adequate protection to the motor and chain became evident and a canvas boot was constructed, which extended from the rear axle truss rod to the front wheel fender stay, with lateral rods to hold it from contact with the moving parts of the motor. A sheet of copper laid over asbestos, both being riveted to the canvas, prevented any danger of fire.

The boot soon proved its worth. One evening, shortly before 10 o'clock, a telephone message arrived, stating that a woman, having lost her last train, wanted me to drive her to a town 20 miles distant. It had been raining during the evening, but the call was urgent, and after removing the tonneau and replenishing the tanks I got under way. The first 10 miles of the road was largely macadamized and familiar ground, but beyond this the country was new to me and the roadbed sandy. So much rain had fallen that the wheel tracks were filled and the car was

running in water the depth of its tires. We made a noise resembling very much that of an express train taking water at 60 miles an hour, and the front wheels threw a stream of solid mud for 10 feet in front of the lamps. After leaving my passenger, a halt was made under a street lamp to take the time, and the trip back to the barn, a distance of 18 miles, was covered in 1 hour and 19 minutes; this in the teeth of a driving rainstorm and under the hardest of road conditions. The lateness of the hour and the steady rocking of the car brought on a feeling of intense sleepiness, in spite of the discomforts of the weather, with the result that twice a momentary loss of the faculties nearly ditched the car. On such a trip, in the dead of night, and alone, one finds excellent company in the almost constant purr of the vibrator, which is rarely noticed by day, and in the steady pound of the odometer as it faithfully checks off the miles from its place on the right hand steering knuckle.

Not long after this trip the telephone brought a request from a commercial traveler to carry him to Berlin, an up State town, 42 miles distant by road. The start was made at 2.15 p. m., and it was probably the most exacting trip the car ever made. The roads, poor at best, were heavy from recent rains, and the many difficult hills demanded much use of the low speed, but the town was reached shortly after 5 o'clock without mishap. After a stop of half an hour the car was headed homeward, but before the outskirts of the town were reached an upturned nail had flattened a rear tire. "Practice makes perfect," and with the aid of an excellent set of tire irons the tube was replaced and the journey resumed in eighteen minutes. This, for a single pair of hands, away from the conveniences of one's own barn, is quick enough. The town was left at 6:08 o'clock and the 42 miles covered with but one momentary stop, in two and one-quarter hours.

The greatest part of the work that the car has done has been of a purely local character, as the average patron engaged it for one or two hours. During the height of the season the demands for it exceeded its ability to fill engagements. I usually started out shortly after 10 in the morning, and in some cases drove almost continually until 11 p. m. The record for one day was eight parties, which kept me out until 12:10 that night. The longest continuous trip that was made with four passengers was 102 miles, one stop of one hour and a quarter being made for lunch. During the month of August the car averaged 90 miles a day for six days in the week, and never once refused to do the work required of it. In speaking of the enterprise the driver of a heavier car once asked the writer: "What do you do with your passengers when you break down?" It was with hesitancy that he accepted the reply: "I don't break down." This was before the chain had broken my record.

No man can drive 6,000 miles without adventures, but little apology need be made for the damage my car has done on its travels. The only smashup it has participated in occurred early in July. In driving alone through the village one dark night the searchlight "picked up" a team ahead traveling in the same direction. A man on a bicycle, riding close beside the rear wheel, supported himself by one of the canopy top posts. The car runs very quietly, and, as is customary, I tooted before passing, and the team drew out to one side to allow me half the road. I was abreast of their rear wheels when, without warning, there came out of the blackness ahead, as suddenly as if it had risen from the ground, a horse and double carriage, with the animal at top speed, almost on a run. They were coming directly at me, and as the light struck the horse's breast he seemed magnified fourfold. A collision was inevitable, and there was little time to choose which team to hit, but I took the one beside me, striking the bicycle rider squarely, and doubled his machine up like so much tin. He must have thought he was between the "devil and the deep sea," but he was more scared than hurt. The approaching team pulled short to the side, cleared the car and disappeared as it had come. Nothing was injured but the bicycle, and that I had rebuilt. My other mishaps have been confined to running over two dogs, one hen, much to her discomfiture, for it disarranged her feathers badly, several snakes and a turtle. One can always hit a snake, for he cannot adapt himself to the speed of an automobile.

There are several items of vital importance to the success of such an enterprise as mine, particularly if one is dependent for a certain portion of his patronage upon automobile skeptics. The car must be absolutely reliable; it must ride comfortably without undue jar, and must be free from objectionable noise. Care must be used in driving to adapt the speed to the varying tastes of the passengers, and the control must be positive and instantaneous. Good driving is a science, and its practice will benefit both passengers and machine. With the exercise of these requirements a few rides will convert anyone but a bigot.

I have been asked what equipment a car requires when it is engaged largely in local traffic. My carrying capacity is limited and only essentials are therefore taken. A tool roll contains several wrenches, screwdriver, small file, cutting pliers, and an excellent set of tire irons. A small wooden box contains patching material, rubber, cement, emery cloth, extra commutator springs and a pair of spark plugs. A jack, pump, spool of wire, overalls, and two extra tubes complete the list of the contents of the tool compartment. Not less than 30 feet of stout rope must be on board and can be carried in the springs of the seat cushion. The car should never leave the barn without an extra tire shoe. A $3.50 covering for it is not necessary, as two yards of heavy canvas, torn into 4 inch strips, with the ends sewed together and wound about it in such a manner that a third of the width of the strip is exposed at each lap, makes an excellent protection and costs but a few cents. The car should always be kept in condition, and if suitably lubricated the omission of oil cans from the tool box is not serious. On the writer's car the lubrication of the motor is from an automatic oiler, mounted on the crank case cover, which is of high efficiency and never gives any trouble.

Every part of the machine should be gone over carefully at frequent intervals and any evidence of wear or the unsatisfactory operation of any part immediately attended to. The poorest policy is to wait until something goes wrong before doing this, for a few breakdowns on the road will shake the confidence of customers and deprive one of their patronage. During the past season the high speed clutch on the writer's car was replaced, owing to an occasional tendency to slip; the low speed triple gears were replaced, there being evidence of wear; the half speed shaft cam was replaced, its retaining pin having become loose; and the rings in the front cylinder were replaced, as that cylinder failed to hold its compression as well as its mate. None of these changes were imperative, but they were beneficial and have kept the car up to its high standard. The only other change made was the substitution of a driving sprocket with one less tooth.

The rate of charge for the car in livery was $1.50 an hour and at the low cost of maintenance brought in satisfactory returns, but the rate is too low and should be advanced to $2 or $2.50.

The automobile livery as a business proposition is destined to become one of much importance in the near future, especially in rural districts where the trolley car is as yet unknown.

Calendar of Automobile Events.

January 11 to 24—Importers' Automobile Salon, New York.

January 14 to 21—New York Automobile Show.

January 23 to 28—Ormond-Daytona Races and Record Trials.

January 23 to 28—Philadelphia Automobile Show.

February 4 to 11—Chicago Automobile Show.

February 10 to 18—British Automobile Show, Olympia, London.

February 13 to 18—Detroit Automobile Show.

February 20 to 25—Cleveland Automobile Show.

OUR FOREIGN EXCHANGES

Lighting of Road Vehicles in Great Britain.

The Motor Union of Great Britain and Ireland has prepared the following suggestions at the request of the Home Office on the subject of the lighting of vehicles after dark:

1. Pending the passing by Parliament of a bill providing that all vehicles throughout the country shall carry efficient front and rear lights, the Motor Union of Great Britain and Ireland venture respectfully to request that the Home Office shall take, in the interests of the safety of the public, the following action:

(a) Amend the model bylaw printed by order of the Home Office for the guidance of councils in making bylaws under the municipal corporations act and the local government act, so as to provide that after dark all vehicles shall show a red light in the contrary direction to which they are proceeding. The present model bylaw provides that vehicles shall carry a lamp or lamps so constructed as to show to the front a white light visible within a reasonable distance to persons meeting or approaching the vehicle. Vehicles are not required to show a red light to the rear, except when they are carrying loads projecting more than 6 feet.

(b) Circularize the local authorities who have power to make bylaws, suggesting that they shall adopt the new model bylaw providing in all cases for the carrying of a rear red light.

(c) Bring special pressure to bear upon those local authorities whose present lighting bylaws exempt slow going vehicles from carrying lights at all, or which exempt all vehicles from carrying lights during the summer months.

2. In support of the above request, it is urged:

(a) That since the model bylaw of the Home Office was settled, there has been a great alteration in the conditions of road travel by the increasing use of the motor car. The introduction of a fast traveling vehicle upon the road has rendered it necessary in the public safety that the position of all other vehicles shall be clearly indicated at night by lights. Such indication is particularly required in the case of slow going vehicles, which are necessarily overtaken and passed by the fast traffic.

(b) Serious accidents have been caused by the neglect of slow going vehicles (which on dark and unlighted country roads usually occupy the centre of the carriage way and are often on the wrong side of the road) to carry efficient lights, and such accidents are likely to increase in number unless some efficient means of lighting the slow going vehicles is insisted upon.

(c) The need for detecting unlighted vehicles upon the road has rendered it necessary for motor cars to carry powerful lamps. The glare caused by these lamps has been seriously objected to. If all vehicles were required by bylaws to indicate their position after dark by lights the necessity for automobilists to carry such powerful lamps would be considerably reduced.

(d) It is most desirable that there shall be uniformity of regulation. A main road in 20 miles may pass through the area of three or four authorities having power to make bylaws. Pending a statutory provision such uniformity can only be secured by the action of the Home Office.

3. For these and other reasons the union desires in the strongest possible way to urge the department to make strong representations to the councils of counties and boroughs in England and Wales to induce them to adopt an efficient and satisfactory bylaw providing that all vehicles shall carry a lamp or lamps so constructed and capable of being so attached as when lighted to show a white light in the direction in which the vehicle is proceeding and a red light in the contrary direction, such lights to be visible within a reasonable distance to persons meeting or approaching or overtaking the vehicle.

Strength of Steel at High Temperatures.

Prof. C. Bach has presented in the *Zeitschrift des Vereines Deutscher Ingenieure* the results of an elaborate series of tests of the strength of steel at high temperatures. Bars from three different works were tested, these being distinguished by the letters O, K and M. Of the bars O, four were subjected to tensile tests at ordinary temperatures, and successive lots of four to tests at the temperatures of 200°, 300°, 400°, 500° and 550° C. At ordinary temperatures the strength of the steel was for bar No. 2, for example, 27 tons per square inch, the ultimate extension on a gauge length of 8 inches 26.3 per cent. and contraction of area 46.9 per cent. The tests showed that the strength increased up to 300° C., by about 3.17 tons per square inch, and from this temperature onward the strength fell, roughly in proportion to the temperature, to 13.1 tons per square inch at 550° C. The ultimate extension decreased from 25.5 per cent. at ordinary temperatures to 7.7 per cent. at 200° C., from which again it rose to 39.5 per cent. at 550° C. The contraction of area also fell at 200° C., but did not commence to rise until the temperature was above 300° C.

In the case of the bars from the works distinguished by the letters K and M, tests were made by keeping the loads on for a considerable time. This prolonging of the action of the load had no effect until the temperature reached 300° C., at which point it caused a slight decrease of strength, and at 400° and 500° a greater decrease. As regards the effect of prolonged loading on the extension and contraction between the temperatures of 300° and 400° C., it caused an increase in both; but from 400° C. the extension and contraction under prolonged loading decreased until at 500° C. they were lower by from 20 to 25 per cent. than with ordinary duration of test. Professor Bach draws the conclusion from his investigations that for steam boilers, piping, etc., the strength of steel should be tested at the higher temperatures; and he is of opinion that this conclusion is justified not only by his experiments, but from the well known fact of the brittleness of steel when worked at a blue heat.

Further Paris Show Statistics.

Comte Mortimer Mégret, a well known writer on technical subjects in the French motor journals, has compiled some interesting statistics with reference to the Paris Salon. He finds that 56 per cent. of the cars staged were over 20 horse power, the general rise in power being shown by the fact that the proportion in 1903 was only 21 per cent. The atmospheric inlet valve, though it has practically disappeared from high class cars, apparently still retains a considerable measure of popularity among the smaller makers on the Continent, as it was to be seen on 27 per cent. of the exhibits, as compared with 33 per cent. in 1903. Ignition by coil and accumulators had fallen from 72 per cent. to 16 per cent., and high tension magneto, which is largely taking its place, had risen from 6 per cent. to 36 per cent. Low tension magneto is evidently increasing in popularity, as the proportion of cars fitted with this system had risen from 22 per cent. in 1903 to 44 per cent. in 1904. The leather covered cone clutch had fallen from 90 per cent. to 78 per cent. of the whole. The future of the metal to metal clutch would seem to depend on the results obtained in ordinary use with the disc type of clutch, which several firms are introducing. The propeller shaft transmission has gained slightly on its rival the chain, so far as the cars at the Show are concerned, 51 per cent. of the exhibits employing this system, as compared with 47 per cent. in 1903.

The South African Automobile Market.

The attention of manufacturers in the automobile industry is again directed to the increased openings South Africa offers for their output. The market for commercial types is particularly promising, especially as a supplement to existing railway facilities. Negotiations are now in hand for installing a motor passenger service between Wellington and Cape Town as a suitable addition to the present railway service. The scheme has already been approved, subject to a sufficient number of persons guaranteeing to make use of the service for a certain period, a stipulation which is regarded as merely nominal, the proposed new serv-

ice filling a very long and urgently felt want. For transport of agricultural produce and general merchandise, motor vehicles are steadily gaining in favor. The consensus of leading opinion is that a very large demand for such types will be forthcoming, which it would well repay manufacturers to exploit by giving greater publicity to the merits and possibilities of suitable makes. There is little doubt indeed that if the agricultural and commercial communities of the sub-continent had their attention more frequently drawn to the facilities and economies of many of the motor cars and wagons, an infinitely greater trade would accrue. As yet the latter have in the aggregate done little to keep their names before the South African market, which offers every prospect of becoming one of the richest in the world. Motor vans are now being manufactured by the Wolseley Tool and Motor Car Company for the conveyance of mails and passengers in Cape Colony over long distances where the existing railway facilities are insufficient. The cars are of 24 horse power, and under ordinary conditions capable of running, with a full load, 70 miles with one supply—10 gallons—of petrol. They are constructed to carry six passengers, driver, and conductor, in addition to half a ton of mails and luggage. For private use advices to hand also report a steadily increasing demand, although its volume is naturally more difficult to gauge than that emanating from commercial centres, but in the aggregate a large and increasing trade is clearly foreshadowed. Not the least pointed indication in this respect is that the governments of more than one British colony have been approached to take steps to guard against any danger threatened by the increased use of motor cars in certain districts.

Auto Restrictions in Switzerland.

Switzerland has long been regarded as a dangerous country for automobiles, owing to the absurd and petty restrictions to which motorists are subjected in the different cantons. In Grisons and in Vaud the automobile has always been absolutely forbidden, while in many others a walking pace is insisted upon when passing through every paltry village. Furthermore, if any incident occurs which can possibly be attributed even indirectly to the presence of a motor car, prohibitive fines are extorted, regardless of the dictates of fair play. By a monstrous enactment which has recently been promulgated throughout Switzerland the municipal authorities are now permitted to confiscate absolutely any motor vehicle which has been driven in such a way as to cause any offense against their bylaws or regulations, if in the opinion of these authorities the offense is sufficiently grave. Those who have braved the perils of motoring in the German cantons of Switzerland, and experienced the officiousness and red-tapism which there reign supreme, will not need to be told that if it be desired by the authorities to appropriate a few cars opportunity will not be allowed to lack.

Carriage Work at the French Show.

Limousine, coupé, landaulette; landaulette, coupé, limousine. At first sight one might say the Paris Automobile Show is comprised, from a coach building point of view, chiefly of these models, and I think this is one of the most expressive points of this exhibition: that the old open car should have dropped so much out of favor and the covered vehicle advanced to such a great degree. Whichever way you walk and whichever way you turn in the exhibition you see one or more of the above models on every stand. I think this is accounted for in a great measure by the average Frenchman's love of warmth. When I was lately in Paris I could not help being struck that, although the sun was shining, the majority of the cars in the Champs Elysées which were fitted with Cape cart hoods had their hoods up and all the curtains down. This phase is, I think, noticeable all over France. Hotels are stuffy, railway carriages are hot, and even the cabs in the street are all warmed; and it appears also that the average Frenchman who owns a motor car prefers to be comfortably seated in a covered vehicle and be driven by the chauffeur in a long haired fur coat. This, I think, shows the French taste in these matters, and accounts also for the number of closed cars in the exhibition.

The old fashioned tonneau seems to have practically died out, and at the same time the small two seated vehicle is not so much in evidence as it has been in other shows.

With regard to the lines of the various models exhibited, these, I think, are not so good as usual, as the manufacturers seem to endeavor to obtain something new in design without, as a rule, giving sufficient attention to the details of design. In this respect there are one or two extraordinary ideas shown—one especially, which has a mail coach body, a landaulette hood, and a victoria front, the whole forming a combination which is very incongruous.

Another point which is very noticeable is the increase in the weight of the bodies as now built in France. I asked at the various stands the weight of their bodies, and the answer invariably was in the region of about 300 kilos. This, to our English ideas, is of course excessive. I also had the privilege of visiting one of the largest carriage manufactories in Paris, and there this point was particularly noticeable. They do not seem to worry in the least about the weight of the bodies, and they were using material the weight of which would in England be considered prohibitive.

I noticed that the use of aluminum was to a great extent being given up. Wooden panels of mahogany or walnut seemed to be the most common material used, and aluminum was only employed where absolutely essential, namely, for Roi des Belges or panels of similar pattern. While we in England are endeavoring to reduce the weight of both bodies and chassis, apparently in France they are not giving this matter the consideration it deserves.

There are, of course, the usual quantity of carriage building freaks in the exhibition, and under this category might, I think, be almost placed the sliding and hinged main interior seats which are shown on some of the cars. I noticed in some of them that you touched a spring and the whole back of your seat went at a different angle, and you pushed another knob and it formed a bed. While this might be all very useful in an armchair, I can hardly see the value or use of it on a motor car, as I think the time has arrived when the reliability of the automobile has become sufficiently assured to enable you to reach a hotel each night. There is also shown on one stand a large caravan, which is in every respect a first rate traveling hotel, with the exception of the bathroom.

There was one exceptionally fine piece of work exhibited, namely, the coupé on the Mercedes stand, the whole turnout of which showed extreme care and thought, and was, I think, one of the finest pieces of carriage building in the Show, both as regards its lines and general finish.

I noticed, also, that there was a certain tendency for the two seated car, which could be driven from the inside, to become fashionable. Whether this is practicable or not remains to be seen. The idea certainly seems, for a professional or business man, most excellent.

With regard to the accessories which were fitted to the various cars, there has been considerable improvement in these, especially with regard to the fitting of small extra seats, which were hidden away in certain of the cars in a most ingenious manner.

Taken as a whole, however, I must say that I was disappointed with the advance made in the carriage building department during last year, and from a very careful examination of the Paris Salon I think we in England can claim, at any rate in this branch of the automobile industry, to have more than held our own, and that the carriage building industry, for which England has been so justly celebrated for centuries, has at any rate realized that there is something in this great and new industry for it, and we shall very shortly get back to that premier position which we held for so long, and which at one time seemed, owing to the short sightedness and the narrow minded conservatism of the British carriage builder, very likely to be lost to us.—*H. J. Mullinor in the Autocar.*

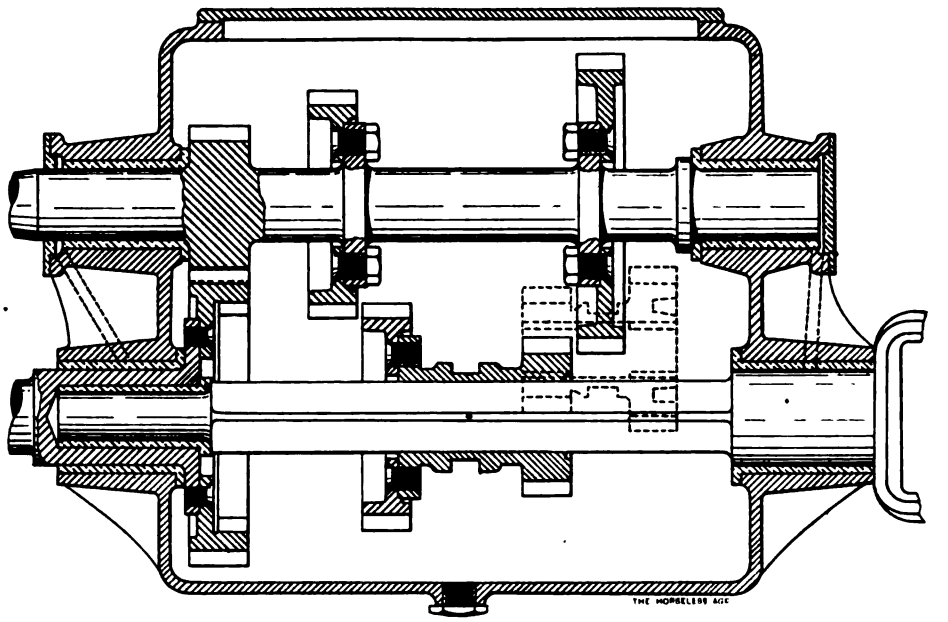
New Vehicles and Parts

New Yale Models.

The Kirk Manufacturing Company, of Toledo, are bringing out two new Yale models. The smaller one is of the double opposed cylinder type, with engine under the front seat, similar to their last year's model, but it is said to embody several improvements in details.

The larger car has a four cylinder vertical engine, rated at 24 to 28 horse power, the bore and stroke of which are 4¾ by 4½ inches, respectively. All valves are mechanically operated, the exhaust and inlets being located on opposite sides of the engine. The cam shafts are driven by gears located outside the crank case. The valves are made from single piece drop forgings, and are interchangeable, are 2⅜ inches in diameter and have ⅜ inch lift. To obtain a high compression the piston has a high dome. It is 6 inches long and has four rings above the wrist pin, the latter being hollow.

The connecting rod is a drop forging of the regulation I section, with the crank hub slightly offset, and bronze bushed, the upper bearing being 2¼ inches long by 1 diameter, and the lower one 2⅞ by 1¾. The cylinders are individual, with integral heads, the jackets extending down to the bottom of the stroke. The crank shaft has one central bearing 2⅞ inches long. The three bearings are oiled by sight feed in addition to the splash, and the pistons are entirely lubricated by splash. The crank case, cast of aluminum is scalloped on the bottom to give stiffness and also to prevent the oil from running from end to end. It is split horizontally, with bearings attached to the upper half. Drain plugs are screwed into the bottom. The cam shafts may be removed without detaching the bottom of the case, as the latter is also horizontally split on the centre line of the cam shaft the upper part containing the tappets, thereby being readily detached by the removal of a few screws. The tappets have a round shank, but square heads containing a roller which bears on the cam, the square part moving in a flat track. The shank works through a bronze bushing.



YALE CHANGE GEAR BOX.

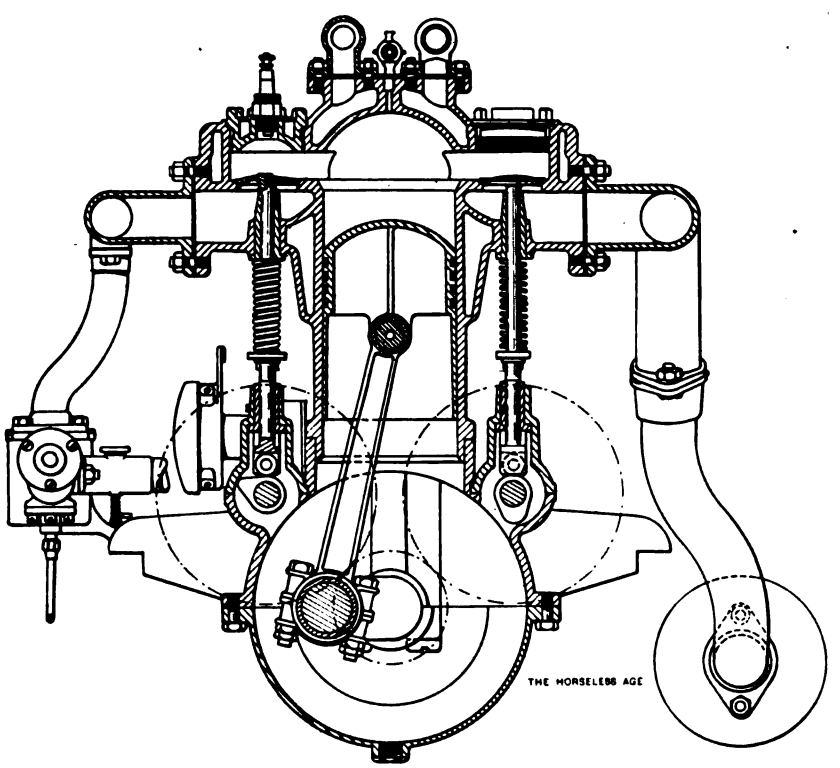
The jump spark plugs are screwed into the plug caps that cover the inlet valves. Both lines of water pipe, ingoing and outgoing, are attached near the top of the cylinders.. The flywheel is bolted to a flange which is securely fastened to the crank shaft. Steel bushings through which the bolts pass serve as dowel pins for alignment. The inside of the rim is coned to receive the movable clutch member, the latter being pressed in by a spring and released by foot pressure, a ball bearing taking the end thrust. It is flexibly connected by means of a universal joint with floating member to the change gear group of the typical sliding type, which gives three speeds forward and one reverse. All large gears are bolted to flanges forward on the shafts.

The emergency brake operates on an extension of the countershaft.

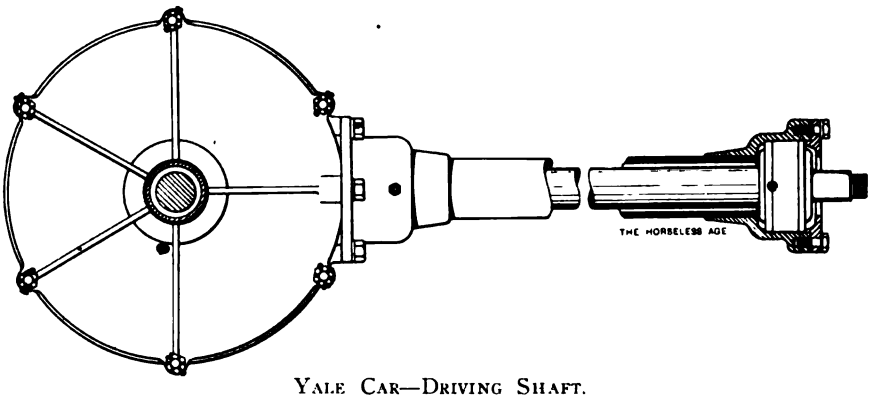
The drive to the rear axle is by Cardan jointed shaft, the pivotal points of the joints all being in the same plane. The bevel pinion has ball thrust and roller shaft bearings. The differential cage also has a side ball thrust and roller bearings for the driving axles, which also turn in roller bearings near the wheel hubs. The rear axle gear case is split vertically and a truss rod runs beneath it. Expanding rings act as brakes on the inside of the brake drums, which form part of the hub castings. The wheels are of wood, artillery type, and are shod with 32x4 inch tires.

The main frame is of 3x2 inch angle iron, while the sub-frame, also of angle iron, is of 2x1½ inch sections.

The vaporizer is of the float feed type, with provision for regulating the mixture to correspond to the change of throttle, but is not automatic, according to the



SECTIONAL VIEW OF THE YALE MOTOR.



YALE CAR—DRIVING SHAFT.

present time understanding of the word. Four coils are used for ignition, and the commutator is driven by spiral gears from the cam shaft, and is located at the side of the engine.

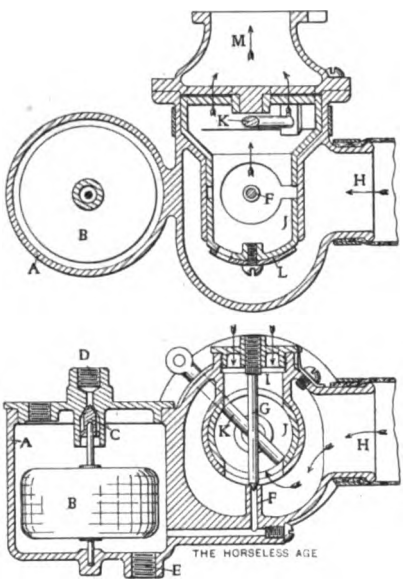
The Reo Touring Car.

The new Reo car, of the Reo Car Company, Lansing, Mich., is equipped with a double, opposed, 4½x6 inch cylinder, 16 horse power engine arranged under the front seat. All valves are mechanically operated, the exhaust and inlet being placed in adjacent valve chambers on the upper side of the cylinders, and operated through the intermediary of tappets from the cam shaft, which is mounted in the crank case. Three cams do the work, the two outside ones each operating an inlet, while the centre one operates both exhausts, they being in line with one another.

The crank case is a one piece iron casting, open and faced off on top, and also on the two sides, where heads are bolted to it for supporting the shaft. The bearings of the latter are lined with babbitt. On top of the crank case is bolted a square aluminum casting, having a bar cast across its centre, and from this frame the cam shaft hangers are suspended. The cam shaft, which is driven by spur pinion and gear, has a spline cut from one end to the centre cam, in which spline works a small rod. This rod, when the connecting foot lever in front is pushed, causes a pin to project from the cam face, which acts as an extra cam to hold open the exhaust valves during a portion of the compression stroke, for starting purposes. The foot lever mentioned also interconnects with the spark control lever (which is located on the steering post), so that the spark is always shifted to the late position when the relief cocks are opened

The tappets, which are cylindrical, are fitted at their ends with rollers, which bear against the cams, and at the other ends of their supports the tappets have down hanging arms that push lower tappets in line with the valve stems and having a line of motion parallel with that of the first.

The valves are of cast iron, cone seated, the heads being joined to their stems by shrinking on and heading over. They are 1⅞ inches in diameter and have five-sixteenths inch lift. Mr. Olds lays great stress on having the valves on the upper side of the cylinders, as it keeps all oil away from the valves, causing less sticking, pitting, dropping from valve mechanism, etc. There



REO CARBURETOR.

A, float chamber; B, cork float; C, float valve; D, gasoline connection; E, drain hole; F, gasoline spray nozzle; G, gasoline adjusting valve; H, main air inlet; I, supplementary air inlet; J, throttle valve; K, throttle valve rod; L, shutter for adjustment of main air inlet; M, outlet to engine.

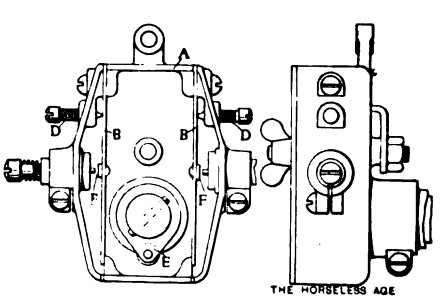
is a little aluminum cap that drops over the exposed valve springs and stems, which is held down by a few screws. There is also an aluminum cover that bolts down on the square casting on the top of the crank case. Over this is mounted the oil tank, which is cylindrical in form and divided into two separate chambers. Each chamber has a sight feed and a gauge glass, the latter to indicate whether each cylinder is getting its proper share of oil. The pipes from these tanks lead to the cylinders, the cranks and other bearings being lubricated by splash. The end bearings also have emergency grease cups. Two carburetors are used, mounted close to their respective inlet valves.

Double coils are used for ignition—a pair of small Splitdorf coils, mounted on the dash. The plugs are screwed into the cover plugs over the inlet valves. The commutator is mounted to rock upon the external boss of the cam shaft bearing. As will be seen by the illustrations of the device herewith, the brass case A is slotted to receive the flat springs B B, the free ends of which rest on the cast shelves shown. The springs are securely held by being pinched in the slots by means of the screws C C, the screws D D acting as tension screws. The cam E is pinned to the cam shaft and has a steel roller pivoted in its nose. This lifts the springs, causing the platinum points at F to come in contact and thus close the circuit of each of the coils in turn. The cylinders, which are stud bolted to the crank case, project into the latter several inches; or perhaps it may be more proper to say the crank case has cylindrical extensions that cover the cylinders for some distance. The attaching flanges of the latter being well up on the body, an open space is left between the two.

The muffler, which is about as long as the over all length of the engine, is placed beneath it, short pipes connecting direct from the cylinder heads to the top side of the muffler. The exhaust from the latter issues from both ends.

The pump, which is of the gear type, is supported by an extension of the crank shaft. This being the only support it has, it cannot get out of alignment. A pin secured to the engine framework enters a slot cast in the flange of the pump, thus keeping it from rotating with the shaft.

The carburetors, two in number, are of the float feed type, with provision for changing the fuel supply according to the amount of throttle opening. The arrangement of the float chamber will be readily understood from the drawing herewith. The air enters on the right hand side and goes into a large chamber. Projecting up from the bottom is the spray nozzle, and entering the latter, with a cone seat, is the gasoline adjusting needle, which, when the proper adjustment is found by experiment, is soldered, to prevent "monkeying." The needle in passing from the top to the nozzle passes through a cylindrical housing or mixing chamber, which in turn contains an inner movable lining, with corresponding openings. The air is drawn from the right hand side past the nozzle, where it takes its gasoline and passes out at right angles from where it entered. The movable lining serves as the throttle, as the openings

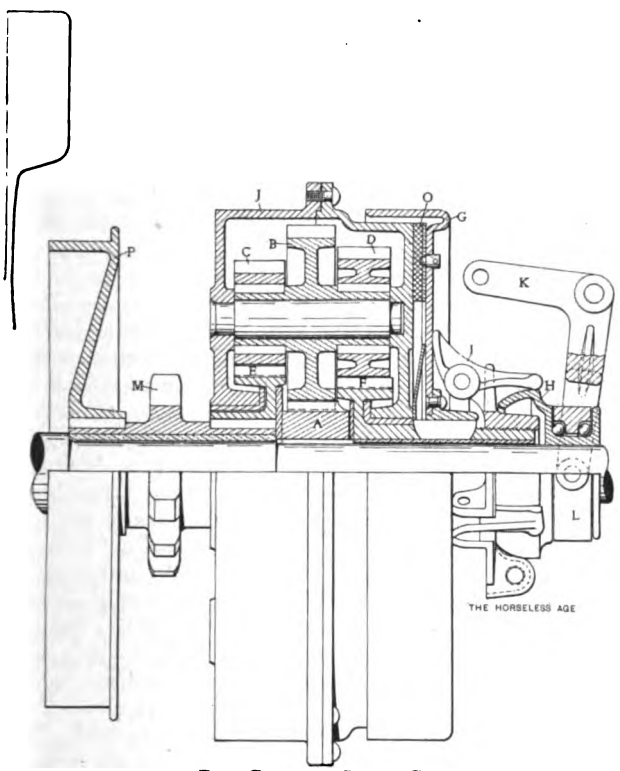


REO COMMUTATOR.

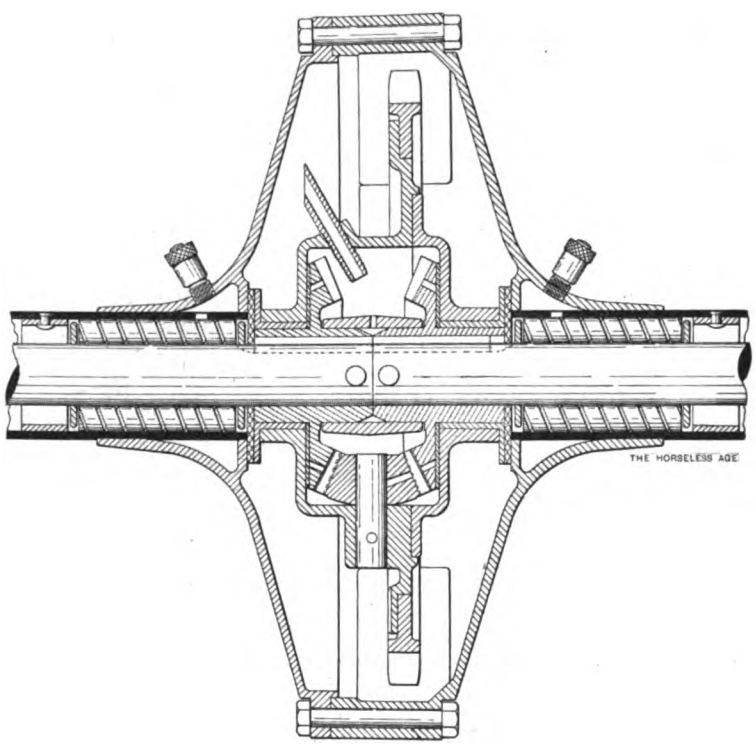
are made to coincide or differ. An auxiliary air port is gradually uncovered as the throttle is opened; a coarse wire mesh cylinder is slipped over the inlet, and over this is drawn a knit woolen mitten for a dust screen.

The change gear, which is of the planetary type, is mounted direct on the engine shaft, the whole being assembled in an independent frame that is supported on the main frame by means of flanges, and is held by a few bolts, it being readily taken out when desired. Externally the gear bears a striking resemblance to most other gears of this type, but the internal construction is different, no internal gears being used. The pinion A, which is keyed to the engine shaft, drives the planetary pinion B, which parts together and they rotate as a unit at the engine speed, thus giving the direct drive. The bands for these clutches are lined with fibre. A drum P is mounted upon the sprocket pinion hub, which is utilized as a brake by means of a brake band.

A 1¼x⅝ inch Diamond roller chain drives to the rear axle, the sprocket on the latter being entirely enclosed, except for the chain openings, and these will have additional c6vers protecting the chain for some distance. The differential is of the bevel type, all enclosed in an independent cage. It will be noticed in the drawing that the thrust bearings have an exceedingly large bearing surface. Drums for external band brakes lined with leather are bolted to the hubs. The spring of the cross piles and clamped together with long bolts, to form the complete radiator, gaskets being placed at the connections. It is claimed that in case of accident or leaky tube it is an easy matter to remove the faulty element and connect together again as before. The front springs are semi-elliptic, hinged at the forward end and slotted to slide on a pin at the other; they are 2 inches wide by 38 inches long. The rear ones are full elliptic and are 2x36 inch. The frame is pressed steel, reinforced with wood at the centre, where the weight of the engine comes. The front axle is tubular, and is provided with Timken roller bearings, while the rear is supplied with Hyatt bearings. The rear wheels are 30x3½ inch, while the front ones are 30x3 inch. The



REO CHANGE SPEED GEAR.



SECTION THROUGH REO DRIVING AXLE.

has the pinions C and D keyed to it, the former meshing with E, which is keyed to the sprocket M, and the latter with F, which is keyed to drum G. Now if the brake band is tightened on drum J the casing is held from rotating and the drive takes place through A to B, C to E, and hence to the sprocket. This gives the low forward speed. If drum G is held by its band the drive becomes A to B, D to F, and as the latter cannot rotate, owing to the brake band, the pinions all take up a planetary movement together with the casing, and as the ratio of C to E varies from D to F, the gear E is driven in an opposite direction to that of the engine, and gives the reverse. Forcing the coned casting H under the bell cranks I by means of the crank K and the collar L (the latter, it will be noticed, having a ball thrust) causes the disc face of the drum G to be pressed against the casing J through the packing O. This locks all shaft is considered to be sufficient for equalizing the pull on the bands, thus doing away with ropes. The radius rods have a ball joint at the frame connection; the adjustment is accomplished by turning the ball terminal, which is threaded into the main rod, the latter being pinched together by means of a screw, for locking. The steering wheel is hinged for tilting, and the steering gear is of the worm and sector type. The spark control is mounted upon the post. There are four foot pedals, one each—beginning on the right—for the throttle, the reverse, the emergency or pinion shaft brake, and the relief valve. A side lever is used for the two forward speeds.

The radiator is tubular, with crimped gills, and is made in units of four flat tubes through one set of gills. These units have their ends fitted to match one another, and are assembled in complete weight with tonneau is about 1,525 pounds.

The Coat of Mail Grip.

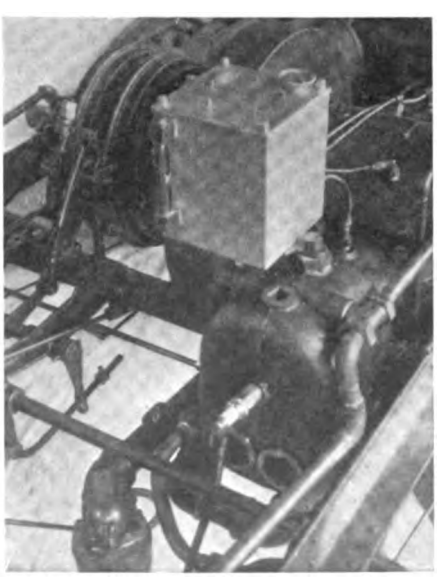
The Post Manufacturing Company, 1908 Broadway, New York city, have brought out a new tire protector under the above name, which they claim combines the constructional features of the Post grip formerly manufactured by them with the qualities of a non-puncturable protector for the pneumatic tires. The protector consists of a leather shoe entirely encircling the tire, fitted with teeth that are claimed to give positive traction and prevent skidding in any going. The steel plates are so constructed that they form a complete band of steel across the part of the tire on the ground, while the resilience of the tire is said to be not affected.

The Michigan Model E.

The new car which has been brought out for the year 1905 by the Michigan Automobile Company is to be known as their Model E. It is equipped with a side entrance tonneau body, with individual front seats, and embodies several detail improvements over their product of last season.

The main frame is of angle iron, so placed that the bend comes at the lower inside edge of the various members. Angle plates are rivetted to each where the side and cross pieces meet. The frame is carried upon four full elliptical springs, those at the front being attached directly to the under side of the side members, while those at the rear are hung on pivots which extend out from the frame and whose centres are in line with the rear cross piece. The front springs are 32 inches and the rear ones 36 inches long. All are 1¼ inches wide. The front axle is tubular, and is fitted with yoke steering knuckles. The rear axle is of the live type, designed for a single driving chain. Thirty inch wooden artillery type wheels are used, which are shod with 3½ inch tires. The wheel base is 86 inches and the tread 55 inches.

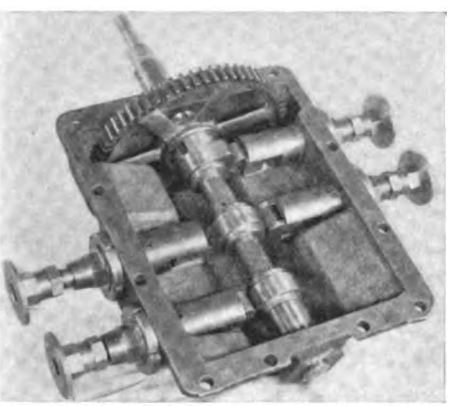
The motor is of the two cylinder horizontal opposed type, and is mounted with the crank shaft running across the car and somewhat back of the centre line of the frame. It is attached through lugs cast on each cylinder, which rest upon and are bolted to cross members of angle iron. The cylinders have a bore and stroke of 4⅝ inches and 5 inches, respectively, and the motor is rated at 14 horse power. The valves are placed on the under side of the cylinders, side by side in a single port formed on the side of the cylinder head. The admission valves are mechanically actuated, and are identical with the exhaust valves. The coil springs which hold the valves on their seats are wound



View of Motor.

so that their diameter decreases toward their lower ends, at which points they are held by flat keys which pass through the valve stems. The valve tappets are located in a plane somewhat below that of the valve stems. To transmit the necessary motion to the valves the tappets are provided with disc heads, which enable them to be turned to make any necessary adjustments of the length of lift and yet always to provide a point of bearing for the end of the valve stems.

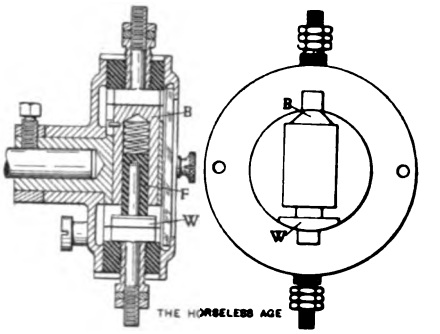
The parts of the half time mechanism, including the cam shaft, valve cams, tappets and driven gear, are located in a casting which forms the bottom of the crank case and entirely encloses the parts named. A feature in the design of this mechanism, which is now being adopted in the construction of motors of this type, is that the two exhaust valves are placed in line and a single cam is used to operate them. This is located at about the middle of the shaft, with the admission valve cams on either side. The bushings for the cam



Michigan Valve Cam Shaft.

shaft bearings screw into the ends of the detachable casting, as do also the bearings for the valve tappets. The latter are provided with lock nuts to prevent their turning. At their inner ends, which extend to within a short distance of the cams when these are turned toward them, they are slotted horizontally to accommodate the blocks which form the ends of the tappets. In the case of the exhaust valve tappets hardened rollers are supplied, while those for the admission valves are rounded over to form a half cylinder. Oil holes are drilled into the top of the tappet bearings near the inside edge of the casting to insure the lubrication of the tappet rods and blocks. As has been intimated, the length of the tappets is variable by turning the disc heads, which are threaded on them and are held in position by lock nuts.

The crank shaft revolves in bronze bushed bearings, which are split horizontally at the line at which the upper and lower parts of the crank case join. The flywheel is attached to the end, extending inside the car, and is secured by a key and taper combination in which a large flat washer is drawn against the hub of



Michigan Commutator.

the wheel by a cap screw threaded into the end of the crank.

Ignition is by the jump spark system, the plugs being located in the heads of the cylinders. Vibrator coils are used, and a commutator for the primary of the wipe type employed, which is novel in construction and is shown in section in the accompanying sketch. A ring of fibre, in which two copper contact pieces, located diametrically opposite each other, are imbedded in its inner surface, is mounted within a housing, which encloses the whole device and is provided with a glass cover at the front. This housing is supported at the back by a sleeve which bears upon the driven member and can be twisted about on it to vary the time of ignition. The driven member is drilled out to receive the end of the half time shaft, to which it is secured by a set screw passing through it and a collar, which serves to hold the housing in position laterally. That portion of the driven member inside the ring is shaped in the form of a hollow cylinder, and carries the hardened steel contact making brush B. This is round in section, except at its outer end, where it is beveled to narrow the contact surface. It is held from turning by a small dowel pin, which fits in a slot cut in the inner part of the cylinder in which the brush is held. The brush B is hollowed out for the greater part of its length, and contains a small spiral spring, and the shank of another sliding member W, which is fitted with a large head, the top of which conforms to the curvature of and bears against the ring. The spring tends to spread the pieces B and W apart, and to force them against the ring. An insulating sleeve of fibre F prevents electrical connection between them, the current being conducted through B alone from the segments to the ground. The construction is employed to avoid the tendency of the spring, when a single sliding member is used, to throw the plane of the ring out of perpendicular with the half time shaft.

Dry cells are used to supply the necessary electrical energy for ignition, two sets of four being carried in a box beneath the floor boards in front of the operator's seat.

A mechanical oiler is mounted over the forward cylinder, from which pipes are run to the base of each cylinder for the lubrica-

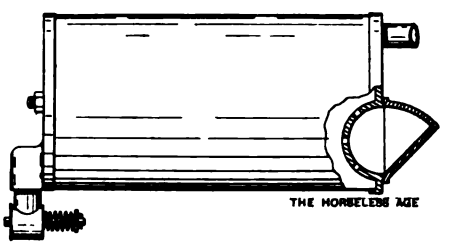
tion of the pistons and to drip in the top of the crank case directly over each crank. A fifth pipe runs to the inside bearing of the crank shaft near the flywheel.

The carburetor is of the float feed type of conventional design. The admission valve ports are joined by a system of piping and special fittings, and are connected to the single pipe from the carburetor through a T connection. The exhaust ports, being in line, are connected by a straight length of pipe, which is continued beyond the rear cylinder to the muffler, placed lengthwise of the car at the rear of the frame. The construction of this part is noteworthy in that it consists of a single chamber only, with a special form of outlet, which is shown in the part sectional sketch herewith. The gases pass directly into this chamber through the exhaust pipe. At the same end at which they enter an internal hemisphere is formed in the head through which nine 3-16 inch holes are drilled. A small casting is bolted to the outside of the muffler head, and forms with the hemispherical depression a small chamber into which the gases pass from the larger one. The outer end of this is drilled with sixty 5-64 inch holes, through which the exhaust passes out into the atmosphere. An automatic relief valve is fitted to the muffler to prevent its bursting in case of the accumulation of too great a pressure. It can also be opened by pressure on foot pedal if it is desired to cut the muffler out of action.

The cylinders of the motor are water jacketed, and the circulation of the cooling water is maintained by a centrifugal pump driven by bevel gears from the crank shaft. The radiator is placed in front of the false bonnet, and is of the flanged pipe type. The water and gasoline tanks are located directly behind it and in front of the dash. They are combined within one outer casing, and are separated by a partition with asbestos lining.

The change gear group is of the conventional planetary type, having no internal gears. It is placed beside the flywheel, and is mounted upon some crosspieces which support the motor. The driving power is transmitted from the motor through a coupling which is attached to the hub of the flywheel by cap screws, and to the transmission shaft by a key. A single chain delivers the driving power to the sprocket mounted on the housing of the spur gear differential on the rear axle.

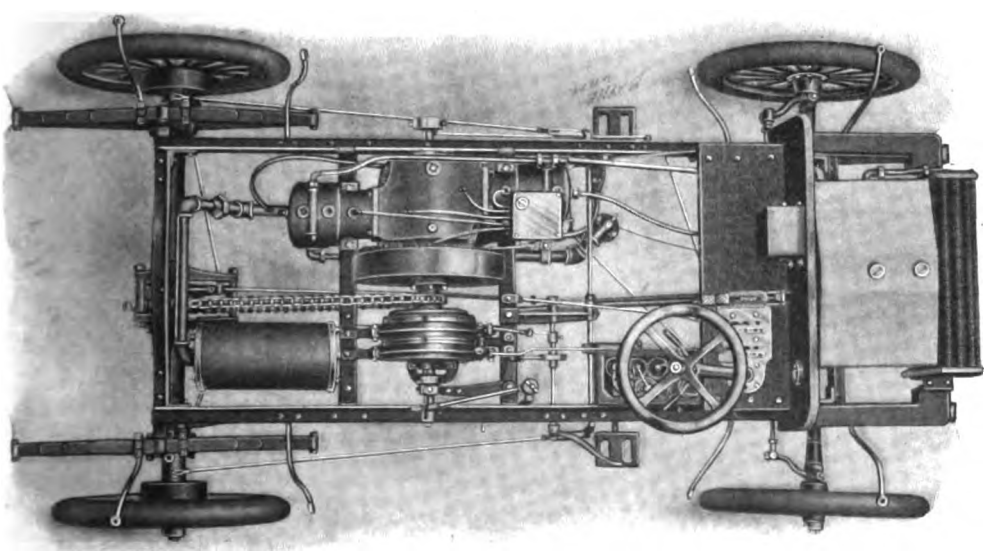
Steering is by means of a hand wheel which operates a pair of spur gears of such size that a turn of the hand wheel through 180 degrees gives the maximum amount of movement to the steering wheels in either direction. The hand wheel is made so that it can be tilted back to make ingress and egress from the operator's seat easier. The braking means consist of a pair of pedal controlled internal expanding brakes on the rear hubs, and a band brake, also applied with a pedal, acting on the differential housing. A lever at the side of the front seat is used to engage the low and high



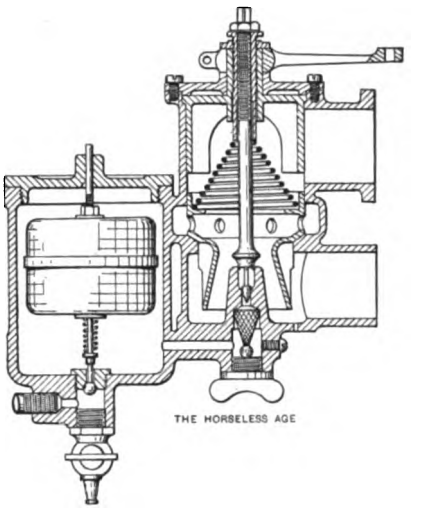
MICHIGAN MUFFLER.

speeds forward, while a third pedal is employed to give the reverse. The speed of the motor is controlled by a throttle, and by the ignition timer, which are operated by two small levers mounted on the steering column beneath the wheel.

The complete car weighs between 1,600 and 1,700 pounds. The company will continue to make their Model D during the coming year with but a few minor changes.



PLAN OF MICHIGAN CHASSIS.



THE MCINTOSH CARBURETOR.

The McIntosh Carburetor.

We show herewith a sectional view of a compensating carburetor, invented by James McIntosh, of 25 Wright street, Cleveland, Ohio. It is of the float feed type, the float acting directly to raise a bail valve into its seat. The stem of this valve passes directly through the float, which is made adjustable upon it in order to vary the height of the gasoline in the chamber. This is accomplished by means of a nut, which is threaded into the upper end of the stem and against which the float is held by a small spiral spring below. Running this nut up or down, therefore, causes the bail valve to close later or sooner as the case may be, and varies the height of gasoline accordingly.

The gasoline is drawn through a vertical jet located in the diametrical centre of the mixing chamber, and is strained in its passage through a fine screen of conical shape, which can be removed for purposes of cleaning through an opening beneath. The spray valve at the top of the jet is cleaned by the movement of the needle valve which regulates the supply of oil drawn over and is connected to the lever by which the throttle valve is turned, so that it moves with it.

Located in the mixing chamber is a large hollow poppet valve, which is held on a seat formed in the contining case by a conical spiral spring. When the motor is first started all the air drawn over passes through the bell shaped extension at the lower part of this valve, which surrounds the gasoline jet. As the suction of the motor increase the pressure of the incoming air raises this valve off its seat and permits the excess air to pass across the seat through holes in the side of the valve and out through the admission pipe to the motor.

Adjustments are provided at the spray valve and also at the top of the automatic air valve spring to vary the proportions of the mixture.

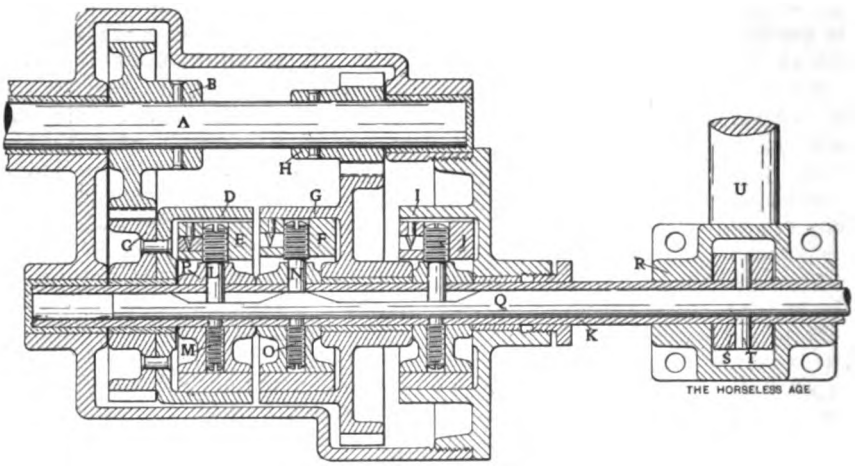
"La Petite"—A Popular Priced Runabout.

The writer unexpectedly came across an interesting little runabout recently while nosing around Detroit, where automobile factories and automobile inventors are nearly as plentiful as Jersey mosquitoes in August. It is the invention of J. P. Lavigne, and is to be placed upon the market by a company now organized for that purpose, under the name of Detroit Automobile Manufacturing Company. It is intended to be sold for $375, and the present model only weighs 310 pounds. It is said to have made 18 miles per hour on a level road carrying four men of an average weight of 175 pounds, though its regular seating capacity is only two. It is intended largely for a lady's or juvenile machine, or for a general runabout for physicians, business men or others. It would probably look a little out of proportion for a large man, especially a tall man, but it would harmonize with medium size or small people, better, perhaps, than the runabouts of the extremely large sizes.

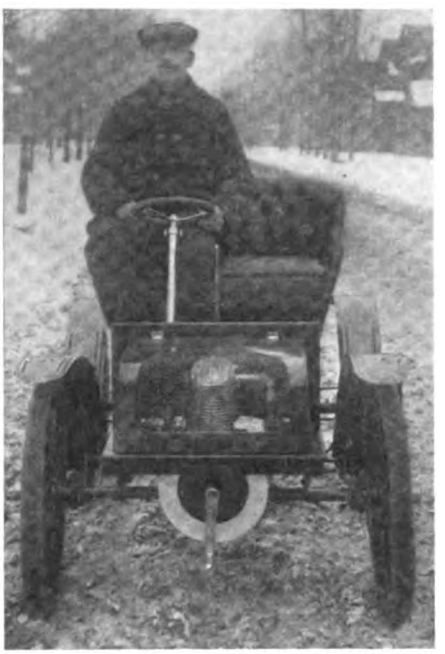
The present model has a single cylinder vertical engine of the De Dion type mounted under a bonnet in front; this is to be changed to a double cylinder of 2½x3 bore and stroke, the cylinders standing like V so as to receive equal air currents; the rating will be 3 horse power.

On the new car the ignition will be by a single induction coil, the engine being provided with a combined low tension circuit interrupter and a high tension commutator. A Kingston motor cycle vaporizer is used. The gasoline tank is located under the seat.

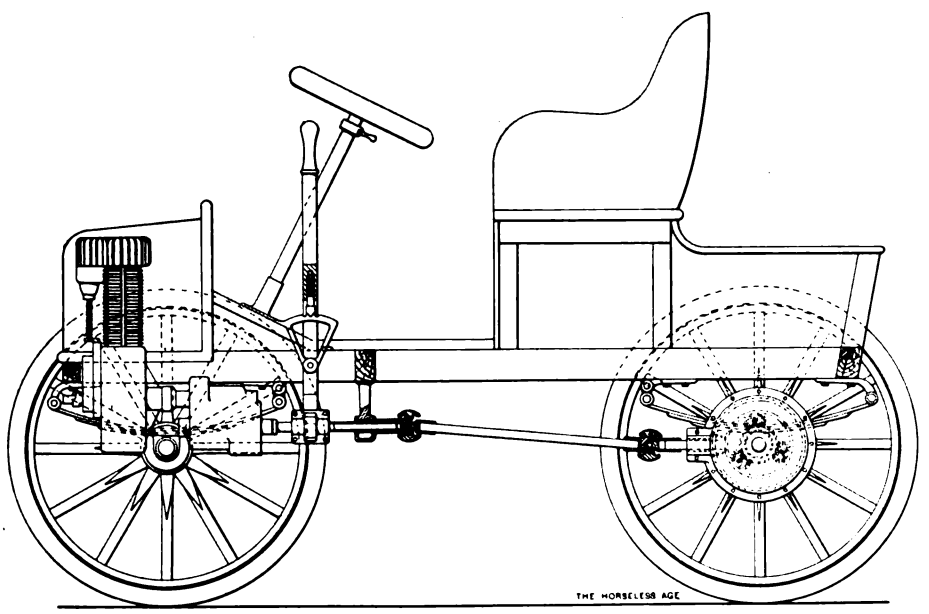
The change gear gives two forward speeds (in the new model it will also have a reverse), and is of the internal, individual clutch type. By referring to the sectional view of the clutch herewith, it will be seen that gear B, which is pinned to the motor shaft A, meshes with the gear C of equal pitch diameter which rotates freely on the hollow shaft K. Riveted to C is the clutch drum D with internal shoes E, which are held from rotation by the screw pins L and M entering the spider P and shaft K and are allowed a reciprocating motion therein. Gear and drum G, shoes F and pins N and O are similarly arranged, the gear meshing with the pinion H pinned on the motor shaft. A similar description applies to shoes J. Inside of the hollow shaft K is the notched solid shaft Q, which is given a reciprocating motion by the trunnioned box R, collar S and pin T. In the position shown in the drawing the cam, or raised portion of shaft Q, has forced out pin N and drum F, thus clutching drum and gear G. This causes the drive to take place from pinion H to gear G, thus giving the low speed. By drawing the controlling lever backward to the next notch in sector V, the cam is carried forward under pin L, and shoe E is clutched to drum D and gear C, thus driving from gear B to gear C without reduction, which gives the high speed. Throwing the lever forward to the other extremity causes the shoes J to expand and act as a brake against the stationary drum I.



"La Petite" Change Speed Gear.



"La Petite" Runabout.



Sectional Plan View of "La Petite" Runabout.

The drive to the rear axle is by Cardan shaft and bevel gears. The Cardan joint has an external spherical shaped ring that serves as the cross, the yokes being mounted inside. The pin bearings, however, are in the outer ring. One pin is made considerably larger than the other, so that the smaller one can pass through it, thus holding the larger one in place; the smaller one has its ends headed over. As will be noticed in the drawing, the spherical ring is dished out inside, so as to retain oil, and connects by an oil hole to the bearings of the pins. The rear joint shown in the drawing has been dispensed with, one joint only being used in the present machine. The rear drive is a typical bevel gear arrangement with spur gear differential.

A rack and pinion steering gear is used The rack being cylindrical, allows the steering post to tilt forward when desired. The springs are semi-elliptic, 22

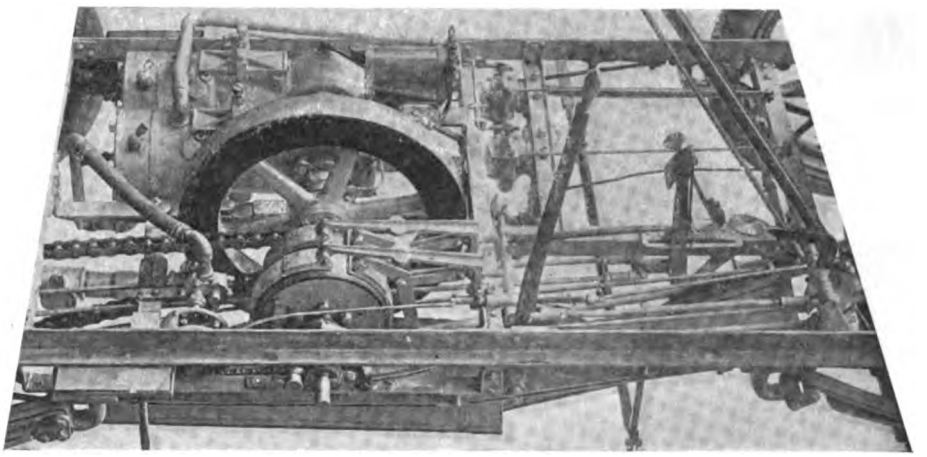
inches long, both front and rear. The wheels are of wood, are 28 inches in diameter, and shod with 2½ inch single tube tires. The throttle control handle is placed on the steering post just under the wheel.

There is a separate frame of angle iron, to which are fastened all parts except the body, making the body and chassis separate and independent, so that by releasing six bolts the body can be removed. The front axle is tubular. The tread is 40 inches, but an option will be given for standard tread; the wheel base is 46 inches (51 inches in the new machine). The body is painted a dark blue with gold striping, and upholstered with black leather. The chassis is also painted blue, two shades lighter than the body. A roomy compartment for parcels, etc., is provided in the body back of the seat.

The 1905 Elmore.

The 1905 Elmore car is of very attractive appearance. It has a neatly designed side entrance tonneau body, very tastily painted in dark blue, with light blue stripes and trimmed with brass, the chassis being a cream yellow. The engine is their well known two cycle, and is now built with two cylinders, placed side by side, and rated at 16 horse power at the normal speed of 800 revolutions per minute. The bore and stroke are 4½ and 4 inches respectively. The engine weighs, complete with flywheel, about 250 pounds. The cranks are set 180° apart. As the single engine was fully described in THE HORSELESS AGE last spring, it is not necessary to go any further into the details, as with one or two exceptions, which will be mentioned, they remain practically unchanged.

The circuit breaker, which is of the platinum pointed screw and spring type, is now placed upon a countershaft, with roller bearings, and is gear driven. The water pump, of the gear type, is also placed upon the end of this shaft. The ignition is by jump spark.



VIEW OF ELMORE CHANGE SPEED GEAR.

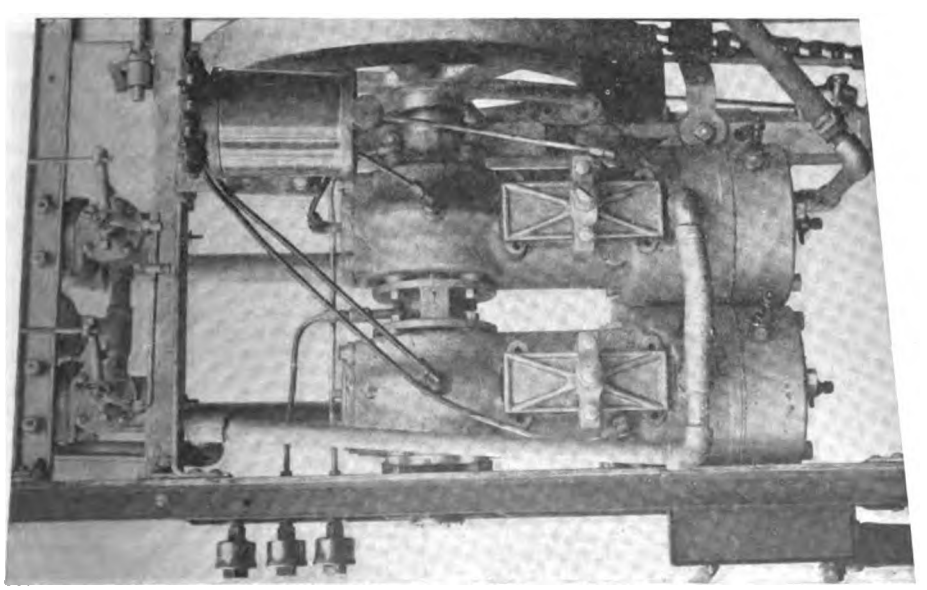
The bypass covers are now taken off by loosening one screw, where formerly six screws had to be taken out. This is plainly shown in the illustration herewith. The engine has all the self starting qualities of the four cylinder, four cycle engines, as was demonstrated to the writer's satisfaction, as he saw it start time and again without a failure, by simply throwing on the switch and shifting the spark lever until it reached the proper position to spark inside the cylinder. It would then immediately start off in good order.

A twin vaporizer, with one float chamber, common to both, is used. It is of the automatic type, the same as their last year's, but made considerably smaller.

The planetary gear is the same as last year, but of increased dimensions to allow for the extra engine power. The engine and transmission are placed under the front seat and transmit to the rear axle by a single chain, the same as last year. There is only one set of brakes, which act on the differential, the drums of which have been increased in diameter. The reverse gear is used as an emergency brake, it being possible to use both at once.

The radiator is changed somewhat, but more in appearance than principle. It is composed of round tubes with square gills, and at a casual glance has somewhat the appearance of the Mercedes type. The steering last year was direct, but is now accomplished with a rack and pinion.

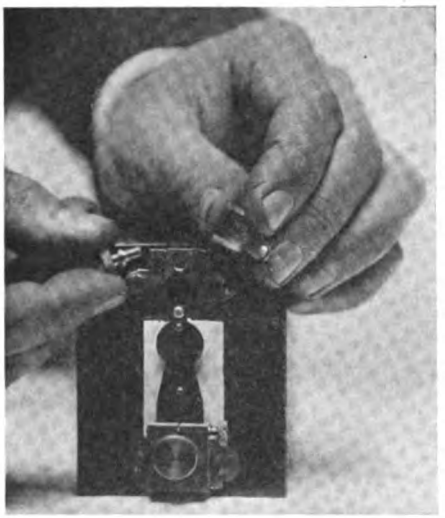
The frame is of angle iron and its stiffness and strength are largely increased by means of a truss rod running underneath. The axles are tubular and the adjustable radius rods are attached to the spring hanger. The springs are semi-elliptic, the front ones being 1¾x34 inches and the rear ones 1¾x36 inches. The rear ones are offset in the usual manner. The spark and throttle are located on the steering post; high and low speed is obtained by a side lever; a presser foot pedal operates the reverse, and a push foot pedal puts on the brakes. The water and gasoline tanks and the dry batteries are placed under the bonnet. The working parts of engine, gear and chain are easily accessible through the side entrance by lifting the floor boards. The engine is oiled by gravity sight feeds from a tank placed directly above it, and the main bearings are lubricated by grease cups placed on the outside of the frame. The total weight is about 1,500 pounds. The company are also turning out a single model with rear entrance tonneau.



TOP VIEW OF ELMORE MOTOR.

The American Mercedes.

The Daimler Manufacturing Company, of Long Isand City, N. Y., announce that their 1905 product will be an exact reproduction of the 40-45 horse power Mercedes cars made in Germany, as arrangements have been made whereby they secure not only complete working drawings of these cars but the material to be used as well. Certain parts, including the axles, will be imported complete, the work on them being done in the factory of the parent company, but the larger number of the various pieces will be made and all of the assembling done at their plant in this country.



WILLIAMS COIL, No. 3.

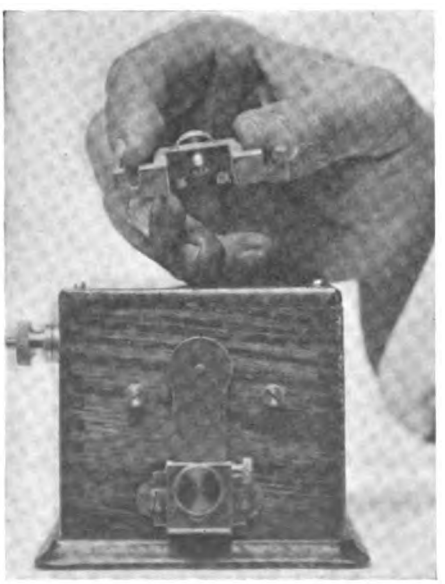
New Williams Spark Coils.

A recent call on E. Q. Williams at his factory in Syracuse disclosed a number of new improvements in the spark coil line, one quite important one being the interchangeability of coils. For example, take a four coil dashboard case, each coil is independently removable, so they may be shifted about in their relations to the cylinders. If a cylinder is behaving bad, and you suspect the coil, shift it to another cylinder, replacing it with the one removed. If the coil is at fault, the trouble will be shifted, and you will at once know whether to blame it, or to look elsewhere. All that is required to exchange coils is to remove a binding nut on the bottom of the case from each coil. The electrical connections are made automatically, and all connections are from the bottom, the vibrator being the only electrical part on top. It is claimed that this makes it easier to adjust and clean, and that it is also easier to keep the coil water and dust proof.

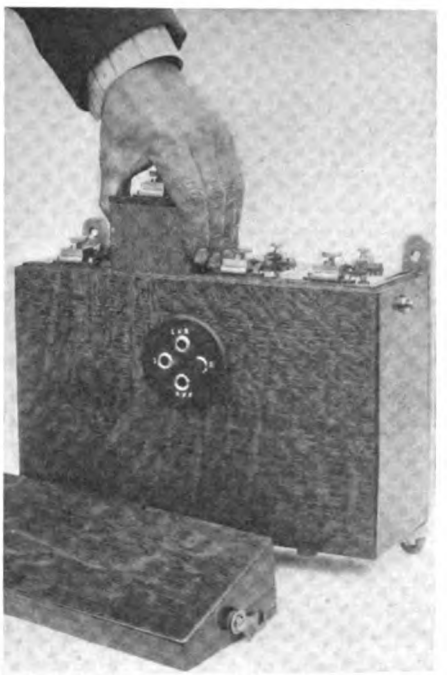
Mr. Williams is making two kinds of vibrators: one with the contact point at the extreme end, beyond the hammer; the other one with the regulation bridge and points. The bridge, however, embodies a handy little kink, which consists in cutting slots through the sides to the screw holes, so that it is only necessary to give the screws a fraction of a turn, when the bridge can be removed by pressing sideways, thus giving access for examining and "touching up" the points, the original adjustment remaining unchanged upon replacement. The vibrator with the end contact is known as the No. 3. The vibrator spring proper is very light and short, and the head is also light. This is said to give a very fast vibration. Instead of a bridge and contact screw, the upper contact point is held by a short steel spring. The latter is said to vibrate three or four times as fast as the vibrator spring. The action, as explained by Mr. Williams, is as follows: "When the vibrator hits this little spring it is set in very rapid vibration, with the result that we get a much quicker break than with the ordinary type. The lightness of the vibrator and its rapidity, together with the form in which it is constructed, insure a minimum current consumption. It will be noticed that the contact is made on the hammer, as far away from the spring support as possible. This manner of making the contact requires a very small motion of the vibrator to break the circuit."

The current consumption is claimed to be exceptionally small. To prevent the cover latches from jarring loose, there is attached to them what might be termed a spring dog that holds them in position. On a four coil case there are only ten terminals—two for each coil and one for each battery.

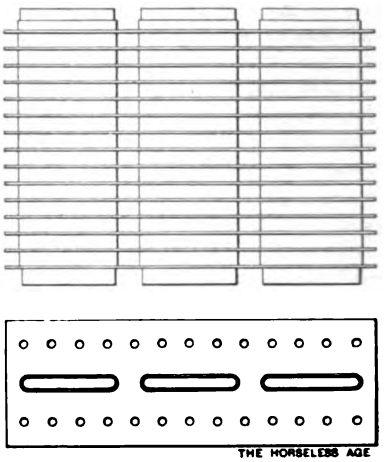
A four socket plug switch is placed on the front of the box.



WILLIAMS COIL, WITH REMOVABLE BRIDGE.



WILLIAMS QUADRUPLE COIL.

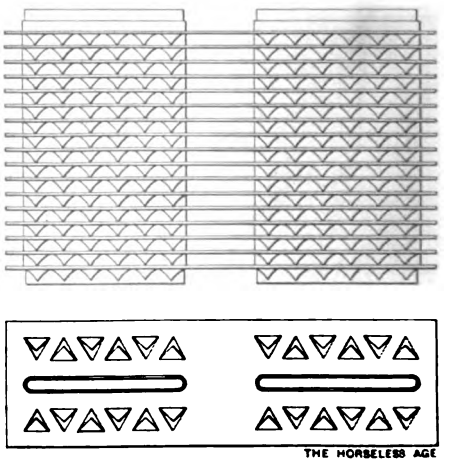


BRISCOE RADIATOR CONSTRUCTION.

Briscoe Cooling Specialties.

The Briscoe Manufacturing Company, of Detroit, have brought out a new line of flat tube rectangular fin radiators, and have made certain improvements in their honeycomb and other types. The new type is made up of several designs, all using flat tubes in multiples of two, three or more, depending upon the cooling surface required. The tubes run through rectangular strips of sheet copper, and usually the latter are punched with a V shaped tool, the points being bent to project out to better intercept the current of air, and thereby increase the radiation. A series of these elements are grouped in a frame. The ends of the tubes are joined by special fittings to connect them either in parallel or series; these fittings in turn being connected to the next upper or lower element by short curved pipes. A piece of sheet metal separates each element from its neighbor, thus aiding the conductivity of heat; the assembled radiator is then mounted in an ornamental polished brass case, which usually also serves as a water tank.

The company are now building their round tube coolers with the tubes staggered. Thus one tube does not intercept the air from those behind, no tubes being on the same horizontal plane. They also manufacture a line of fans which are made both with and without ball bearings.



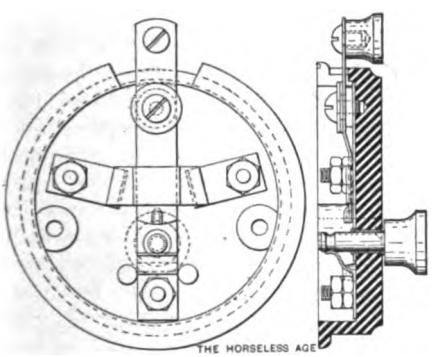
BRISCOE RADIATOR CONSTRUCTION.

The Dow Switch.

The sketch herewith shows the new ignition switch made by the Dow Portable Electric Company, of Braintree, Mass. It is intended for use with either two sets of batteries or a battery and generator. By moving the handle to the right or left either one or the other of the two sources of electrical energy are thrown into circuit, and when the handle is in the central position, as it is shown in the sketch, both are thrown in circuit and are arranged in multiple. A removable plug is supplied to cut off the current when the handle is in any position.

The Prest-O-Lite Acetylene Storage System.

The Concentrated Acetylene Company, of 330 North Illinois street, Indianapolis, Ind., have developed a system of storing acetylene for automobile lighting purposes



Dow Switch.

in tanks containing absorbent materials. They write us that they have established exchange agencies at more than 100 different points in the United States, where tanks can be gotten by tourists or customers in the immediate vicinity without the loss of time or trouble. It is their plan to make large shipments of tanks to the exchange agencies, and have agents accept the empty tanks for filled ones, supplying the latter immediately to customers.

The tank is 20 inches long by 6 inches in diameter. It has a specially constructed end gauge, which registers the amount of pressure and the number of cubic feet of gas in the tank. The gas is taken from the tank through a ground needle valve. It is claimed that 50 cubic feet of gas will supply two half foot burners for fifty continuous hours, and that the average driver does not use his lamps more than fifty continuous hours in sixty days.

The Pittsfield Timer.

The accompanying cut shows the new timer made by the Pittsfield Spark Coil Company, of Pittsfield, Mass. The various terminals, the number of which depends upon the number of cylinders in the motor, are arranged radially about the periphery of an aluminum containing case of circular shape, and are individually insulated from it by layers of mica.

The cam, which is secured to the half time shaft by a taper pin, bears against rollers at the free ends of a series of stiff steel levers. These are pivoted at their other ends, and the rollers held against the cams by coil springs wound about their pivots. As the platinum contact points on these levers come against those on the terminals in the containing case, the latter yield slightly, compressing small spiral springs which back them up and hold them in their normal positions. At the same time a slight sidewise movement takes place between the two, owing to the radial action of the levers.

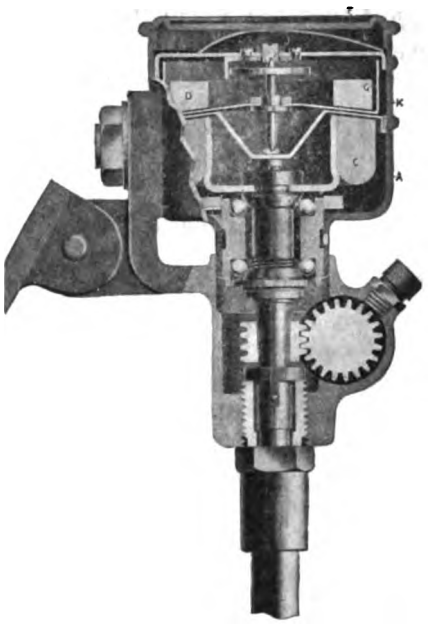
The device is entirely enclosed at the rear by shoulders and lips formed on the sleeve which supports the stationary member upon the shaft, and at the front by an aluminum cover, which is held in place by small thumb nuts run onto stud bolts.

The Auto-Meter.

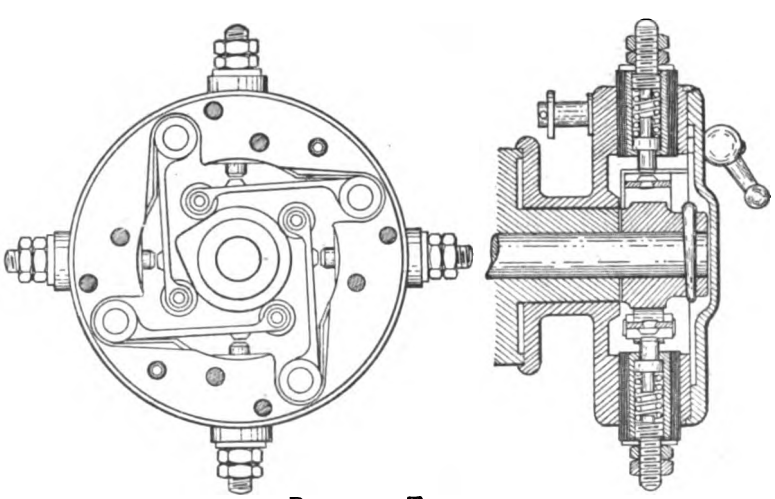
The internal construction of the auto-meter—a combined speed meter and odometer made by the Warner Instrument Company, of Beloit, Wis., is shown in the sectional sketch herewith. The device is contained within a cast brass case, provided with a screw cap cover F, all working parts therefor being protected from dirt. The main driving shaft, which connects at its lower end with the flexible shaft running to the driving gears at the hub of a wheel, revolves on the two ball bearings which can be seen at about the centre of the cut. The cone for the lower one of these is threaded on the shaft, so that the bearings can be adjusted.

Immediately below these bearings the driving gears for the odometer can be seen. They consist of a worm (shown in section) attached to the shaft and a corresponding gear attached to the spindle of the odometer, which is not shown in the cut. Above and to the right of this latter gear is a covered oil hole through which they may be periodically lubricated. The operation of the speedometer depends upon the principle of magnetic drag. Secured to the upper end of the shaft is the annular permanent magnet C, which revolves with the shaft. The dial, so called, is mounted on the outside face of the piece G, which has the shape of a disc with upturned rim, the figures being readable through the glass plate K. This piece is pivoted by means of the hardened steel vertical pin F in two sapphire bearings J J. The hairspring H at the top of this pin tends to hold the dial on the zero point, and the drag of the magnet C, as it revolves, tends to turn the dial against the efforts of this spring, the turning effort on the dial depending upon the speed at which the shaft is revolving, which, in turn, is governed by the speed of the car.

The dial is graduated to register the speed of the car by miles up to 60 per hour, or higher if desired. It is mounted within an independent housing E, which can be removed from the exterior casing by unscrewing the cap at the top of the device, so that adjustments can be readily made.



Sectional View of Auto-Meter.



Pittsfield Timer.

What the Show Offers.

Among the cars to be shown at Madison Square Garden next week are the following, which comprise nearly all the vehicles that will be exhibited. The list is arranged according to price, and gives the salient features of each machine.

GASOLINE VEHICLES.

$500.

Pope-Tribune, Model 2.—Two passengers, 6 horse power, 4½x4 inch vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 750 pounds.

$600.

Overland Runabout, Model 15.—Two passengers, 6-7 horse power, 3½x3½ inch two cylinder vertical motor, planetary transmission, two speeds and reverse, shaft drive, two brakes, lever steering.

$650.

Covert Runabout.—Two passengers, 6½ horse power, 4x4¼ inches, single cylinder vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 750 pounds.

$650.

Northern Runabout.—Two passengers, 6 horse power, 4¾x6 inch horizontal motor under body, planetary transmission, two speeds ahead and reverse, chain drive, two brakes, lever steering.

$650.

Oldsmobile Runabout.—Two passengers, single cylinder 5x6 inch motor under body, planetary transmission, two speeds and reverse, chain drive, two brakes.

$700.

Maxwell-Briscoe Runabout.—Three passengers, 8-10 horse power, 4x4 inch two cylinder horizontal motor under hood, planetary transmission, two speeds and reverse, shaft drive, one brake, wheel steering; weight, 850 pounds.

$750.

American Motor Company Runabout.—Two passengers, 10 horse power, 4x4 inch two cylinder vertical motor in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 785 pounds.

$750.

Mitchell Runabout.—Two passengers, 9 horse power, 4x4½ inch two cylinder vertical engine in front, sliding gear transmission, three speeds and reverse, chain drive, wheel steering, one brake; weight, 1,100 pounds.

$750.

Oldsmobile Touring Runabout.—Two passengers, horizontal single cylinder motor, 5x6 inch bore and stroke under body, planetary transmission, two speed and reverse, chain drive, two brakes.

$750.

Overland Runabout.—Two passengers, 8-9 horse power, 3½x4 inch two cylinder vertical motor in front, planetary transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,000 pounds.

$750.

Pierce-Racine Model A-1 Runabout.—Two passengers, 8 horse power, single cylinder vertical motor in front, planetary transmission, three speeds and reverse, chain drive, one brake, wheel steering; weight, 1,150 pounds.

$750.

Wolverine Model D Touring Car.—Five passengers, 20 horse power; 5x5 inch two cylinder opposed motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,700 pounds.

$800.

Acme Type 9, Light Runabout.—Two passengers, 9 horse power, 4⅛x5 inch single cylinder horizontal motor under body, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,100 pounds.

$900.

Crest Tonneau.—Four passengers, 8 horse power, 4x5 inch single cylinder air cooled vertical motor in front, planetary transmission, two speeds and reverse, shaft drive, wheel steering, one brake; weight, 1,300 pounds.

$900.

Pope-Tribune Model 4.—Side entrance tonneau, four pasengers, 12 horse power, 4½x4½ inch two cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,550 pounds.

$900.

Blomstrom Queen Model B.—Detachable tonneau body, two or four passengers, 12 horse power, double cylinder, horizontal opposed engine under body, planetary transmission, single chain drive, wheel steering.

$950.

Elmore Rear Entrance Tonneau.—Four passengers, 10 horse power, 5x4½ inch single cylinder horizontal motor under body, planetary transmission, two speeds and reverse, single chain drive, wheel steering, two brakes; weight, 1,300 pounds.

$950.

Glide Touring Car.—Four passengers, 8 horse power, 5x6 inch single cylinder horizontal motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,400 pounds.

$950.

Ford Model C.—Four passengers, 10 horse power double opposed motor under body, planetary transmission, two speeds and reverse, chain drive, one brake, wheel steering.

$950.

Oldsmobile Light Tonneau.—Four passengers, single cylinder horizontal motor, 5½x6 inches bore and stroke, located under body, two brakes, planetary transmission, two speeds ahead and reverse.

$1,000.

Acme, Type 10, Touring Runabout.—Two passengers, 16 horse power, 4x5 inch two cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,175 pounds.

$1,000.

Pope-Hartford Model B Tonneau.—Four passengers, 10 horse power, 5¼x6 inch single cylinder horizontal motor under body, spur gear transmission, two speeds and reverse, single chain drive, wheel steering, one brake; weight, 1,600 pounds.

$1,000.

Union Rear Entrance Tonneau.—Four passengers, 12 horse power, 5x4 inch two cylinder vertical motor in front, special variable speed transmission, double chain drive, wheel steering, two brakes; weight, 1,650 pounds.

$1,000.

Blomstrom Queen Model E.—Side entrance, tonneau body, five passengers, 16 horse power, double cylinder opposed motor in body, planetary transmission, two speeds and reverse, single chain drive, wheel steering.

$1,050.

Cameron Surrey.—Five passengers, 12-15 horse power, 3⅝x3¾ three cylinder vertical air cooled motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,150 pounds.

$1,100.

Michigan Light Touring Car, Model B.—Five passengers, 14 horse power, 4⅝x5 inch two cylinder horizontal opposed motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,550 pounds.

$1,100.

Yale Light Touring Car.—Side door tonneau body, double cylinder opposed horizontal motor under seat; planetary transmission; two speeds and reverse; single chain drive; wheel steering; weight, 1,650 pounds..

$1,125.

Glide Side Entrance Touring Car.—Four passengers, 12 horse power, 4⅜x4 inch two cylinder opposed motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,400 pounds.

$1,200.

Buick Touring Car.—Five passengers, 22 horse power, 4½x5 inch two cylinder opposed motor under body, planetary trans-

mission, two speeds and reverse, chain drive, wheel steering, three brakes; weight, 1,740 pounds.

$1,200.

Buffum Model F Light Car.—Two passengers, 12 horse power, 4x5 inch four cylinder vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,000 pounds.

$1,200.

Duryea Park Wagon.—Six passengers, 12-15 horse power, 4½x4½ inch three cylinder inclined motor under seat, planetary transmission, two speeds and reverse, chain drive, lever steering, one brake; weight, 1,150 pounds.

$1,200.

Model Touring Car, Style C.—Five passengers, 12 horse power, 4¼x5 inch two cylinder opposed motor under body, sliding gear transmission, four speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,200 pounds.

$1,200.

Pierce Stanhope.—Four passengers, 8 horse power, 3 15-16x4 5-16 inch single cylinder vertical motor, planetary transmission, two speeds and reverse, spur gear drive, wheel steering, one brake; weight, 1,250 pounds.

$1,200.

Union Side Entrance Tonneau.—Five passengers, 16 horse power, 6x4 inch two cylinder vertical motor in front, special variable speed transmission, double chain drive, wheel steering, two brakes; weight, 1,750 pounds.

$1,250.

Elmore Side Entrance Tonneau.—Five passengers, 16 horse power, 4¼x4 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, single chain drive, wheel steering, two brakes; weight, 1,500 pounds.

$1,250.

Knox Runabout.—Four passengers, 8-10 horse power, 5x8 inch single cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever steering, two brakes; weight, 1,700 pounds.

$1,250.

Michigan Light Touring Car, Model E.—Five passengers, 14 horse power, 4⅝x5 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,600 pounds.

$1,250.

Pierce Racine Model B-2 Side Entrance Tonneau.—Four passengers, 16 horse power, two cylinder vertical motor in front, planetary transmission, three speeds and reverse, chain drive, one brake, wheel steering; weight, 1,550 pounds.

$1,250.

Premier Runabout.—Two passengers, 16-18 horse power, 3¾x4¼ inch four cylinder vertical motor, transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,500 pounds.

$1,250.

Reliance Light Touring Car.—Side entrance tonneau, 16 horse power motor; weight, 1,700 pounds.

$1,250.

Reo Side Entrance Tonneau.—Five passengers, 16 horse power, 4¾x6 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,500 pounds.

$1,250.

Wayne Touring Car.—Five passengers, 16-22 horse power, 5x5 inch two cylinder horizontal motor under seat, planetary trnnsmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,650 pounds.

$1,300.

Stevens-Duryea Model L Runabout.—Two and four passengers, 7 horse power, 4¾x4½ inch two cylinder horizontal motor under body, individual clutch transmission, three speeds and reverse, single chain drive, lever steering, two brakes; weight, 1,350 pounds.

$1,350.

Haynes-Apperson Touring Car.—Two passengers, 15-18 horse power, 5x5 inch two cylinder opposed motor under body, individual clutch transmission, three speeds and reverse, chain drive, wheel steering, one brake; weight, 1,500 pounds.

$1,350.

Rambler Surrey, Type 1.—Five passengers, 18 horse power, 5x6 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, single chain drive, wheel steering, two brakes; weight, 2,000 pounds.

$1,350.

Studebaker, Model 9502.—Five passengers, 15 horse power, 5x5½ inch two cylinder horizontal opposed motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,950 pounds.

$1,400.

Compound Model 4 Side Entrance Tonneau.—Four passengers, 12-15 horse power, 4x4 inch three cylinder compound vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,250 pounds.

$1,400.

Franklin Model E.—Two passengers, 12 horse power, 3¼x3¼ inch four cylinder vertical air cooled motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,000 pounds.

$1,400.

Oldsmobile Touring Car.—Four passengers, 20 horse power, two cylinder horizontal opposed motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes.

$1,400.

Premier Tonneau.—Four passengers, 16-18 horse power, 3¾x4¼ inch four cylinder vertical motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,600 pounds.

$1,500.

Columbia Light Touring Car.—Four passengers, 12-14 horse power, 5x4½ inch two cylinder opposed motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,870 pounds.

$1,500.

Dolson Side Entrance Detachable Tonneau.—Five passengers, 20 horse power, 5½x6 inch two cylinder opposed motor under body, planetary transmission, two speeds and reverse, chain drive, wheel steering, two brakes; weight, 2,000 pounds.

$1,500.

Duryea Phaeton.—Four passengers, 12-15 horse power, 4½x4½ inch three cylinder inclined motor under seat, planetary transmission, two speeds and reverse, chain drive, lever steering, one brake; weight, 1,100 pounds.

$1,500.

Franklin Model A.—Two passengers, 12 horse power, 3¼x3¼ inch four cylinder vertical air cooled motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,100 pounds.

$1,500.

Haynes-Apperson Light Touring Car.—Side entrance tonneau, four passengers, 15-18 horse power, 5x5 inch two cylinder opposed motor under body, individual clutch transmission, three speeds and reverse, shaft drive, wheel steering, one brake; weight, 1,500 pounds.

$1,500.

Knox Runabout.—Four passengers, 14-16 horse power, 5x6 inch two cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever or wheel steering, two brakes; weight, 1,850 pounds.

$1,500.

Marion Side Entrance Detachable Tonneau.—Five passengers, 16 horse power, 4x4 inch four cylinder vertical air cooled motor transverse in front, planetary transmission, two speeds and reverse, double chain drive, wheel steering, two brakes; weight, 1,600 pounds.

$1,500.

Mitchell Side Entrance Tonneau.—Five passengers, 18-20 horse power, 4x4½ inch

cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,750 pounds.

$1,500.

Northern Touring Car.—Two passengers, 17 horse power, 5¼x5¼ inch two cylinder opposed motor in front, planetary transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,700 pounds.

$1,500.

Oliver Side Entrance Tonneau.—Five passengers, 12 horse power, 2¾x3½ inch two cylinder horizontal motor in front, double chain drive, wheel steering, one brake; weight, 1,750 pounds.

$1,500.

Premier Side Entrance Tonneau.—Five passengers, 16-18 horse power, 3¾x4¼ inch four cylinder vertical motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,600 pounds.

$1,500.

Overland Touring Car, Model 18.—Five passengers, 15-16 horse power, four cylinder vertical motor, with cylinders 3½x4 inches, planetary transmission, two speeds and reverse, shaft drive, wheel steering, two brakes.

$1,550.

Maxwell-Briscoe Model H Touring Car.—Five passengers, 16-18 horse power, 5x5 inch double opposed motor under hood, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$1,550.

Jackson Model C Touring Car.—Five passengers, 18 horse power, 5x5 inch double opposed motor under body; weight, 1,500 pounds.

$1,600.

Model Touring Car, Style B.—Five passengers, 16 horse power, 4½x7 inch two cylinder opposed motor under body, sliding gear transmission, four speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,400 pounds.

$1,600.

Northern Touring Car Rear Entrance Tonneau.—Five passengers, 17 horse power, 5¼x5¼ inch two cylinder opposed motor in front, planetary transmission, two speeds and reverse, shaft drive wheel steering, two brakes; weight, 2,100 pounds.

$1,600.

Pope-Hartford Model D, Side Entrance Tonneau.—Five passengers, 16 horse power, 4¾x4½ inch two cylinder horizontal opposed motor under body, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,900 pounds.

$1,650.

Acme Type 6, Light Touring Car.—Five passengers, 16 horse power, 4x5 inch two cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, two brakes; weight, 1,900 pounds.

$1,650.

Franklin Model B.—Four passengers; 12 horse power, 3¼x3¼ inch four cylinder vertical motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,250 pounds.

$1,650.

Waltham Side Entrance Tonneau.—Four passengers, 15-20 horse power, 3x4¼ inch four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,450 pounds.

$1,700.

Franklin Model F, Front Entrance Tonneau.—Four passengers, 12 horse power, 3¼x3¼ inch four cylinder vertical air cooled motor transverse in front, planetary transmission, two speeds and reverse, chain drive, wheel steering, one brake; weight, 1,250 pounds.

$1,700.

Northern Side Entrance Touring Car.—Five passengers, 17 horse power, 5¼x5¼ inch two cylinder opposed motor in front, planetary transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,100 pounds.

$1,750 (?)

Autocar Side Entrance Tonneau.—Five passengers, 16-20 horse power, 3½x4 inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,900 pounds.

$1,750.

Columbia Light Touring Car, Side Entrance.—Four passengers, 16 horse power, 5x4½ inch two cylinder opposed motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,900 pounds.

$1,750.

Knox Surrey.—Four pasengers, 14-16 horse power, 5x6 inch two cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever or wheel steering, two brakes; weight, 1,950 pounds.

$1,800.

Winton Model C.—Five passengers, 16-20 horse power, 3½x5 inch four cylinder vertical motor in front, individual clutch transmission, two speeds and reverse, shaft drive, two brakes; weight, 1,800 pounds.

$1,850.

Pungs-Finch Side Door Tonneau.—Five passengers, 22 horse power, 4x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$1,900.

Knox Side Entrance Tonneau.—Five passengers, 14-16 horse power, 5x6 inch two cylinder horizontal air cooled engine under body, planetary transmission, two speeds and reverse, single chain drive, lever or wheel steering, two brakes; weight, 2,000 pounds.

$2,000.

Compound Model 3, Side Entrance Tonneau.—Five passengers, 24-28 horse power, 5¾x5¾ inch three cylinder compound vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,150 pounds.

$2,000 (?)

Covert Touring Car.—Five passengers, 24 horse power, 4x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$2,000.

Corbin Model D, Side Entrance Tonneau.—Four passengers; 16-20 horse power, 3¾x4¼ inch four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,750 pounds.

$2,000.

Knox Commercial Vehicle.—Capacity 1,500 pounds, 8-10 horse power, 5x8 inch single cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever steering, two brakes; weight, 2,500 pounds.

$2,000.

Model Touring Car.—Five passengers, 20 horse power, 5x7 inch two cylinder opposed motor under body, sliding gear transmission, four speeds and reverse, chain drive, wheel steering, two brakes; weight, 1,600 pounds.

$2,000.

Oldsmobile Heavy Delivery Wagon.—Capacity 2,000 pounds, 16 horse power, 5x5 inch two cylinder vertical motor under seat, double chain drive, planetary transmission, two speeds and reverse, two brakes.

$2,000.

Rambler Surrey, Type 2.—Five passengers, 20 horse power, 5x6 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,200 pounds.

$2,000.

Regas Detachable Side Entrance Tonneau.—Five passengers, 26-28 horse power, 4½x5 inch four cylinder vertical motor in front, sliding gear transmission, three speeds ahead and reverse, double chain drive, wheel steering, two brakes; weight, 1,850 pounds.

$2,000.

Springer Delivery Wagon.—Capacity 1 ton, 12-14 horse power, two cylinder horizontal opposed motor, sliding gear transmission, three speeds and reverse, double

chain drive, wheel steering, two brakes; weight 2,200 pounds.

$2,000.

Waltham Side Entrance Tonneau.—Five passengers, 20 horse power 4x4¼ inch four cylinder vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight 1,650 pounds.

$2,000.

Wayne Side Entrance Tonneau.—Five passengers, 24-28 horse power, 4x5 inch four cylinder vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,600 pounds.

$2,000.

Ford Model B.—Five passengers, 20 horse power, 4x5 inch four cylinder vertical motor in front, planetary transmission, shaft drive, two speeds and reverse, wheel steering; weight, 1,710 pounds.

$2,500.

Franklin, Model B.—Five passengers, 20 horse power, 4x4 inch four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$2,500.

Frayer-Miller Side Entrance Detachable Tonneau.—Five passengers, 24 horse power, 4 1-16x5⅛ four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight 1,800 pounds.

$2,500.

Knox Patrol Wagon.—Ten passengers, or 2,000 pounds capacity, 14-16 horse power, 5x6 inch two cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever steering, two brakes; weight, 3,200 pounds.

$2,500.

Northern Limousine.—Four passengers, 17 horse power, 5¼x5¼ inch two cylinder opposed motor in front; planetary transmission, two speeds and reverse, wheel steering, two brakes; weight, 2,400 pounds.

$2,500.

Stevens-Duryea Model R Touring Car.—Four passengers, 20 horse power, 3⅞x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, two brakes, wheel steering; weight, 1,650 pounds.

$2,500.

Springer Model A Touring Car.—Five passengers, 12-14 horse power, two cylinder horizontal opposed air cooled motor under body, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 1,800 pounds.

$2,500.

National Model C.—Five passengers, four cylinder 4¼x5 inch vertical motor in front, sliding gear transmission direct on high, wheel steering, internal expansion brakes.

$2,500.

Upton Side Entrance Tonneau.—Five passengers, 30 horse power, 4¼x4¾ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,000 pounds.

$2,500.

Winton Model B.—Five passengers, 24-30 horse power, 4⅜x5 inch four cylinder vertical motor in front, individual clutch transmission, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,100 pounds.

$2,500.

Yale Touring Car.—Side entrance tonneau body; 24 to 28 horse power; four cylinder vertical engine in front; 4¾x4½ inch cylinders, sliding pinion change gear; bevel gear drive; weight, 2,300 pounds.

$2,550.

Knox Commercial.—16-18 horse power, 5x7 inch two cylinder horizontal air cooled motor under body, planetary transmission, two speeds and reverse, single chain drive, lever steering, two brakes; weight, 3,300 pounds.

$2,750.

Acme Type 8 Touring Car.—Five passengers, 30 horse power, 4x5 inch four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,300 pounds.

$2,750.

Meteor.—Five passengers, 18 horse power, 3¾x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$2,800.

Cadillac Model D.—Five passengers, 30 horse power, 4⅜x5 inch, four cylinder vertical motor in front, planetary transmission, three speeds and reverse, wheel steering, two brakes; weight, 2,600 pounds.

$2,800.

Cleveland Light Touring Car.—Five passengers, 18 horse power, 3⅓x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 1,800 pounds.

$2,800.

Locomobile, Type E, Side Entrance Tonneau.—Five passengers, 20 horse power, 3¾x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 1,800 pounds.

$3,000.

Haynes-Apperson Touring Car.—Side entrance body, five passengers, 35-40 horse power, 5x5 inch four cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,750 pounds.

$3,000.

Packard Model L Touring Car.—Five passengers, 22 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, wheel steering, two brakes; weight, 2,200 pounds.

$3,000.

Rambler Limousine.—Five passengers, 20 horse power, 5x6 inch two cylinder horizontal motor under body, planetary transmission, two speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,400 pounds.

$3,000.

Royal Tourist.—Five passengers, 32-38 horse power, 5x5½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,450 pounds.

$3,000.

Studebaker Model 9503.—Five passengers, 20 horse power, 3⅞x4½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,100 pounds.

$3,000.

Thomas Model 25, Chassis.—Forty horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,600 pounds.

$3,000.

Warren Side Entrance Tonneau.—Five passengers, 44 horse power, 6x6 inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,800 pounds.

$3,000.

Packard Two Passenger Special.—Twenty-eight horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,200 pounds.

$3,200.

Peerless Double Side Entrance Touring Car.—Five passengers, 24 horse power, 4x5½ inch four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,400 pounds.

$3,500.

Franklin Model C.—Five passengers, 30 horse power, 5x5 inch four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, shaft

drive, wheel steering, two brakes; weight, 2,400 pounds.

$3,500.

Packard Model N, Side Entrance Tonneau.—Five passengers, 28 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,350 pounds.

$3,500.

Pierce Great Arrow, Side Entrance Tonneau.—Five passengers, 24-28 horse power, 3 15-16x4¾ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,500 pounds.

$3,500.

Pope-Toledo Touring Car.—Five passengers, 30 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes.

$3,500.

Thomas Model 26 Touring Car.—Five passengers, 50 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,750 pounds.

$3,500.

Springer Model B Touring Car.—Seven passengers, 12-18-24-30 horse power, four cylinder double opposed motor under body, sliding gear transmission, three speeds and reverse, double chain drive. wheel steering, two brakes; weight, 2,600 pounds.

$3,500

Standard Touring Car.—Five passengers, 25 horse power, 4x5½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,200 pounds.

$3,500.

Austin Touring Car.—Side door tonneau body, five passengers, 50 horse power, four cylinder 5½x5 inch vertical motor in front, Austin planetary combination gear, three forward speeds and reverse, direct bevel gear drive, worm and nut steering by hand wheel, two brakes; weight, 2,400 pounds.

$3,500.

Winton Model A.—Five passengers, 40-50 horse power, 5¼x6 inch four cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, wheel steering, two brakes; weight, 2,400 pounds.

$3,500.

Winton Model B, Limousine.—Eight passengers, 24-30 horse power, 4⅜x5 inch vertical motor in front, individual clutch transmission, two speeds and reverse, shaft drive, wheel steering, two brakes.

$3,700.

Type D Locomobile.—Five passengers, 25 horse power, 4x5 inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,200 pounds.

$4,000.

Ardsley Side Entrance Touring Car.—Five passengers, 30-35 horse power, 4⅝x5¾ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,250 pounds.

$4,000.

Buffum Model K Touring Car.—Five passengers, 28 horse power, 4½x5½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,000 pounds.

$4,000.

Corbin Model C Side Entrance Tonneau.—Five passengers, 24-28 horse power, 4½x5½ inch four cylinder vertical air cooled motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,400 pounds.

$4,000.

Pierce Great Arrow Side Entrance Tonneau.—Five passengers, 28-32 horse power, 4¼x4¾ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,700 pounds.

$4,000.

Thomas Limousine, Model 29.—Seven passengers, 50 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,800 pounds.

$4,000 to $5,500.

Columbia Touring Car (Body Optional).—Five to seven passengers, 35-40 horse power, 5x5 inch four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 3,060 pounds.

$4,000 to $8,000.

Welch Pullman Limousine.—Seven passengers, 30-36 horse power, 4½x5 inch four cylinder vertical motor in front, sliding gear transmission with individual clutches, two speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,800 pounds.

$4,100.

Packard Inside Driven Brougham.—Two passengers, 28 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, shaft drive, wheel steering, two brakes; weight, 2,400 pounds.

$4,500.

Winton Model A Limousine.—Eight passengers, 40-50 horse power, 5¼x6 inch four cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, wheel steering, two brakes.

$4,600.

Packard Limousine.—Four passengers, 28 horse power, four cylinder vertical motor in front, sliding gear transmission, two speeds and reverse, shaft drive, two brakes; weight, 2,550 pounds.

$4,800.

Peerless 35 Horse Power Limousine.—Five passengers, four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, shaft drive, wheel steering, two brakes.

$5,000.

Locomobile Type H.—Seven passengers, 35 horse power, 4½x5½ inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,500 pounds.

$5,000.

Matheson Touring Car.—Seven passengers, 24 horse power, 4½x6 inch four cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,700 pounds.

$5,000.

Pope-Toledo Landaulette.—Five passengers, 30 horse power, four cylinder vertical motor in front; sliding gear transmission, two speeds and reverse, chain drive, two brakes.

$5,000.

Sturtevant Side Entrance Tonneau.—Five passengers, 35-48 horse power, 4½x5 inch six cylinder horizontal opposed motor under body, special three speed transmission, shaft drive, wheel steering, pneumatic brake; weight, 3,000 pounds.

$5,000.

Lozier Touring Car.—Five passengers, 30-35 horse power, 4½x5 inch four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,500 pounds.

$6,000.

Matheson Touring Car.—Seven passengers, 40 horse power, 5x6 inch four cylinder vertical motor in front, individual clutch transmission, three speeds and reverse, double chain drive, wheel steering, two brakes.

$6,000.

Thomas Model 27 Touring and Racing Car.—Four passengers, 60 horse power, six cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, two brakes; weight, 2,700 pounds.

$6,250.

Pope-Toledo Side Entrance with Victoria Top.—Five passengers, 45 horse power, four cylinder vertical motor in front; sliding gear transmission, three speeds and reverse, double chain drive, wheel steering, two brakes.

$6,500.

Manhattan Car.—Fifteen to twenty-five passengers, 50 horse power, 5½x6 inch four cylinder vertical motor in front, special transmission, two speeds and reverse, double chain drive, wheel steering, two brakes; weight, 5,000 pounds.

$7,200.

Panhard Touring Landaulet.—Five passengers, 18 horse power, 100x130 mm. four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,600 pounds.

$7,500.

Daimler Touring Car.—Seven passengers, 40-45 horse power, 120x150 mm. four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, three brakes; weight, 2,200 pounds.

$7,500.

Locomobile, Type F.—Seven passengers, 45 horse power, 5x6 inch four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,800 pounds.

$8,000.

De Dietrich Coupé Limousine.—Seven passengers, 20 horse power, four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 3,000 pounds.

$8,100.

Panhard Double Phaeton.—Five passengers, 24 horse power, 110x130 mm. four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,700 pounds.

$8,500.

De Dietrich Side Entrance Touring Car.—Five passengers, 30 horse power, four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,750 pounds.

$10,500.

Panhard Cab.—35 horse power, 130x130 mm. four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, two brakes; weight, 2,800 pounds.

$12,000.

De Dietrich Touring Car.—Five and seven passengers, 40 horse power, four cylinder vertical motor in front, sliding gear transmission, four speeds and reverse, double chain drive, wheel steering, three brakes; weight, 3,200 pounds.

$14,500.

De Dietrich Racing Car.—Two passengers, 80 horse power, four cylinder vertical motor in front, sliding gear transmission, three speeds and reverse, double chain drive, wheel steering.

ELECTRIC VEHICLES.

$900.

Columbia Electric Runabout.—One motor, three speeds, chain drive, Exide divided battery of twenty cells; capacity, 120 ampere hours; weight, 1,360 pounds.

$950.

Pope-Waverley Speed Wagon Model 36.—Gear drive, National or Exide batteries.

$1,350.

Columbia Victoria-Phaeton.—One motor, three speeds, enclosed chain drive, Exide divided battery of twenty-four cells; capacity, 120 ampere hours; weight, 1,610 pounds.

$1,450.

Pope-Waverley Coupé Top Chelsea Model 26 C.—Gear drive, National or Exide batteries.

$1,600.

Columbia Victoria.—Two motors, three speeds, direct drive, Exide divided battery of forty cells; capacity, 96 ampere hours; weight, 2,000 pounds.

$2,250.

Pope-Waverley Station Wagon Model 30.—Gear drive, National or Exide batteries.

$3,000.

Baker Electric Depot Carriage.—2¼ horse power motor, three speeds. gear drive, twenty-four cell batteries; mileage, 40; speed, 14 miles per hour; weight, 2,300 pounds.

$3,500.

Columbia Brougham-Landaulet.—Two motors, four speeds, direct drive. Exide under slung batteries of forty-four cells; capacity, 140 ampere hours; weight, 5,000 pounds.

STEAM VEHICLES.

$800.

Prescott Runabout.—Two to four passengers, 7½ horse power, steam engine located at centre of car, chain drive, side steering, one brake; weight, 1,400 pounds.

$1,500.

Grout Steam Touring Car.—Five passengers, 12 horse power, 2¾x3½ inch two cylinder horizontal motor under body, double chain drive, wheel steering, two brakes; weight, 1,750 pounds.

$2,500.

White Steam Car.—Five passengers, 15 horse power, 3½x5 inch two cylinder vertical compound motor under body, shaft drive, wheel steering, two brakes; weight, 2,200 pounds.

$5,000.

United Motor and Vehicle Company Side Entrance Tonneau (Steam).—Seven passengers, 25 horse power four cylinder horizontal opposed steam motor under footboard, direct drive, wheel steering, two brakes; weight, 2,600 pounds.

The total attendance at the Paris Show during the seventeen days it remained open is stated to have been 320,000, or 60,000 more than last year. The largest attendance was recorded on Sunday, December 18, viz., 54,000, as against 37,000, the largest attendance for a single day year before last.

Markets for American Automobiles Abroad.

Consul Mowrer, of Ghent, Belgium, writes that about 270 automobiles are now being used in East Flanders, and the demand increases from year to year. The most popular machines are those of from 12 to 26 horse power. French makes only are sold in that market, up to the present, for the following reasons mainly: The French machines are well adapted to Belgian roads, which are paved with Belgian block stone, even between small villages; they are cheaper than American machines, and the parts needed for repairs can easily be obtained from the factory if they are not carried in stock by the agent; the chauffeurs and mechanics are more familiar with the French types, and agents carry and exploit only French makes. Through the press the merits of American automobiles are atracting attention, however, and their introduction has already begun in Antwerp and Brussels.

Henry H. Morgan, consul at Luzerne, Switzerland, writes that, according to his belief, the time is at hand when American manufacturers of automobiles and motor boats will find a market in Europe, and it may be well for them to give the subject serious attention. In Lucerne there are a few machines of American make, and the owners express themselves as being pleased with them. The small "runabout," so extensively used in the United States, would find a market there, and the consular office will be glad to distribute where they will do the most good any catalogues or literature upon the subject.

James Boyle, consul at Liverpool, observes that it is unfortunate for the reputation of American cars in England that a number of the makes sent over have not been of the best—cheapness and showy looks evidently being considered more important than quality. There are American cars in England which have a good reputation, and he thinks there is a market for a thoroughly good American car at moderate price. There is no question about the quality of English made cars, but as a rule they are too expensive. It is suggested that American manufacturers of motor cars come to some arrangement with reliable agents in London, rather than endeavor to develop a direct trade with the retail buyer by correspondence and printed matter. In England, as in the United States, cars should be well advertised. Under no circumstances should American single tube tires be sent there; it would be better to send cars fitted with "clincher" rims, suitable to take the English and Continental tires. Sample sets of English or Continental tires could be purchased in the United States, and American manufacturers of cars could then see that the rims were made to fit. Arrangements could easily be made to fit English or Continental tires on the cars after arrival on this market.

COMMUNICATIONS

Cooling Oil Experience.

Editor HORSELESS AGE:

I have read with interest the articles for and against the use of oil for cooling automobile engines in winter, and perhaps my experience with this oil may be of interest to some of your readers.

When I first applied for an oil for cooling gas engines the local representatives of the Standard Oil Company did not seem to know of just such an oil, but said they had an oil which was used for oiling windmills and other apparatus used in the open, and which would not freeze at the lowest of temperatures. I purchased 5 gallons to try this oil (it is known as Polar Ice), and it has proven satisfactory in every way. So far this winter the temperature has been as low as 7° below zero, and with one exception the oil has never failed to cool the engine. This one instance was when the supply of cylinder lubricating oil gave out, and under such circumstances the engine would have overheated with water in the circulating system.

The machine in which this oil was used stands in a cold, unheated barn (not in a warm garage), and the oil has never failed to give good service.

It is known that oil attacks rubber hose, but when a person knows that his engine will be cooled and that his cooling medium will not freeze or evaporate, he feels that he can afford to replace leaky hose at the end of the winter months.

HAROLD R. WELLS.

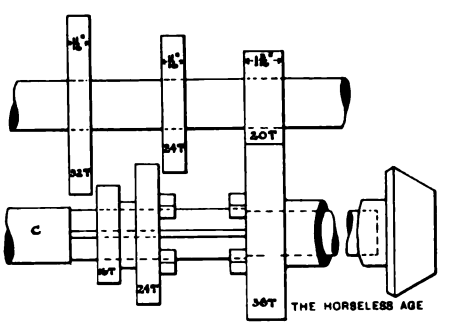
Gear Design Problem.

Editor HORSELESS AGE:

I have read with interest the recent articles on change gear design, but find some variation in the results of the formula of Mr. Heldt and Mr. Fay. I enclose sketch of a gear, which, we will say, necessitates the use (for constructional reasons) of a finer pitch on the "countershaft gears" which are at the drive end. The faces of these gears have been deduced from a number of formulæ with varying results. Would like to hear Mr. Heldt's and Mr. Fay's solution of this construction, giving an equal stress per square inch on the low speed pinion when driving through low gear. That is, so that the teeth of each pinion shall be equally loaded in proportion to its face and pitch. It will be seen that the angular velocity of the countershaft pinion when driving on the intermediate speed is the same as that of the driving shaft, and when driving on low gear is just half the speed of the drive shaft. The ineffective portion of the face is to be omitted from the calculation, as the full face of the tooth can be made effective, if the teeth are beveled only on one face, leaving the driving face intact.

The engine will develop 594,000 foot pounds per minute at 950 revolutions per minute. Normal piston speed, 633 feet per minute. BERNARD FISHBACK.

[No formulæ for this type of gears were given in our article on gear design, as only two of the cars the gear data of which was gathered had their gears arranged in this manner. It will be noticed, by referring back to this article, that the stress in the metal for the first speed pinions is in each case about 28,000 pounds, while the stress for the countershaft pinions is in one case 37,000 and in the other 49,000, or an average therefore of 43,000 pounds. If you wish to use the same stress in the first speed pinion and in the countershaft pinion you will get a countershaft pinion proportionately wider and a first speed pinion proportionately narrower than used on the two cars with this type of gear referred to in the article on gear design. An average stress of 35,000



GEAR DESIGN PROBLEM.

pounds per square inch might be allowed. This would give a width of eleven-sixteenths inch for the first speed pinion and 1 3-16 inches for the countershaft pinion. The intermediate speed pinion transmits a tangential pressure only two-thirds as great as that transmitted by the low speed pinion, but as it runs at a proportionately greater peripheral speed, the width can hardly be made less than that of the low speed pinion, viz., eleven-sixteenths inch.—ED.]

Wants a Side Door Body.

Editor HORSELESS AGE:

Will you kindly inform me through your valuable paper, or ask some of your kind readers, whether it would be possible to convert my 1904 autocar with rear entrance tonneau body to a side entrance tonneau vehicle, without reducing the speed or otherwise injuring the car? Also about what the cost would be? A. J. S.

[We do not believe that it is possible to fit a side entrance tonneau body, as this requires at least a foot more room back of the front seat than the ordinary tonneau, and the frame is not long enough for that.—ED.]

Expense of Operating a Steam Runabout.

Editor HORSELESS AGE:

Having read with much interest the expense accounts of different car owners in your recent issues, I thought perhaps my experiences in the expense line might interest others; here they are:

In April, 1903, I purchased a second hand steam runabout. During the summer I used it as a touring car, myself and wife making a trip to Monterey over the Santa Cruz and San Juan mountains, and side trips, 430 miles the round trip. In the late autumn we made a tour through Lake County, one of the many "Switzerlands of America," over some rough mountain roads, running in all 2,058 miles for the season.

Early this spring we toured to the "Giant Forest" in the Sequoia National Park, and return, 625 miles, and were the first to negotiate that mountain road with an automobile. Some idea of the climb can be obtained from Geological Survey mark of 6,400 feet elevation at Camp Sierra—enough to convey the idea that we are not patrons of the park boulevards. Being a machinist by trade and occupation has reduced my expense account, I believe, very much. I have run the car 1,551 miles this year, or 3,609 miles in two seasons.

Depreciation, 15 per cent. of cost. per season, $56.25	$112.50
Gasoline, 420 gallons, average price $21.94	92.15
Repairs, spring, burner, chain, balls, etc.	62.90
Tires, vulcanizing, inner tube, repair outfit, etc.	50.50
Miscellaneous supplies, lamps, horn, robe, etc.	16.90
Transportation, by boat, ferry, etc.	14.05
Stabling on road, alterations in stable, etc.	18.80
Insurance, first season, $300, 2 per cent.	6.00
A total cost of	$373.80

Or 10.35 cents per mile. Ignoring the all important factor, depreciation, the bill would be $261.30, or 7¼ cents per mile. The average mileage per gallon of gasoline was 8.35.

The following list shows a percentage of cost of the different expenses

		Without Depreciation
Depreciation	.30	...
Gasoline	.25	.35
Repair	.17	.24
Tires	.14	.19
Stabling	.05	.07
Miscellaneous supplies.	.04	.07
Transportation	.04	.06
Insurance	.01	.02
	1.00	1.00

As to present condition of car, it is A1, ready to run on ten minutes' notice.

W. G. LUPER.

Winter Use of a Steam Car.

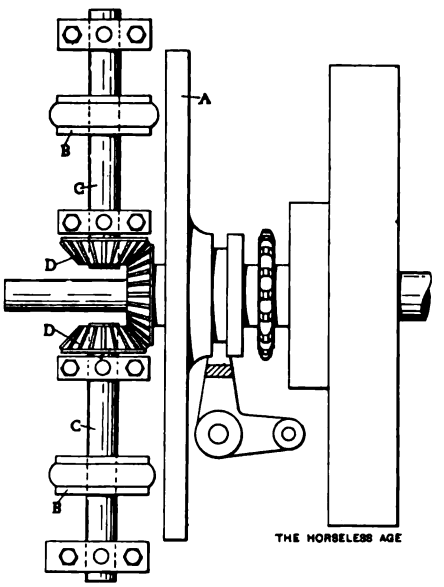
Editor HORSELESS AGE:

Your recent editorial urging more extended trial of motor cars in winter suggests to me that, as there are a large number of steam runabouts like mine, at least in New England, their owners may be interested in the two photographs I send with this, showing respectively my summer and winter arrangements. Perhaps no explanation is needed, further than to say that after entering the car as it is shown in winter rig I can close the side openings by letting down extensions of the side curtains and buttoning them to the front. The "extensions" referred to appear in the photo rolled up and held by straps. Except in the most inclement weather, however, they are not needed, the front alone contributing greatly to one's comfort and proving sufficient protection for short trips, even in zero weather. The only precautions taken against freezing are to empty the tank gauge glass and to add a special fitting provided by the builders which makes it easy to fill the steam gauge and its pipe with glycerine.

For those who have read in your columns Mr. Damon's recent tale of woe I will add that I have run this car practically every day since early last spring without any delays on the road and without mishap worth mentioning. At least four times a day it covers the mile between my house and office; nearly all my frequent journeys to Boston (65 miles the round trip, as I go) have been taken in it, until winter set in; and I have done much riding for pleasure besides.

But the point I mainly wish to make is this: There seems to be no difficulty whatever in traction, and I have seen no reason for winding the rear tires with rope, as I supposed I should have to do. To reach home I have to surmount a rise of about 100 feet, including two or three pretty fair grades; and even on "glare ice," when horses not newly sharpened could hardly travel, I have had no slipping of consequence. Of course, it goes without saying that I use reasonable caution. There has been no snowfall, as yet, exceeding 4 or 5 inches, and I judge I could get through twice that amount, for the few miles I need to run daily. On the whole, I am surprised and gratified to find that my car is so nearly weatherproof and so serviceable. I do not claim any beauty for my home made rig, but it certainly is practical and useful.

W. S. SOUTHWORTH.



MR. DU MOND'S FRICTION DRIVE.

If any reader knows of a decision or expression of opinion by the courts on the subject of the constitutionality of any State passing a law to prohibit the use of automobiles on any road commonly used for horse drawn vehicles, will he kindly refer to the decision in such a manner that we can obtain a copy of it?

A Friction Drive Suggestion.

Editor HORSELESS AGE:

In regard to belt and friction drive, I am quite sure it will not do for high powered cars. I enclose a diagram of a runabout change speed gear that has two friction surfaces, but is rather more complicated than the one described in THE HORSELESS AGE of December 25. The friction disc A has a slight end play on the sprocket collar, and can be pressed tightly against the paper wheels B. Said wheels can be slid in unison toward or from each other on the squared shaft C. The shaft and wheels are driven by bevel gears D, one of which is keyed to the engine shaft, the reverse is of the usual planetary band brake form. This device, if made of liberal proportions and protected from dust and oil, will give good results on light runabouts

P. E. DU MOND, M. E.

Freezing Temperature of Gasoline.

Editor HORSELESS AGE:

Kindly publish in your columns the temperature at which gasoline freezes.

W. E. T.

[We do not believe that gasoline has ever been frozen, and are quite certain that it will not freeze at the lowest atmospheric temperatures in this latitude. It could, of course, be solidified artificially, but we believe the experiment has never been made. The freezing point would, no doubt, vary considerably for different grades of gasoline.—ED.]

Explosive Engine Query.

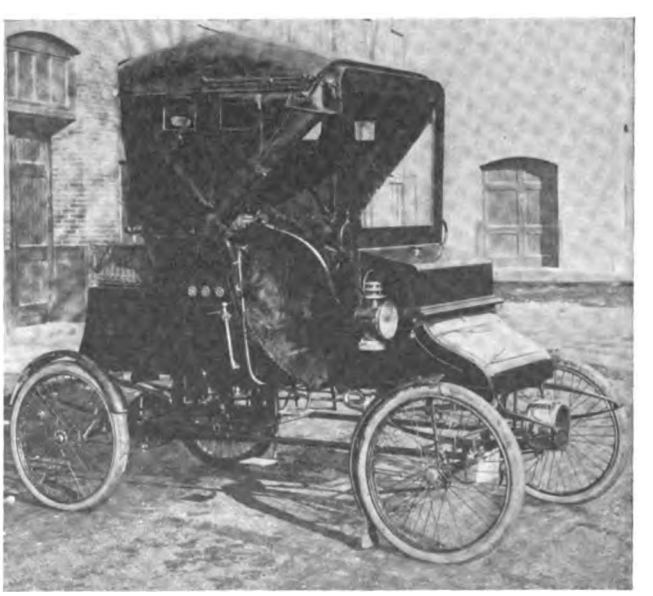
Editor HORSELESS AGE:

Is there any difference, so far as delivery of power is concerned, between a two cylinder horizontal engine placed under the body of an automobile and the same style, same size engine placed in front?

C. L. C.

[No.—ED.]

MR. SOUTHWORTH'S STEAMER WITH TOP DOWN.



MR. SOUTHWORTH WITH WINTER EQUIPMENT.

LEGISLATIVE AND LEGAL.

Rewards for Automobile Arrests Legal.

The trouble between automobilists in general and the authorities of Patchogue, L. I., in particular were revived last week by the decision of Judge Smith, of Brooklyn, in the case of R. W. McNeil, a taxpayer of Brookhaven, who had sought to have the supervisors of Nassau County restrained from paying the rewards which were claimed by the various deputy sheriffs for making arrests for violations of the automobile speed laws. Messrs. Niles and Johnson, who are also counsel for the American Automobile Association, appeared for McNeil.

Judge Smith's opinion, which was favorable to the supervisors, and consequently establishes the legality of such rewards, is in part as follows:

"Section 230 of the county law provides that 'all expenses necessarily incurred by the district attorney in criminal cases, or proceedings arising in his county,' shall be a county charge. Substantially this provision of law was in effect at the time of the decision of the Court of Appeals in the case of The People, ex rel Gardner, against the Supervisors of Columbia County, 134 New York, page 1. In that case Justice Bradley, in his opinion, speaking of the district attorney, says 'it was his duty to conduct prosecutions for crimes committed in his county, the expenses necessarily incurred by him in criminal cases arising therein were county charges. This duty to conduct prosecutions may fairly be construed to embrace whatever is essential to bring the criminal to trial, as well as proceedings in the trial.'

"In the absence of an authority to the contrary, the offering of a reward for evidence which shall lead to a conviction of persons guilty of offenses which were notoriously being constantly committed, cannot be declared to be not properly essential to bring offenders to trial for their offenses. Very much must be left to the discretion of the district attorney. This action is based on the entire lack of power to offer the reward, and not upon the abuse of the discretion in offering the reward.

"The above statement is based upon the assumption that the district attorney offered the reward of which complaint is made. The plaintiff claims that the rewards were in effect offered by the supervisors. The supervisors do not contend that they have any authority to offer rewards for evidence which shall lead to a conviction of a crime committed within their county. They have no such power, but in this case they did not offer the reward or direct the offering of the reward. They, in terms, requested the district attorney to offer the reward; he was at liberty to refuse their request. There was no direction or request as to the form of the offer. If the district attorney chose to advertise in his offer that it was made pursuant to a resolution of the board it was probably done to assure any person that acted upon his offer that his claim would undoubtedly be allowed by the body which had the lawful power to audit and allow it. The essential point is that the board did not attempt to control the discretion of the district attorney, so that his offer of the reward was an act for which he is alone responsible and which was within his power. It follows that the complaint must be dismissed with costs."

Opinion on West Virginian County Court Ruling.

On October 5 the County Court of Grant County, West Virginia, made an order that "All persons be, and are hereby prohibited from running and operating automobiles or machines of like character upon any of the highways in this county. Anyone violating the provisions of this order will be subject to a penalty of one hundred ($100) dollars."

The executive committee of the National Association of Automobile Manufacturers, Incorporated, took the matter in hand at its last meeting, and directed its counsel, Charles Thaddeus Terry, to prepare an opinion on the validity of the order for the benefit of David L. Luke, a resident of the county, and of all other persons interested. Mr. Terry has prepared a memorandum of authorities and arguments which show:

1. That this order is an illegal usurpation by the County Court of Grant County, of the powers of the Legislature.

2. It is in violation of both the United States and West Virginia constitution, in so for as it deprives citizens of both liberty and property without due process of law.

3. It is in excess of the police powers of the State, and is a deprivation of both liberty and property without due process of law.

4. It discriminates between the users of the highways and deprives automobilists of the equal protection of the law, and is therefore void.

The arguments in the case may be seen and copied at the association's offices. It is not unlikely that similar cases will arise in other directions, in which case the association will be glad to supply the members, or anyone else interested, with the details of Mr. Terry's arguments.

PHILADELPHIA, Pa.—Upon a petition filed by the Diamond Drill and Machine Company and Clement & Sons, Judge McMichael has appointed George De B. Myers receiver for the Union Motor Truck Company.

New Incorporations.

The Reo Motor Car Company, New York city. Capital, $10,000. Incorporators. R. E. Olds, C. Andrade, R. M. Owen.

Curtis Automobile Company, Milwaukee. Capital, $10,000. Incorporators, Orin L. Curtis, Harry Landauer, Frank Thanhouser.

Ardsley Motor Car Company, Yonkers. N. Y. Capital, $75,000. Directors, Theodore S. Fuller, Frederick P. Fuller, A. E. Rittenhouse.

Fuller & Walch, Yonkers, N. Y. To sell automobiles. Capital, $10,000. Incorporators, Frederick P. Fuller, Theodore S. Fuller, A. S. Andrews.

The E. R. Clark Automobile Company, Springfield, Mass. Capital, $10,000. Incorporators, Edward R. Clark, Edgar A. Stoddard, Ralph W. Stoddard.

Toronto Gas and Gasoline Engine Company, Toronto, Ont. Capital, $300,000. Directors, J. Laishley, L. C. Laishley, Robert Hunter.

The Evans Automobile Company, Columbus, Ohio. Capital, $30,000. Incorporators, J. Cyrus Morrison, G. W. Smith, W. E. Evans, Smiley Caldwell, Charles E. Leist.

Orlando F. Weber Company, Milwaukee, Wis. To manufacture automobiles and automobile parts. Capital, $80,000. Incorporators, Orlando F. Weber, Alfred Reeke, A. F. Soliday.

The Middleton Manufacturing Company, Milwaukee, to manufacture automobiles and automobile parts. Capital, $200,000. Incorporators, William C. Middleton, Frederick S. Middleton, Albert S. Schrewe.

United States Automobile Company, Rochester, N. Y. Capital, $200,000. Directors, Harry S. Woodworth, Henry H. Love, John A. Barhite, Austin F. Crittenden, Charles F. Garfield, Henry H. Kingston, Jr.; J. Foster Warner.

The Edmunds & Jones Manufacturing Company, Detroit, Mich. To manufacture automobile lamps, etc. Capital, $6,500. Incorporators, George Edmunds, William T. Jones, George Roberts, Edward C. Humphreys, Harry W. Brooks.

The Gordon Bennett Race.

The French Government has sanctioned the Gordon Bennett Cup race to be held over the Circuit Auvergnat, which has been selected by the Automobile Club of France for the event. The club has offered a trophy to be known as the Grand Prix de l'Automobile Club de France, which will be competed for over the same course and at the same time as the Gordon Bennett race. There is some discussion regarding the restriction of the eligibility to drive in this race to the nationality of the cars entered. That is, that only Frenchmen be allowed to drive on the French team, and so on. Hitherto there has been no such restriction.

Club Notes

BUFFALO A. C.

Special efforts are being made to increase the club membership. On Tuesday, January 10, the third entertainment of the winter will be held in the clubrooms. The program will be of an athletic character.

LEWISTON AND AUBURN (ME.) A. C.

A committee was appointed recently to confer with the legislative committee of the Maine State Grange relative to concerted action to secure from the Legislature favorable action in the matter of good roads. It is considered likely that the Portland Club will join in the movement.

BAY STATE A. C.

The club was organized recently in Boston, and the following officers elected: Lewis R. Speare, president; F. H. Tudor, vice president; H. L. Bowden, treasurer; J. C. Kearison, secretary; A. E. Gilmore, Harry Fosdick and W. W. Burke, directors.

MARION (IND.) A. C.

A meeting was held in the rooms of the Commercial Club on January 3. Steps were taken toward framing an automobile law to be presented to the Legislature, and volunteers called for who would attend the meetings of that body and help in securing the passage of the bill.

CLEVELAND A. C.

A booklet has recently been issued in which are given a brief history of the club and a statement of its purpose, the names of the principal officers for each year since the club was organized in 1900, the officers and committees for 1905, the constitution, bylaws and house rules, and a list of all the members. Copies of the Ohio State automobile law and the Cleveland ordinance are also included.

WORCESTER (MASS.) A. C.

A communication has been received from Richard P. Elliott, of Boston, stating that he has prepared a bill to be presented to the Legislature at its next session, which requires that all vehicles upon the highways shall carry lights after dark, visible 300 feet to the front and rear. The cooperation of the club is asked to secure its passage. The effort to have President Goddard appointed a member of the metropolitan highway committee has failed, owing chiefly, it is said, to the fact that his "boom' was started too late. A number of changes are soon to be made in the arrangement of the clubrooms. A lunch room is one of the new features proposed. At a meeting last week it was voted to hold a hill climbing contest next spring and a committee consisting of A. K. Miller, William A. Chaffin and Secretary F. E. Frost was appointed to arrange for it.

MILWAUKEE A. C.

A meeting was held at the Hotel Pfister recently at which it was decided to allow the secretary a salary of $75 per year. A paper on skidding was read by G. Scholtka, and an interesting talk on snow blindness given by Dr. E. W. Bartlett. A number of new members were elected.

SYRACUSE A. C.

On January 3 the third annual banquet was held at the Yates Hotel. Henry Walters acted as toastmaster. Among those who spoke were Congressman Michael E. Driscoll, Mayor Alan C. Fobes, Prof. W. K. Wickes, Supervisor Robert E. Gilman, William Rubin, Justice F. W. Thompson, John D. Lyon, of Binghamton, Arthur Benjamin, Giles E. Stilwell and Harlan W. Whipple.

A. A. A.

Announcements are out for the first annual banquet, to be held on January 16 at the Waldorf-Astoria in New York. The list of speakers contains the names of Mayor McClellan and ex-Governor Odell. The arrangements are in the hands of a committee consisting of Harlan W. Whipple and C. H. Gillette, of the association, and T. M. Hilliard, manager of the Waldorf-Astoria. Reduced railroad rates have been secured for members attending the annual meeting on the one fare and certificate plan. Members purchasing railroad tickets not later than January 18 may obtain a certificate from the ticket agent, which should be presented to Secretary Gillette at the Hotel Seville, Madison avenue and Twenty-ninth street. If the necessary minimum attend the meeting, the return rate will be reduced to one-third.

RHODE ISLAND A. C.

The fourth annual banquet of the club was held at the Wellington, Providence, on January 4 after the annual meeting in the club rooms, at which the following officers were elected for the ensuing year: President, Dr. Julian A. Chase; first vice president, William Penn Mather; second vice president, Darwin Almy; treasurer, Howard D. Wilcox; secretary, Elliot Flint; governors, to serve until 1908, Charles O. Read and Darwin Almy. At the banquet President Chase acted as toastmaster and presented the following speakers: Harlan W. Whipple, A. R. Pardington, A. A. Post, C. H. Gillette and Asa Goddard, president of the Worcester Club. The protest of A. E. Morrison, of Boston, against the award of first place to B. F. Blackinton in the hill climbing contest held by the club at River Point on November 26, has been disallowed, because the protest was not filed in writing within twenty-four hours after the close of the event, as required by the A. A. A. racing rules, and also because the performance on which Morrison based his protest was made in a match to decide a tie, after the hill climbing contest proper.

Commercial Vehicle Notes.

The post office authorities of Cleveland, Ohio, have placed a number of motor wagons in service for conveying mails between the various sub-stations and railway depots.

The Indiana Automobile Company, of Indianapolis, will act as agents for the commercial cars made by the Knox Automobile Company during 1905.

The Rockliff Motor Truck Company, of Brooklyn, N. Y., has been chartered by the Secretary of State to manufacture and sell automobiles and other road motors. The capital stock is $50,000, and the directors for the first year are Sidney D. Van Wagner, Charles E. Patterson and Charles Rockliff, of Brooklyn.

Trade Literature Received.

The Induction Coil Company, 9 Miller Building, Milwaukee, Wis.—Catalogue of Mueller coils.

C. W. Spicer, Plainfield, N. J.—Catalogue of Spicer dust proof universal joints, for automobile use.

Electric Vehicle Company, Hartford, Conn.—Specifications of the various models of Columbia cars.

J. T. Pederson, 642 First avenue, New York City.—Folder showing his various types of pressure feed lubricators.

Atwood Manufacturing Company, Amesbury, Mass.—Catalogue of oil, electric and acetylene gas lamps for automobiles.

Pittsfield Spark Coil Company, Pittsfield, Mass.—Folder showing Pittsfield ignition supplies, coils, plugs, commutators, etc.

The Hesse-Bright Manufacturing Company, Philadelphia, Pa.—Illustrated catalogue of Hesse-Bright ball bearings, giving tables of safe loads, etc.

Cullman Wheel Company, 521 Larrabee street, Chicago, Ill.—Catalogue of chains, sprockets and differential gears made and handled by the company.

The Concentrated Acetylene Company, 330 North Illinois street, Indianapolis, Ind. —Catalogue showing Prest-o-Lite gas tanks attached to various makes of cars.

The Manufacturers' Foundry Company, Waterbury, Conn.—Illustrated booklet showing some of the gasoline engine cylinder castings made by this company.

The Swinehart Clincher Tire and Rubber Company, Akron, Ohio.—Booklet containing information concerning the construction and application of Swinehart solid tires.

W. D. Custead, 45 West Twenty-seventh street, New York City.—Folder giving information concerning his recently patented variable speed and power transmission device.

Wray Pump and Register Company, 191 Mill street, Rochester, N. Y.—Pamphlet illustrating the various forms of Kellogg double acting tire pumps and air pipe couplings.

MINOR MENTION

W. C. Jaynes, of Buffalo, will handle the Pope-Toledo during the coming year.

Fred P. Brand, formerly of the Locomobile Company, is now with the Electric Vehicle Company.

The Marion Motor Car Company will be represented in Buffalo by J. A. Cramer this year.

The New York agency for Matheson cars has been secured by Shepard Brothers, of 500 Fifth avenue.

The automobile repair shop of Estes Ruggles & Son, of Ware, Mass., was damaged by fire recently.

Roy A. Fay has been appointed business manager of the Harvard Automobile Company, of Cambridge, Mass.

The Reed-Underhill Company, of Boston, Mass., will have the agency for the Stearns car for the coming season.

Harrington's Auto Station No. 1, Worcester, Mass., has taken the agency for Thomas cars in that county for 1905.

The Briscoe Manufacturing Company, of Detroit, Mich., are negotiating for a factory in the neighborhood of New York city.

There is a rumor afloat that the Baldwin Automobile Company, of Connellsville, Pa., are about to resume the manufacture of cars.

The Fischer Special Manufacturing Company, of Cincinnati, makers of spark coils, etc., have moved into a new factory at 2076 Reading road.

The Overland Rubber Company, of Denver, Col., have been appointed representatives of the tire department of the Diamond Rubber Company, of Akron, Ohio.

Henry M. Leland, vice president of the Leland & Faulconer Manufacturing Company, of Detroit, has been appointed general manager of the Cadillac Automobile Company.

The Reo Motor Car Company, of Philadelphia, has been organized to sell Reo cars. F. W. Stockbridge has been appointed manager, and quarters have been secured in the Mink Arcade in Penn square.

The Apperson Brothers Automobile Company, of Kokomo, Ind., have opened a branch office at 66 West Forty-third street, under the management of L. A. Hopkins, formerly treasurer of the Brooklyn Automobile Company.

A large touring car belonging to H. O. Stone, of Chicago, was struck by a Milwaukee avenue cable train last week, and the chauffeur, D. E. Tobin, and two friends were hurled into the street and severely injured, Tobin fatally.

The Michigan Automobile Company, of Grand Rapids, Mich., have moved to new quarters in the Thum Block on Ottawa street, where increased facilities are offered. They will have the agency for the Pope-Toledo, Cadillac, White and Buick cars during 1905.

The Standard Engine and Automobile Company has entered into an agreement with citizens of Greenwood, Ind., by which a factory is secured for the manufacture of automobiles.

W. H. Webster writes that he is now with the Maxwell-Briscoe Company, 317 West Fifty-ninth street, New York city, having severed his connection with the automobile department of John Wanamaker.

A new building is being built on the corner of Fourth and Ripley streets, Davenport, Ia., the first floor of which will be occupied by the Burck Auto Carriage and Implement Company as a salesroom and garage.

The Merkel Motor Company, of Milwaukee, by F. P. Rugee, president, and W. J. Merkel, secretary, have filed an amendment to their charter decreasing the capital stock from $200,000 to $100,000 and changing the board of directors from three to five members.

At a meeting of the Chamber of Commerce of New York city, on January 5, Albert R. Shattuck addressed the members on the subject of good roads, and asked them to indorse a resolution urging the expenditure of $50,000,000 on the highways of the State.

The Randliff Motor Car Company, recently organized, have secured the premises formerly occupied by the Suto Car Company, at 24 and 26 Columbus avenue, Boston. They are the Eastern representatives of the Panhard & Levassor and the Maxwell, Briscoe Company.

The Moline Automobile Company, East Moline, Ill., have appointed the Buck Auto, Carriage and Implement Company, of Davenport, Ia., agents for Davenport, Rock Island, and a number of neighboring counties on both sides of the Mississippi, and the Mead Cycle Company agents for Chicago and vicinity.

Upon the recommendation of the Bureau of Combustibles, Fire Commissioner Hayes, of New York, has revoked the license granted to Tadini F. Gerome, proprietor of an automobile garage and repair shop at 71 South Washington square, on the ground that the conditions there are in violation of the rules of the department.

The Matheson Motor Car Company, of Holyoke, Mass., have purchased a plot of land on the Grand boulevard, Detroit, Mich., and expect to build a factory on it in the spring. A Detroit office has been opened at 910 Hammond Building, in charge of F. A. Hinchman. He has recently been elected treasurer, and F. F. Matheson secretary.

The capital stock of the New York Sporting Goods Company has been increased to $100,000, and they have received permission to amend their charter to cover the manufacture and sale of motor cars and supplies. They have secured the building at 17 Warren street, New York city, which will be used for sales purposes. Roger F. Murray has been added to their board of directors.

On January 2 a 100 mile track race was held at Dallas, Tex., and was won by Ollie Savin, driving E. H. R. Green's Pope-Toledo, in 2 hours, 6 minutes and 42 3-5 seconds. There were five starters.

The Evans Automobile Company, of Columbus, Ohio, recently organized, have elected the following officers: J. Cyrus Morrison, president; Smiley Caldwell, vice president; George W. Smith, secretary; Charles E. Leist, treasurer, and William E. Evans general manager. Quarters have been secured at 63 Fay street, and the company propose to do a general automobile business, including a livery service.

An application for a charter of incorporation under the laws of Pennsylvania has been made by Joseph S. Mack, William E. Butler, Willis A. Heath, John M. Mack, W. C. Mack, A. F. Mack, Leo E. Schimpff and Louis Meyer, for an intended corporation to be called the Mack Brothers Motor Car Company, for the manufacture of motors, cars, vehicles, boats, locomotives, automobiles and machine and hardware specialties. The Weaver-Hirst foundry plant, of Allentown, Pa., has been acquired by the company, whose present factory is in Brooklyn, N. Y.

Spaces at the Detroit Automobile Show, which opens on February 13, have been allotted to Cadillac Automobile Company, Packard Motor Car Company, Stirling Auto Company, Northern Manufacturing Company, Waverley, Pope-Toledo Company, Maxwell-Briscoe Company, J. P. Schneider, Welch Motor Car Company, E. R. Thomas Motor Car Company, Pungs-Finch Motor and Gas Engine Company, Reid Manufacturing Company, C. H. Blomstrom Motor Company, Olds Motor Company, Wayne Automobile Company, W. H. Weber, White Sewing Machine Company, Ford Motor Company, Young & Miller, Reliance Motor Car Company, Humber Motor Company, C. F. Splitdorf, Standard Oil Company, Briscoe Manufacturing Company, American Lubricator Company, Gray & Davis, Hartford Rubber Company, B. F. Goodrich Rubber Company, Veeder Manufacturing Company, Morgan & Wright, Schug Manufacturing Company, Firestone Rubber Company, Badger Brass Manufacturing Company, Rose Manufacturing Company, Diamond Rubber Company, Concentrated Acetylene Company, Twentieth Century Manufacturing Company, Monnier Cycle Supply Company, Fawkes Rubber Company, Warner Gear Company, Fisk Rubber Company, G & J Tire Company, Automobile Equipment Company, Goodyear Tire and Rubber Company, McDonald, Wessels & Ames Company, Matchless Metal Polish Company, Armstrong & Co., S. F. Bowser & Co., Detroit Steel Products Company.