The Horseless Age

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Dependence of Tire Life on Wheel Diameter and Cross Section.

By Albert L. Clough.

It is pretty well admitted upon all sides that there is a decided economic advantage in the use of pneumatic tires of larger cross section than that which is barely necessary to carry the weight of a car without frequent blowouts. That is, that if a 4 inch tire can be used to support so many hundred pounds of car weight, and come within the recommendations of the tire makers, a 4½ inch tire can be employed with even greater ultimate advantage, for the larger tire, although costing more initially, may be expected to afford so much additional mileage as to reduce the tire bill per mile to a lower figure than that obtainable with the smaller one.

Another belief which is widely held is that, assuming two tires of the same cross section, say 4 inches, one of them 30 inches in diameter and the other 36 inches in diameter, the latter is the better proposition economically, assuming that both are used under cars of equal weight, horse power and speed, with suitable differences in their driving gear ratio.

The writer knows very little, indeed, about the tire problem, and does not remember ever seeing any figures published giving a concrete idea of how two such cases as the above figure out from the economic standpoint. This little communication is written in a spirit of inquiry, in the hope that it may bring out some pertinent information from the tire makers, from car manufacturers or from users. As far as the average motorist is concerned, the answer to the question as to whether the large diameter tire is cheaper in the end than the small diameter tire of equal cross section, conditions of use being the same, is almost entirely a matter of opinion, unsupported by accessible data.

LARGER WHEEL DIAMETERS.

It would be interesting to know what bearing, if any, the following considerations have upon the question: Take the case of two cars, otherwise of the same model, one equipped with 30 inch wheels and 4 inch tires, and geared 3 to 1, and the other fitted with 36 inch wheels and 4 inch tires, and geared 3.6 to 1. These two cars should possess the same speed and hill climbing power. Under these conditions the tractive effort exerted upon the road by each tire is obviously the same, and each section, as it becomes the point of contact, is equally stressed. In the case of the 36 inch tires, however, each section is thus stressed only 5/6 as frequently as in the case of the 30 inch tire, at the same car speed. In so far as this oft repeated stress upon the structure of the shoe tends to disrupt it, it would seem that the larger tire should have the advantage in point of length of life.

If the two cars possess equally powerful brakes, the stresses in the tires due to brake application are of equal severity in both cases. Exactly as in the case of driving stresses, the frequency with which any one section of the casing is stressed, in retarding the car, is only 5/6 as great in the case of the larger as in that of the smaller tire. Has anyone any data as to the practical effect of these different rates of repetition of these stresses?

SLIPPING.

The attrition between the road and the tire, tending to wear away the tread, is distributed over 6/5 as much surface in the case of the larger tire as in the case of the smaller one, the pressures and sliding stresses being roughly the same in the two cases. The larger tire has a larger area of contact with the road than the smaller one, however. Does this make any difference in the rate of slip in favor of the larger tire? If so, is there any difference in the rate of wear of its tread due to this cause? It is frequently assumed that, between surfaces of the same materials, equally loaded, friction is independent of the area of the contact surfaces. Is this rule true when applied to tires?

If the rate at which the materials of the shoe are fatigued by the driving and braking stresses imposed upon them, and also the rate at which the tread is worn down are, as they would appear to be, 5/6 as rapid in the case of the larger tire as in that of the smaller, this is only another way of saying that these rates of failure are inversely as the amount of material in the two sizes of tire, the cross sections being equally heavy in both instances.

It is understood, however, to be the practice with many tire makers to employ additional layers in the building up of the 36x4 inch tire section as compared with those used in fabricating the 30x4 section, and that there is also some additional rubber in the 36x4 tread. Certain makers, on the contrary, seem to use identical sections for all tires of the same cross section, irrespective of wheel diameter.

EFFECTS OF ROAD IRREGULARITIES.

Considering the effect of road irregularities upon these two tires, it is evident that, in absorbing a rock or other obstruction upon the roadbed, the wall of the large diameter tire is required to flex less abruptly than the wall of the smaller one. The question as to how much, if any, significance this fact has as tending toward a longer period of service in the case of the larger tire is an interesting one, and one probably incapable of prediction on *a priori* grounds, but requiring experimental demonstration.

Road shocks due to the wheels dropping into road depressions or climbing abrupt water bars are admittedly less in the case of larger than that of smaller wheels. Assuming springs of equal efficiency on the two cars which we have been considering, and admitting that the oft repeated action of pneumatic tires in absorbing road shocks is one of the most important, if not the most important, causes of their ultimate failure, what effect may a difference in diameter between 36 and 30 inches have in the life of the two sizes of tires here taken as examples?

RESILIENCE OF WOOD WHEELS.

Another question may be worth the asking. Does the resilience of the wood wheel itself act in an appreciable degree to mitigate the severity of the shocks borne by tires? If so, is the 36 inch wheel, with its longer spokes, an appreciably more efficient aid in "buffing" the shocks than the 30 inch wheel, and thus a factor in the direction of longer tire life? It may be that this is a question worth considering in connection with dished spokes, but not with the ordinary form of wheel.

Referring to a 1910 price list of tires one finds the 36x4 tire and tube listing for 21.7 per cent. more than the 30x4, while the diameter of the 36 inch tire is exactly 20 per cent. greater than the 30 inch.

The prices are thus very nearly in proportion to the diameters, and the economic advantage of the larger tire, if there be any, may be found in the extra heavy cross section and tread sometimes embodied in the larger diameter tire, in its less susceptibility to damage by shocks due to road irregularities, and the greater ease with which it absorbs rocks and other objects. The writer would very much like to know whether practice demonstrates any such advantage to exist, and the magnitude of it.

OPTIONS PUZZLING.

This question was brought up recently by a party who was contemplating buying a chassis from a manufacturer who offered an option in regard to wheel diameters, including the 32, 34 and 36 inch sizes. After discussing easy riding qualities, centre of gravity and so forth, the query arose as to which size would afford lowest tire maintenance cost. No reliable data could be obtained at the time to settle this point. As there are probably other readers who have had the same question come up in their experience, the matter is brought up here in the hope that some light may be shed upon it.

Referring to the point touched upon in the first paragraph of this article—that of the economic value of tire sections with a large factor of safety as regards weight carrying capacity—it is probable that definite figures from users who have employed tires of different section upon the same car at different times, as to the magnitude of the advantage gained by using the larger ones, would be very welcome, as no published figures upon this subject are recollected.

Piston Packing Rings.

By R. M. A.

So far as the machine shop can lessen the cost both of hand labor and of a "running in" of bearing parts, it is not only reasonable but economical to do so. This preliminary leveling of high spots and a consequent longer life to the motor without adjustment is a live issue today. Yet at present some manufacturers are relying upon hand labor for a large part of the fine fitting that can be disposed of in the machine end. Pistons and their rings are still being filed after leaving the grinder, thus destroying a good surface and increasing expense.

It has long been noted that the points of the piston packing rings project with sufficient force to prevent the immediate vicinity back of these points from bearing. This is so marked that with a ring, as it is finished in many shops, held in a standard gauge bushing, this lack of bearing allows light to pass through (see Fig. 1, A A). This space allows compression to leak by, as well as oil to waste. Placing two similar engines side by side, with a maximum oil level in the crank case of engine A, having

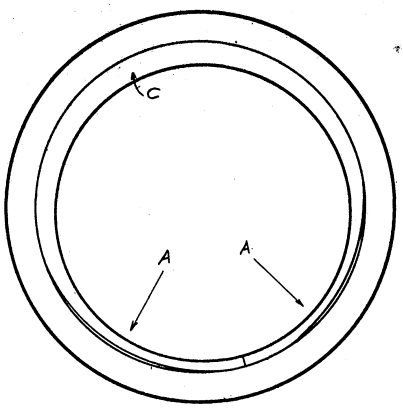


Fig. 1.

tight, well fitting rings, and a minimum level in engine B, with poorly fitting rings, it was difficult to cause A to smoke as much as B. A had stiff rings that fitted well from the first; with B the case was the very opposite. It was also noted on all engines of type A that the road testers wondered at this apparent lack of oil, having become accustomed to its prevalence at the exhaust pipes of the B type. In general, no hand filing was done or found necessary after the proper manner was found for machining the rings of A.

If in Fig. 1 the points of the ring C bear so hard as to sacrifice part of the bearing surface, it is logical to reduce these high spots, as previously done with a file. To do this in the lathe was even simpler. It is the general practice to house the rings in a hardened bushing preparatory to clamping them on the flanged arbor for the final cut. This bushing, however, was simply relieved by cutting two channels diametrically opposite, and the rings were placed in as before, but alternating their relation, the gap of ring No. 1 coming directly over the heavy part of No. 2, and all points opposite

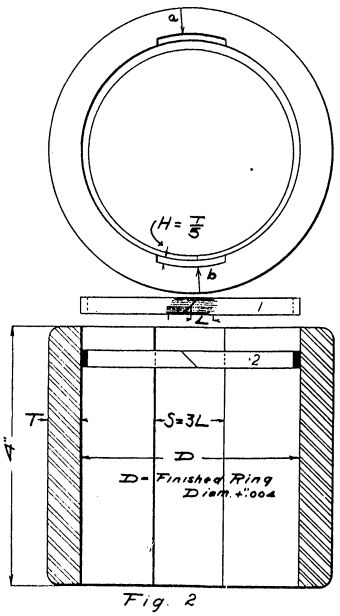


Fig. 2

either one channel or the other. Fig. 2 shows this plainly. The rings, on being clamped on the flanged arbor, with the bushing removed, have their points perceptibly projecting beyond the adjacent rings, such that in cutting the tool removes proportionately more metal at these points. The strength of metal here is now sufficiently reduced so that the ring as a whole has a more uniform bearing. For average practice the width of channel $S = 3L$, where L is the average length of the high spot (see L, Fig. 2). The length L should preferably be taken from a regular old style shop ring after same has been run in a regular test before shipping. The depth of the channel S is taken as $H = \frac{T}{5}$, where T is the thickness of the steel bushing, which latter should be at least one-half inch. To space the ring points equally over the channel S two fine file marks are cut at *a* and *b* so that when the ring is flush in the bushing the upper edge of the gap is in line with its respective mark. In filling the bushing with rings care should be taken to give them a motion parallel to the axis of the bushing, as any twisting will tend to dislocate the ring.

With a more perfect bearing of the ring assured the "stiffness" of the same rings can be reconsidered. There being no theoretical compression radially, the strength of the ring is unaffected by either compression or explosion. When we consider the very light springs used on large steam cylinders to keep the ring bearing, it seems true that many of the present designers have made the gas engine ring stiff in order to insure its wearing in properly. An instance of rings that were too severe is very interesting and baffled the designers at first.

Three very stiff rings were used all at the top of the piston. The men complained of their difficulty in pushing the piston up into the cylinder. This was the first real notice we had. On examining the cylinder after a short run it was found that all traces of the grinder had been removed in the path of the rings only. A few cars were shipped with these rings, and it was not long before customers complained of a peculiar knock in the motor. After trying all past remedies (of course not as yet knowing the cause) with no results, the motors were torn down. Ridges were found in the cylinders corresponding exactly to the path of the rings, but on the opposite side from the thrust of the piston. New cylinders being tried, the trouble disappeared, and, having substituted lighter rings, the trouble has not recurred. The interesting part of this is that the perceptible wear was on the opposite wall from the thrust. This can be explained only by the fact that the thrust caused the piston and the rings to bear on the wall, while on the opposite wall the rings projected a distance equal to the clearance of the piston diameter and cylinder such that the rings acted like cutters and "pulled down" this wall.

Heat Distribution in Auto Engines.

By F. E. Watts.

The article on page 231 of the issue of September 1, entitled "Fuel Economy and Its Dependence on Engine Design," sets forth in an admirable way many of the conditions which must be met to secure economical operation. The advantages to be secured by making the walls of the compression space of as small area as possible in relation to its volume are, however, perhaps overemphasized for automobile work. Probably there is less heat lost from an engine with a nearly globular compression space than from one having any other form; but the difference is not great enough to warrant the importance usually given to the matter in text books, at least not for small engines making a large number of revolutions per minute. When I first began work on stationary engines I believed in long stroke engines for this very reason, but was never able to definitely trace any increased economy to the use of a long stroke. The long stroke engines wore better and ran more quietly as a general rule. but were not markedly more economical of fuel.

The only really important reason why a long stroke motor should be more economical than a short stroke one, aside from frictional considerations, is that the charge is retained in the cylinder longer, and hence each particle is liable to be more completely burned. There is probably little difference in the heat lost through the cylinder walls, no matter what the ratio of bore and stroke, at least for small engines.

Let us consider two engines, A with bore and stroke of 4 inches each, B with a bore of 4 inches and a stroke of 8 inches. Their data might be as follows:

	A.	B.
Piston displacement....	50 cu. in.	100 cu. in.
Revolutions for 1,000 feet, piston speed...	1,500 r. p. m.	750 r. p. m.
Compression space.....	15 cu. in.	30 cu. in.
Time of stroke.....	0.02 sec.	0.04 sec.
Expansion ratio.....	Same in both.	
Expansion rate.....	2	1

This table shows that there will be little difference in the heat losses in the two engines. B takes in twice as much gas as A, and handles it in a chamber which has less wall area per unit of charge than A, but it handles each unit slower, expands it for a longer time, and hence exposes each unit to the walls for a longer time.

As was stated in the article before referred to, the cylinder temperatures and pressures fall rapidly after the charge begins to expand, and hence the heat loss to the walls is greatest at the beginning of each stroke when the exposed surface consists of the walls of the compression space, the piston head and the upper part of the cylinder bore. But the diagrams for the heat transferred to the walls and for the heat transferred from the walls to the water jacket could they be drawn, as they no doubt will be in the near future, are not at all like the diagram for the heat inside the cylinder. The heat loss to the walls no doubt varies greatly in different parts of the cylinder with different methods of applying the cooling agent and with various arrangements of the valves. Convection of the gases and heat transfer from the piston are the two important factors which tend to equalize the cylinder temperature and heat losses per unit from the top downward.

This is admirably shown for a small motor by the experiments of Prof. H. L. Callender, which were described in The Horseless Age of May 18, 1904. The motor was a Clement Garrard cycle motor, with a single vertical, air cooled cylinder. The bore was 2.4 inches and the stroke 2.8 inches. Circumferential ribs were used for cooling, as shown in the sketch. The compression was 68 pounds at 730 r. p. m. with full throttle, and 33 pounds at 1,160 r. p. m. with

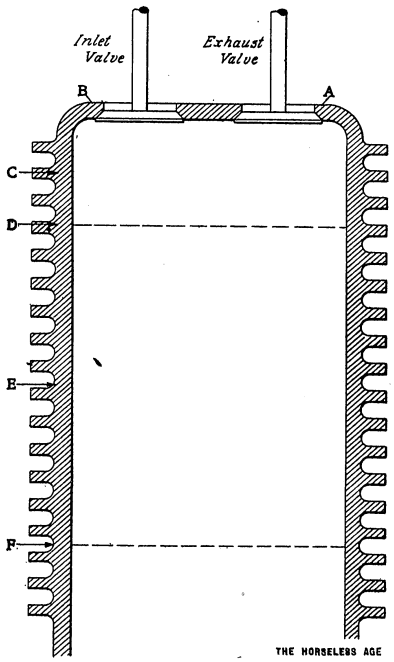


Diagram of Air Cooled Cylinder.

small throttle. Temperatures of the cylinder walls were measured at various points by means of thermo couples screwed into small holes in the walls.

When the motor was run on the block the temperature near the exhaust valve, as at A, rose to 570° C. So a centrifugal fan was mounted on the flywheel so as to deliver air horizontally across the head. A second fan was arranged to deliver air horizontally against the side of the cylinder. When only the first fan was used the temperature at A rose to about 400° C. With both fans it rose to about 300° C. At B it rarely rose above 70° C. On the walls of the combustion chamber, as at C, it was from 200° to 260° C. Tests at D, E and F showed a drop of only about 20° C. in the length of the stroke. That is, when the temperature was 200° C. at D it was 180° C. at F. Furthermore, it was found that retarding the spark raised the temperature of the head and lowered that of the barrel.

The manner of cooling this motor was not favorable to the transfer of heat downward, but evidently on account of its high speed, 2,000 r. p. m. in some cases, the piston carried heat enough to the lower end of the cylinder so that the heat lost per wall unit there must have been quite large, as compared with that through the walls of the compression space. Very likely in slower running, water cooled automobile engines the piston convection is less, but it has been shown to be considerable even in large stationary engines.

For these reasons I believe that while the shape of the combustion chamber is of importance, it has less influence on engine economy than is generally thought. And while valves in the head, cylindrical or globular compression spaces, and long strokes have their advantages, they are not important enough to warrant their preference over other forms of construction. They aid in more thoroughly scavenging the cylinders and in taking advantage of gas inertia, and these advantages will probably eventually be considered of more importance than their as yet undetermined influence on heat losses.

A Home Made Automobile Fire Extinguisher.

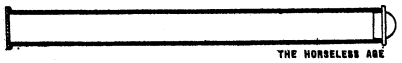
By J. M. Prudden.

It is remarkable how few automobiles are provided with some sort of fire extinguisher, although the value represented by an automobile and the chances of fire are very great. This may be due to carelessness of the owners, it may be that the price is a deterrent, or even the appearance may be against the extinguisher. If the car should ever catch fire on some country road far away from water or help this neglect would certainly be deplored. The appearance is a small matter, for modern extinguishers are neat, and as for the price—why, it is the possible saving of money which would prompt you to get one. No matter how good a car may be, it is liable at any time to catch fire. No matter whether your car is insured or not, a fire may endanger life.

The principal difference between the two types of extinguishers, one using liquid chemicals and the other powder, is in relation to prices. Although the powder may not be so easily sprinkled in inconvenient places as the liquid may be sprayed, there is advantage in the powder in that it will not spread burning gasoline or oil, which are often the source of automobile fires, and, of course, the powder cannot freeze, as the liquid might.

The modern fire extinguishers contain about 10 cents' worth of tin and 25 cents' worth of chemicals, and sell for $2. By following the directions given below anyone can easily construct a fire extinguisher, even of brass, for less than $1. At any plumber's a piece of 1½ inch tin leader pipe may be procured, about 2 feet long. (This can easily be made from 24 gauge sheet brass.)

A bottom should be made and strongly soldered on, and the edge of the open top end turned over. Then a cover should be made which will fit tightly, and which should have a ring riveted to the top of it. The tube should then be filled with carbonate of ammonia (which can be procured cheaply at any drug store, and which should



SKETCH OF FIRE EXTINGUISHER.

be exposed to the air as little as possible), the cover put on and pushed down firmly. Since this chemical must be kept from contact with the air, in the manufactured extinguishers a very thin layer of solder is placed around the edge of the cover, rendering it airtight and yet leaving it so that it may be easily yanked off. It is not possible to solder with ordinary tools as thinly as is necessary, so sealing wax may be placed around the cap instead. In case of fire it is merely necessary to attach the ring in the cap to something, yank off the cover and sprinkle the powder on the fire.

It is surprising what a large fire this extinguisher will put out. It can overcome a fire covering 9 square yards and blazing nearly 15 feet high. It may be attached to a car by a strap or some similar device, but it should not be hung by the ring, for the jarring of the machine would break the sealing wax, decomposition would ensue from contact with the air, and the chemical would be worthless. If this extinguisher were made of brass and placed on the running board of a car it would be no more unsightly than a musical horn.

Amount of Radiator Capacity Required.

BY ALBERT L. CLOUGH.

Although much experimental work has been done to determine the amount of heat which can be abstracted from a given extent and configuration of radiator surface by a current of air of given speed and initial temperature, when there is circulating within the radiator passages a current of water at a known initial temperature, the proportioning of a radiator adequate to cool a motor of given proportions is still pretty largely of an empirical nature rather than a matter of exact calculation.

Motor car manufacturers now hardly ever construct their own radiators, for the reason that the production of this auxiliary of the vehicle engine has been taken over by a number of manufacturers who devote their energies almost entirely to this specialized line of production, which they have brought to a high degree of refinement.

THE USUAL PROCEDURE.

When an automobile manufacturer is bringing out a new model with a motor somewhat altered in dimensions and characteristics from that which he has hitherto used, experience as to the sizes of radiator required in former models is usually the basis of the specifications for the experimental radiator to be used upon the "model car" of the new product. A radiator is ordered, a certain amount larger or smaller than the one used upon the former car, and this is tested out thoroughly upon the new vehicle, and if satisfactory may be adopted. If not, a cooler of somewhat different dimensions is secured, and this is tested out in the same way. Or the manufacturer may furnish the radiator builder with a full description of the new motor and the new car, and the latter furnishes a radiator for test, which, if satisfactory, is adopted. Suggestions as to the fan design pipe sizes and pump capacity, are often made for the car manufacturer by the radiator maker.

DATA GATHERED.

The writer recently took some pains to look up the subject of the dimensions of the radiators fitted upon 1909 models of standard cars. These radiators comprised a considerable number of different makes, and included the true cellular and various forms of horizontal and vertical tubular types. The cars upon which they were used were equipped with four cycle, four and six cylinder motors of widely varying bore and stroke.

The number of cars studied was quite large. In each case the piston displacement of the motor in cubic inches was computed, and the whole volume of the active portion of the radiator (not including the tanks) was figured, and it was a matter of some surprise that the cubic inches of radiator volume per cubic inch of piston displacement as computed for these various cars showed no wider variations among themselves. It appears, in fact, that the space occupied by the radiating surfaces required to take care of the heat loss attributable to a cubic inch of piston displacement shows a decided tendency toward constancy, despite wide variations in the magnitudes of the two variables, and in the form of the heat dissipating surfaces.

CYLINDER-RADIATOR VOLUME RATIO.

The average number of cubic inches of cellular radiator allowed upon these cars per cubic inch of piston displacement figures about 4.25, and the average cubic inches of tubular radiator per cubic inch of piston displacement appears to be about 4.5.

It is perhaps rather surprising that there is so little difference in the space required by the two types, but it is pretty evident that the makers of the various radiator types have worked their respective designs to closely corresponding extremes of "volume efficiency," and it would appear either that the tubular type is about as effective as the cellular, or else that the users of the cellular type have been more liberal in their cooling provisions.

A provision of much less than 4.0 cubic inches of radiator volume per unit of cylinder volume is decidedly uncommon, as is also the allowance of much over 5.0 cubic inches, despite great variations in the absolute dimensions of engines and of the radiators themselves.

The extreme thickness found in any of these radiators was 4 inches, and this value was reached only in the cases of a few large cars, where it was undesirable to further increase the frontal dimensions.

PUMPS AND FANS.

All the radiators whose dimensions were taken were provided with fans, and the circulation was by pump. A high speed of flow seemed generally to be provided for, and the flow pipes were of good size. A half inch of cross section for each 6 horse power motor output is recommended by some radiator manufacturers.

Each radiator maker appears to adhere rather closely to a certain size and form of pipe, and thickness and spacing of fins, in building up his cooler, and the capacity of the radiator is generally altered by using a greater or less volume of this standard construction, cut to fit the bonnet lines of the car to which the radiator is to be fitted. It is this fact that gives to the "cubic inches of radiator per cubic inch of piston displacement" constant what little value it may possess in rough preliminary calculations. There is not necessarily any exact scientific basis for this criterion, although it is perhaps not easy to formulate a better one of equal simplicity, especially as comparative figures concerning the active exposed surface of different makes of radiators are rather jealously guarded by their manufacturers.

It is probably safe to say that any radiator of standard make, which is assisted by a fan proportioned in accordance with average 1909 practice, and through which water is properly pump circulated, will be on the safe side, as far as cooling surface is concerned, if it contains 5.0 cubic inches of volume for each cubic inch of piston displacement of the four cycle engine which it cools.

FOR THERMO-SIPHON CIRCULATION.

Most radiator manufacturers explicitly recommend radiators of much larger size for use with thermo-siphon circulation—50 per cent. or more increased surface in some cases. Not enough data upon radiators operating upon this system has yet been gotten together to enable an empirical constant to be calculated. In a few cases of thermo-siphon cooled engines, which have come to the writer's notice, however, the provision of radiator volume is hardly any, if at all, more liberal than in cases where pump circulation is used.

As to the use of fans, many radiator manufacturers assert that their use is valueless, if not undesirable, except when the car is standing or at speeds below 15 miles per hour approximately, on account of the practical difficulty of producing an air suction equal to the natural air pressure drive to higher rates of motion.

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The Selden Decision.

The decision of Judge Hough, upholding the Selden patent, constitutes a decided victory for the owners of the patent, the Electric Vehicle Company, and also for the Association of Licensed Automobile Manufacturers. The owners of the patent had triumphed over alleged infringers several times previously, as when the Winton demurrer was overruled, and when an injunction was issued against one Moore who failed to put in a defense, but all these successes count for little in comparison with the decision just rendered. In none of the former suits was the validity of the Selden patent put to an actual test, and it was a very prevalent opinion in the industry that it would not successfully withstand such a test. In fact this belief was so strong in recent years that the possibility of being compelled to pay royalties under the patent would have been laughed to scorn by many unlicensed manufacturers.

Now, however, the patent has stood the test. One of the best known judges of the United States Circuit Court, widely experienced in patent litigation, has declared it to be valid and legal, and to cover all forms of gasoline automobiles. Of course, as was to be expected, this decision is not final. The interests involved are so large that the case will be carried to the highest court, and there is, of course, a chance of the present opinion being reversed by the courts, as has often occurred in the past. But it is obvious that the case of the complainants has been greatly strengthened by the present decision.

Judge Hough points out in his opinion that the granting of the patent by the Patent Office already raised a presumption in favor of the complainant, and the Winton demurrer decision, which was a controlling authority, to the effect that on its face * * * the patent was valid, strengthened this presumption. Now these points in favor of the patent have been further added to by a decision holding it valid after a most prolonged legal battle in which apparently every vulnerable point was subjected to attack.

The decision provisionally establishes George B. Selden as the real inventor of the gasoline automobile. Selden may not have been the first to build a successful machine, but he is considered the first to correctly name all the essential elements of such a machine. The lustre which might thus have been conferred on Mr. Selden is somewhat dimmed, however, by Judge Hough's remark that "it is my belief that Selden had contributed little to motor car advancement in the United States, and nothing at all abroad."

However, the most important question raised by the decision is not one of credit for priority in invention, but a question of commercial control of the gasoline automobile business. The members of the Association of Licensed Automobile Manufacturers are, of course, not affected by the decision, because they have already recognized the validity of the patent. But if all the unlicensed makers should now be forced to pay tribute to the owners of the patent, it would not be surprising if the aggregate value of the products covered by the Selden patent during the entire time of its life were to be greater than that of the products covered by any other patent during a corresponding period. Although the royalties will probably be fixed at a low percentage, the amount will, no doubt, run far into the millions. As nearly as can be ascertained about 300,000 cars have been manufactured in this country to date. Of these about one-half, or 150,000, have been licensed under the Selden patent. The average value of the cars on which royalties have not been paid may conservatively be placed at $1,000, giving an aggregate value of $150,000,000. The royalty originally paid by American manufacturers was 1¼ per cent., and this percentage of the above amount figures out to nearly $2,000,000. Present prospects would make it seem well within the limits of possibility that the royalties on the above basis on the cars that will be manufactured during the remainder of the life of the patent may reach $5,000,000.

As we understand the matter, there are still a number of legal steps to be taken before the present case is definitely concluded, and then the owners of the patent will be in a position to propose terms to manufacturers who are not yet licensed. It is generally believed that no higher royalties will be exacted, at least not for cars already delivered by the manufacturers, than those which have already been fixed by the association. Unlicensed manufacturers who are not willing to meet the demands for royalty, if sued, may be able to secure immunity from injunction proceedings pending the trial of the case in the higher courts by putting up bonds. In any case the decision will probably have a rather disturbing influence on the trade and industry, tending to bring back the condition of uncertainty which prevailed shortly after the organization of the "Licensed" Association in 1903, and it is to be sincerely hoped that the owners of the patent, as soon as possible after the decree has been rendered, will come forward with a definite statement of policy, so that every manufacturer will know exactly where he stands, and the market will not be disturbed by frequent injunction threats.

Maintaining Quality.

Perhaps the most difficult problem which confronts a company entering on the manufacture of automobiles is the question of how to keep the quality of their cars uniform, so that each car they turn out shall approach the standard which they believe desirable, or possible, for a car of that particular class.

Quality maintenance may be roughly divided under three heads, viz., maintenance of the quality of the material, maintenance of size and finish, and maintenance of a predetermined accuracy in assembly and adjustment.

The manufacturer can enforce his standards under each of these heads by specifications, inspections and tests. Each of these

three methods of maintaining quality can be elaborated as much as is thought desirable. Thus the specifications given in an order for material may vary all the way from a plain order for so many pounds of "30 carbon" or "nickel" steel, through specifications which seek to maintain the quantity of each element in the steel between certain limits, through others which also specify physical properties which the metal must exceed, to those which in addition to the last take up the manufacture of the metal, and perhaps even the quality of the ore.

Naturally the more rigorous the requirements of the specifications the higher is the price of the metal, and the more frequent must be the tests and analyses to make sure the quality is maintained.

In the machine shop the sizes of each finished surface are usually specified on the drawings, together with the amount of variation from this ideal size which is allowable. The necessary quality of the surfaces is not usually specified, but is left to the judgment of foremen and inspectors.

Just what the limitations of size should be for any piece of work is a much discussed question, and long experience in manufacturing and assembling is needed in deciding on limits. It seems probable, however, that too close fitting should be avoided on most parts, and that a rather liberal allowance with the standards carefully maintained often gives better results as regards quiet and regular operation than does an allowance which is so small that it is not enforced by the inspection department. Limits which are so close that the shop cannot live up to the requirements usually tend to create friction between the manufacturing and the inspection departments, and often result in compromises and agreements in utter disregard of the figures on the drawings.

Close fitting of bearing parts usually makes a machine more expensive, but with the exception of a few hard worked bearings does not always make the machine more efficient. With regard to the spacing of centres for working parts and the alignment of attached surfaces, however, a high degree of accuracy usually results in a more efficient and quiet mechanism.

Care in the machine work and inspection usually results in reducing the cost of assembling, and the requirements of the assembling process usually play an important part in regulating the limits specified for the machine work.

The accuracy of the final assembling and the care with which the car is adjusted, or "tuned up," to use a more descriptive phrase, probably play as large a part in securing satisfaction for the average user as anything we have previously mentioned.

Here, again, we find great differences in the practice of various makers. Some test the cars in the most perfunctory manner. Others test them rigidly, and every car must pass a thorough inspection, which includes the operation of every part and even the condition of small but important parts, such as the tightness of nuts and the presence of cotter pins. Naturally the results secured by these latter makers are more satisfactory to the purchaser than those of the former.

As stated at the beginning, uniform quality is difficult to maintain, but the maintenance of a fairly good quality is not nearly so difficult or costly as the maintenance of a very high quality. The question which confronts the manufacturer, then, and which is becoming more than ever important in these days of lowering prices, is: "What standard shall I seek to maintain?" At the present time there is no universally applicable answer. Probably there never can be, since the answer will very likely depend upon the class of people which it is desired to cater to. At the present time automobile work probably suffers fully as much from over-refinement as it does from careless workmanship.

There is a medium course in the writing of specifications for materials in the setting of limits on machine work, and in the final inspections and tests which will produce the most serviceable and satisfactory car at a reasonable cost. Only a few manufacturers have as yet approximated this course, but a good many of them are tending toward it.

In one respect, at least, the Selden decision came at an opportune time, and may have a decidedly beneficial effect. We are referring to its probable effect on the unchecked promotion of new manufacturing concerns. A too rapid growth has been fostered by the unprecedented demand for cars during the past year, which was largely the result of the general reduction in prices on moderate powered cars at the beginning of the season. Further reduction of prices may still further increase the demand, but it is obvious that this process of extending the market cannot be continued indefinitely, and if the present rate of expansion should be kept up it would not be long before the supply of cars would overtake the demand, and the industry would be brought face to face with the serious problems consequent upon overproduction. If some of the numerous recent flotations should be nipped in the bud by Judge Hough's decision it would very likely be to the ultimate advantage of the industry.

Electrically Preheated Vaporizing Surfaces.

A number of patents have recently been issued covering means for electrically heating the vaporizing surfaces around which the fuel vapor supplied to gasoline and kerosene engines is formed. The object of the arrangement is to facilitate starting under conditions of low temperature of the surfaces.

The claims cover means for supplying heat to internal vaporizing surfaces such as are employed in cylinders fed by fuel injection, and also to the surfaces of external vaporizers or carburetors. Suitably protected coils of wire or ribbon through which the currents are passed and which are arranged in suitable proximity to the surfaces to be heated are the means employed.

This application is of possible interest to motorists who house their cars in unheated stables and experience difficulty in starting their motors. The use of a torch to heat the parts is decidedly risky, and the ability to quickly heat the carburetor vaporizing chamber by connecting a heater arranged about it for a few minutes to the regular lighting circuit might prove a convenience. In fact an ordinary domestic electric heated pad or electro-therm can be used quite successfully for warming up the carburetor and the intake manifold.

Coming Events.

September 20-22—New York, Second Annual Run Around Long Island, New York Automobile Trade Association.

September 21—Riverhead, L. I., N. Y., Motor Contest Association Meet.

September 21 to 29—Munsey Reliability Run, Washington, Boston and return.

September 24 and 25—Brighton Beach Track, Twenty-four Hour Race, Motor Racing Association, New York city.

October 7—Philadelphia (Pa.) Second Annual 200 Mile Stock Chassis Race in Fairmount Park, Quaker City M. C.

October 30—Vanderbilt Cup Race, Long Island Motor Parkway, Long Island, N. Y.

November 6 to 13—National Automobile Show under the auspices of the N. A. A. M. at Atlanta, Ga.

November 9—Atlanta, Ga., Track Races, Atlanta Automobile Association.

November 22—Flag-to-Flag Reliability Run, from Denver to City of Mexico.

December 29-30—Philadelphia (Pa.) Annual Midwinter Endurance Contest, Quaker City M. C.

December 31 to January 7—New York City Annual Show, Grand Central Palace, American Motor Car Manufacturers' Association.

January 8 to 15—New York Annual Show, Madison Square Garden, Association of Licensed Automobile Manufacturers.

February 5 to 12—The Ninth Annual National Show at Chicago, Ill.

Some Points in the Operation and Care of Vehicle Batteries.

(Paper read by H. M. Beck before the Society of Automobile Engineers.)

With the rapid increase in the number of electric vehicles, the question of the proper operation and care of the storage battery becomes one of increased importance, as the best vehicle will not run if the battery goes wrong. While under normal conditions the care of a battery is a comparatively simple matter, it must not on this account be entirely overlooked, and, unfortunately, there has been some tendency recently to minimize the actual attention required. This policy is not new, having been tried in other lines of battery work, and if continued is sure to result disastrously. Why not rather admit that a certain amount of attention is required and insist on it? The best battery can be ruined in a comparatively few charges or discharges, where it would have given a long life with proper treatment.

The instruction books furnished by the manufacturers go into the operation and care of vehicle batteries very completely, and as they have been revised from time to time, one of them now being in its sixteenth edition, they are up to date. It will not be necessary, therefore, to go into many of the details of operation, but there are certain points which are either frequently misunderstood, or else on which it would be well to lay special emphasis, as their importance has apparently not been appreciated.

A storage battery is chemical in its nature, rather than mechanical, and must not, therefore, be confused with mechanical apparatus. The latter gives much more marked warning when it requires attention, and the fact that a battery may be apparently operating perfectly when it requires attention is responsible for a great deal of battery trouble. When a battery finally breaks down permanent injury has been done, and while it can generally be doctored back into shape, it cannot be made to give the life it should have given. In probably no line of technical work is prevention rather than cure of so vital importance.

Unfortunately the chemical theory of the storage battery has never been definitely settled, but an approximate idea of what goes on during charge and discharge can be easily stated.

A storage battery from an elementary standpoint consists of two or more plates, positive and negative, insulated from each other and submerged in a jar of dilute sulphuric acid. The plates consist of finely divided lead known as the active material held in grids which serve both as supports and as conductors for the active material. The active material being finely divided offers an enormous surface to the electrolyte, and thus electro-chemical action can take place easily and quickly. Two plates such as described would have no potential difference, the active material of each being the same. If, however, current from an outside source is passed between them, one, the positive, will become oxidized, while the other remains as before, pure lead. This combination will be found to have a potential difference of about two volts, and if connected through an external circuit current will flow. During discharge the oxidized plate loses its oxygen and both plates will become sulphated until, if the discharge is carried far enough, both plates will again become chemically alike, the active material consisting of lead sulphate. On again charging the sulphate is driven out of both plates and the positive plate oxidized, and this cycle can be repeated as often as desired until the plates are worn out. Thus charging and discharging simply results in a chemical change in the active material and electrolyte, and the potential difference between the plates and capacity is due to this change.

In taking care of a storage battery there are four points which are of the first importance:

First—The battery must be charged properly.

Second—The battery must not be overdischarged.

Third—Short circuits between the plates or from sediment under them must be prevented.

Fourth—The plates must be kept covered with electrolyte, and only water of the proper purity used for replacing evaporation.

While, as already stated, it is impossible to give an accurate formula for the chemical changes which take place in a storage battery during charge and discharge, certain facts dependent upon these are well established, and are used as a basis for operation. These are the following:

Voltage—During charge the voltage of a battery gradually increases until the cells are fully charged, but it will then come to a standstill, and will not rise any higher, no matter how long the charge is continued. The maximum voltage thus reached is not a fixed point, varying widely at different times, depending upon the age of the battery, the temperature, the strength of the electrolyte and the charging rate.

During discharge the voltage falls, and if the discharge were carried far enough it would reach zero, but experience has shown that this point is much too low for safety, resulting in the rapid destruction of the plates.

Specific Gravity—Due to the fact that during discharge the active material of both plates becomes sulphated, the specific gravity of the electrolyte falls. During charge the reverse process goes on, the sulphate is driven out, and the specific gravity of the electrolyte rises. As with the voltage, the gravity will rise gradually during charge until all the sulphate is driven out of the plates, but will then show no further increase, no matter how long the charge is continued. The maximum gravity thus obtained is also a variable figure, depending upon the temperature of the electrolyte as well as upon the actual amount of acid and water present in the cell.

The fall in gravity is almost proportional to the ampere hours discharge. In other words, specific gravity readings can be used as an ampere hour meter, but, unfortunately, gravity readings are difficult or disagreeable to obtain in the case of vehicle batteries, so that this check on the discharge is not frequently used.

Gassing—Until nearly charged, the plates in a storage battery should absorb the energy put into them with little or no gassing. When they are nearly charged, the energy, instead of being stored, shows itself in the form of more or less gassing, the amount depending upon the rate of charge. During discharge a cell should never gas. If it does so, it is an indication that it has been run down much too low and needs immediate attention.

Of the above indications the first two, voltage and gravity, are those most commonly employed in operating. Gassing, while of great assistance as a guide or warning, cannot be depended upon for accurate results, and is only used when nothing but the most crude methods of operation are practical.

Either voltage or gravity readings alone could be used, but as both have advantages in certain cases, and disadvantages in others, it is advisable to use each for the purpose for which it is best fitted, the one serving as a check on the other.

Voltage has the great disadvantage in that it is dependent upon the rate of current flowing. Open circuit readings are of no value, as a cell reads almost the same discharged as it does charged. On the other hand, a voltmeter is a very easy instrument to read, and may be located wherever desirable.

Specific gravity readings are almost independent of the current flowing, but the hydrometer is difficult to read, not very sensitive, and the readings must be taken directly at the cells.

Charge—In the case of the pasted type of plates, used almost entirely in vehicle service, experience has shown that the manner of charging has much to do with the life of the plates, and on this account it is sometimes stated that the life of a vehicle cell is proportional to the number of charges, rather than the number of discharges. On this account it is wise to charge the cells as moderately as practical. On the other hand, it has been found that if the plates are to be kept in good condition, it is necessary to occasionally charge them to a maximum, thus reducing all the sulphate. Also the different cells of a battery work as independent units, and while their efficiencies are approximately the

same, there is generally some slight variation, which if the cells are charged on a very efficient basis will sooner or later cause irregularity, the cells with the lowest efficiency dropping behind. It is necessary, therefore, occasionally to even them up or the low cells will get in trouble. To meet these conditions, charges are divided into two classes—regular charges which should be as efficient as possible, and overcharges given at stated intervals, which are carried to a maximum voltage and gravity, and intended to reduce all the sulphate in plates, and even up any irregularity in the cells.

Initial Charge—New batteries are usually received in a charged condition, but when this is not the case, the plates being shipped dry, or where the battery has been taken out of commission, it requires an initial charge before it is ready for service. This charge is not a complicated matter, but requires considerable time, frequently over 100 hours, and there is a very general tendency to cut it short. When the initial charge is not complete the plates will not be properly formed, a certain amount of sulphate will remain in them which will produce local action, and the capacity and life of the cells will be materially reduced.

In regular operation it is well to charge at the lowest possible rate. A large part of the wear on the plates is caused by the gassing, and the amount of gassing is reduced by a lower rate of current. Since the gassing occurs almost entirely near the end of the charge, it is especially important that the charging rate be low at this point, so that when the available time is limited the necessary number of ampere hours can be gotten into the battery with the least possible wear by having the current rate high at the beginning of the charge and low at the end.

There is one point in connection with the charge which should be especially emphasized, namely, that the final voltage corresponding to a full charge is not a fixed figure, but varies widely, depending upon the charging rate, the temperature, the strength of the electrolyte, and age of the battery. For this reason, charging to a fixed voltage is unreliable and likely to result disastrously. The charge should be continued until the voltage or gravity cease rising, no matter what actual figures are reached. Old cells at high temperatures may not go above 2.4 volts per cell, whereas if very cold they have been known to run up to three volts.

The points to be especially emphasized in connection with the charge are:

First—On regular charges keep the rates as low as practical, and cut off the current promptly. It is preferable to cut off a little too soon rather than to run too long where there is any question.

Second—Overcharges must be given at stated intervals, and continued to a complete maximum. They should be cut off at the proper point, but when in doubt it is safer to run too long rather than to cut off too soon.

Third—Do not limit the charge by fixed voltage.

Fourth—Keep the temperature within safe limits.

Discharge—The discharge largely takes care of itself, except that a battery should not be run down below its voltage limit. The rate of current has very little effect upon the life of the plates, provided the discharge is not carried down too far. Where a battery is completely discharged it should be charged as soon as possible, and if it has been run down too low the charge should be continued to a maximum similar to the overcharge.

Ampere Hour Meter—Many attempts have been made to develop apparatus which would automatically show the charge and discharge of a storage battery, but these have either been based on the wrong principles, or else the instruments would not stand the wear and tear to which they were subjected, and they have therefore not proved satisfactory. Within the last year or so, however, a mercury type ampere hour meter has been placed on the market, designed especially for battery use, and so far the results obtained have been very promising. This meter is equipped with a large dial and a pointer which can be set by hand to any point desired. This pointer revolves in one direction during charge, and in the opposite direction during discharge, and registers directly the ampere hour output or input to the battery. The mercury in which the armature disc is submerged acts as a dashpot, and seems to be very effective in damping the vibrations and jolts which such a meter has to stand.

During discharge the meter shows directly what capacity has been taken out, so that it is a simple matter to determine what is left in the battery. For charging the procedure is somewhat more complicated, although not seriously so. It is necessary to charge a battery for from 15 to 20 per cent. more ampere hours than are discharged in order to make up for the losses in the battery. The method used to accomplish this is to move the pointer ahead the proper number of ampere hours just before charging, then charge until the pointer comes back to zero. The meters are equipped with an electrical contact at the zero point, which can be made to automatically open the circuit if desired. As will be seen, this considerably simplifies the handling of the charge; but there is one point which must not be overlooked, and which should be strongly emphasized, namely, that the efficiency of a battery varies with the amount of work it does, being much lower for light work than heavy. In fact, as long as in commission, the battery needs regular charges, even if it does no work at all; in other words, its efficiency would then be zero. This condition can be handled in several ways. Under average conditions, it is probably safe to charge by the ampere hour meter for a set period, say two weeks, provided at the end of this period the battery is given a regular overcharge. An alternative method is to give an additional charge once a week by the meter of whatever number of ampere hours is found neecssary to keep the battery up. The regular bi-weekly overcharge will probably be found to be the safer method, especially in private service where the conditions are so variable, but whatever method is used, too much emphasis cannot be laid upon the fact that if a battery is to be kept in good condition, in addition to the ordinary charges with the ampere hour meter, regular overcharges must be given. The meter certainly gives promise of reducing the amount of attention a battery requires, but the danger is that it will therefore be assumed that it will eliminate all of it.

Short Circuits—Short circuits between the plates are largely eliminated through the use of the wood separator. This point therefore does not need any special attention beyond that of seeing that the separators are in good condition when installed. With the sediment under the plates, however, the case is different. It is a natural tendency to wish to run a battery as long as possible before putting it out of commission for overhauling. The result is that very generally the sediment is allowed to get up to the plates before the battery is washed. When the sediment reaches the plates there is a discharge of wasted current through it, which in turn necessitates that the cell be given more charge in order to hold it up, and the extra charging again throws down still more sediment. Further, the sediment becomes sulphated, and by local action with the active material of the plates in contact with it causes the active material to become sulphated, which again increases the tendency to washing out. The result is that the plates begin to lose their active material rapidly if the sediment is allowed to collect until it reaches them, and it is, therefore, evident that if a battery is to give its normal life it is absolutely essential that the sediment be cleaned out before, and not after, it reaches the plates. The rate at which the sediment collects depends largely upon the way a battery is handled, and it is, therefore, necessary to determine this rate for each individual case. A cell should be cut out after, say, fifty charges, the depth of sediment measured and the rate so obtained used to determine the time when the battery will need cleaning. As there is apt to be some variation in the amount of sediment in different cells, and as the sediment is thrown down more rapidly during the latter part of a period than at the beginning, it is always advisable to allow at least one-fourth inch clearance. If the ribs in the bottom of the jars are 1¾ inches high, figure on cleaning when the sediment reaches a depth of 1½ inches.

Before dismantling a battery for "washing," if practical, have it fully charged. Otherwise, if the plates are badly sulphated.

they are likely to throw down considerable sediment on the charge after the cleaning is completed.

There have been a great many complaints of lack of capacity from batteries after washing. Almost without exception this is found to be due to lack of a complete charge following the cleaning. The plates are frequently in a sulphated condition when dismantled, and in any case are exposed to the air during the cleaning process, and thus lose more or less of their charge. When reassembled they consequently need a very complete charge, and in some cases the equivalent of the initial charge, and unless this charge is given the cells will not show capacity, and will soon give trouble again. This charge should be as complete as that described elsewhere in connection with the initial charge.

"Flushing" or replacing evaporation in cells with electrolyte instead of water is a most common mistake. The plates of a storage battery must always be kept covered with electrolyte, but the evaporation must be replaced with pure water only. There seems to be a more or less general tendency to confuse the electrolyte of a storage battery with that of a primary cell. The latter becomes weakened as the cell discharges, and eventually requires renewal. With the storage battery, however, this is not the case, at least to anything like the same degree, and unless acid is actually lost through slopping or a broken jar it should not be necessary to add anything but water to the cells between cleanings. Acid goes into the plates during discharge, but with proper charging it will all be driven out again so that there will be practically no loss in the specific gravity readings, or at least one so slight that it does not require adjustment between cleanings. Thus, unless some of the electrolyte has actually been lost, if the specific gravity readings are low, it is an indication that something is wrong, but the trouble is not that the readings are low but that something is causing them to be low, and the proper thing to do is to remove the cause and not try to cover it up by doctoring the indicator. The acid is in the cells, and if it does not show in the readings it must be in the form of sulphate, and the proper thing to do is to remove the cause of the sulphation if there is one, and then with proper charging drive the acid out of the plates, and the specific gravity readings will then come back to the proper point. The too frequent practice in such cases is to add electrolyte to the cells in order to bring up the readings, which, as already explained, are only the indication of the trouble, and this further aggravates the condition, until finally the plates become so sulphated that lack of capacity causes a complaint. This practice of adding electrolyte to cells instead of water seems to be becoming more and more common. In general it is much the safer course to assume that the electrolyte is all right, and look for trouble elsewhere, than to attempt to doctor it by the addition of more acid, and a great deal of trouble today is the result of a misunderstanding of this one point.

The treatment required for bringing a low cell or battery back into shape, while quite simple, is one of the most misunderstood parts of battery operation. The causes of low cells may be very varied, but the results produced, and consequently the treatment required, are not so varied. The general procedure is as follows:

First—Restore the cell mechanically.

Second—Renew the electrolyte if there is any question as to its purity.

Third—Restore the cell electrically by charging.

Before dismantling a cell, if practical, have it fully charged, the mechanical restoration then simply covers the operation of examining the cell and putting it as nearly as possible back into its original condition. This should not be difficult for anyone who is familiar with the assembly of the elements.

Where there is any question as to its purity, the electrolyte should be renewed, as the expense is not great in the case of the small cells used in vehicle service, and it would hardly pay to have an analysis made. Where any considerable amount of electrolyte is under suspicion, the manufacturers will gladly analyze the same. It is well to always have the water used for replacing evaporation and new electrolyte, unless furnished by the battery manufacturers, tested.

The most marked effect of an impurity is to cause the plates to become a bad color, the cells to become inefficient electrically, and in extreme cases the plates may be ruined.

When the electrolyte is renewed the jar and plates should be thoroughly washed, and the new electrolyte should be of about the same strength as that renewed in order to allow for any acid which may be in the plates.

The electrical restoration has been probably the greatest stumbling block, and largely through lack of understanding, as this operation consists in simply charging the cell until a maximum voltage and gravity is reached. The common mistake is to cut off the charge before it is complete, in which case the plates, being still sulphated, will not show capacity, and are likely through local action to soon get into bad condition again.

With the possible exception of trouble due to an impurity, it can be generally stated that chemically the final condition requiring treating is abnormal sulphating, and even where an impurity is present in the electrolyte its action is assisted by sulphating. It should be understood that sulphating is a normal as well as an abnormal process in the charge and discharge of storage batteries, and the difference is in the degree, not the process. The abnormal condition is that ordinarily referred to by the term. In normal service sulphating does not reach the point where it is difficult to reduce, but if carried too far the condition becomes so complete that it is difficult to reduce, and injury results. A very crude method of illustrating the different degrees of sulphating is to consider it as beginning in individual particles uniformly distributed throughout the active material. Each particle of sulphate is then entirely surrounded by active material. The sulphate itself is a non-conductor, but being surrounded by active material the current can reach it from all sides, and it is easily reduced. This is normal sulphate. As the action goes further the particles of sulphate become larger and join together, and their outside conducting surface is greatly reduced in comparison with their volume, so that it becomes increasingly difficult to reduce them, and we have abnormal sulphate.

The general cure for sulphating is charging, so that a cell having been mechanically restored the electrical restoration consists simply in the proper charging. Sulphate reduces slowly, and on this account it is a good plan to use a rather low current rate. High rates cause excessive gassing, heating, and do not hasten the process appreciably, so that it is the safer as well as the more efficient plan to go slowly. A good rate is about one-fifth normal. The length of charge will depend upon the degree of sulphating. In one actual case it required three months' charging night and day to complete the operation, but this was, of course, an exceptional one. The aim should be to continue until careful voltage and gravity readings show no further increase for at least ten hours and an absolute maximum has been reached. In serious cases it may be advisable to even exceed this time in order to make absolutely sure that all sulphate is reduced, and where there is any question it is much safer to charge too long rather than to risk cutting off too soon. A partial charge is only a temporary expedient, the cell still being sulphated will drop behind again.

Since the specific gravity readings are affected not only by the charge but also by the evaporation and changes in temperature, it is advisable, where an absolute maximum is to be reached, to eliminate these. The evaporation should be replaced with sufficient frequency to keep the electrolyte accurately at a fixed height above the plates. In this way water is added so frequently that very little has to be added at any one time, and the effect on the specific gravity readings is negligible. The temperature variations are eliminated by reading the temperature of the electrolyte, when specific gravity readings are taken, and correcting the latter to some standard temperature, such as 70° Fahr. This correction is made by adding one point (.001 specific gravity) for every 3 degrees above 70° Fahr., and subtracting one point for every 3 degrees below 70° Fahr.

When the charge is complete the specific gravity of the electrolyte should be adjusted to the proper point, and the cell is

ready for service. Where there is time, and the facilities are at hand, it is a good plan to take a test discharge in order to make sure that everything is all right.

Failure in the restoration of low cells is probably more often due to cutting off the charge too soon than to any other cause, and from the troubles which are being reported this point evidently needs to be brought out more strongly.

In closing, a word or two about the vehicles themselves. As manufacturers we wish to admit without argument that the battery is the most important part of the vehicle, but, on the other hand, we would like to protest against the frequent practice of blaming the battery for everything that goes wrong. The battery is rated in ampere hours, not mileage, and when the mileage of a vehicle falls short trouble should be looked for in the vehicle as well as in the battery. Batteries are regularly rated at their four hour discharge rate, this being about an average running rate for vehicles. The capacity, however, varies widely with different discharge rates, decreasing as the rates increase, so that anything which causes the vehicle to consume more current will more than proportionately reduce its mileage. For example, suppose that due to inefficient tires, poor bearings or binding brake, a normal current of 20 amperes is increased to 30 amperes. If the ampere hour capacity were still the same, and there were no other losses, the mileage would be reduced about one-third. This increase in current, however, reduces the actual capacity of the battery by about 10 per cent. The average discharge voltage is also reduced, and the drop in wiring of the vehicle is increased, so that the watts delivered to the motor are still further reduced, and finally the motor itself is somewhat less efficient at the higher rate, so that the net result is that the mileage of the vehicle, instead of being reduced by one-third, is actually cut down by about one-half. It is thus evident how important it is that the vehicle, as well as the battery, be kept in the best of condition.

As has already been stated, no attempt has been made to cover many of the details of battery operation, but rather to emphasize and explain some of the most common errors found in the handling of the vehicle batteries of today, and of these probably that which should be brought out most forcibly is the matter of flushing cells with electrolyte instead of water. Keep the plates covered with electrolyte, but use only pure water, not acid, for replacing the evaporation.

Premier Agents' Convention.

During the week beginning September 20 the Premier Motor Manufacturing Company will entertain its agents and representatives at the factory in Indianapolis. On Tuesday evening there will be a banquet at one of the hotels, followed by a run to French Lick Springs, and return on Wednesday and Thursday.

National Good Roads Convention.

The second annual national good roads convention was opened in Cleveland, Ohio, yesterday, September 21, and will remain in session three days. Most of the prominent organizations interested in good roads are represented at the convention, and the governors of many of the States in the Union have sent delegates. The United States Government is represented by Logan Waller Page, director of the United States Office of Public Roads, and members of his staff. In addition to the large number of addresses by highway engineers, etc., practical demonstrations are being given upon different roads in and around Cleveland. Another feature of interest is a large exhibit of road making machinery in the Central Armory of Cleveland. This is said to be the first time that such an exhibit has ever been arranged. The organizations officially represented at the convention are as follows: American Automobile Association, National Grange, United States Office of Public Roads, American Road Makers' Association, National Association of Automobile Manufacturers, Association of Licensed Automobile Manufacturers, and the American Motor Car Manufacturers' Association.

The Cleveland A. C., whose members have arranged the program for the practical demonstrations and social features and entertainments, are the official headquarters for the delegates and guests.

The convention proper is being held in the Chamber of Commerce Hall, where President Lewis R. Speare, of the American Automobile Association, delivered the opening address at 10 o'clock on Tuesday morning. Governor Harmon, of Ohio, then extended the welcome of his State to the delegates, and Mayor Johnson, of Cleveland, followed in welcoming the good roads enthusiasts to the city. Chairman George C. Diehl, of the national committee, acted as presiding officer, and introduced the speakers. Following is the program of the convention, which will be fully reported in our next issue:

TUESDAY, SEPTEMBER 21.
CHAMBER OF COMMERCE HALL.
MORNING SESSION.

10 a. m.—Opening address, President Lewis R. Speare, of the American Automobile Association.

"Welcome to Ohio," Hon. Judson Harmon, Governor of State of Ohio.

10:25 a. m.—"Address of Welcome," Hon. Tom L. Johnson, Mayor of Cleveland.

10:40 a. m.—"The Second Annual National Good Roads Convention," and introduction of speakers. George C. Diehl, presiding officer and chairman of the national committee, directing the convention.

10:50 a. m.—"Good Roads of the State of Ohio," James C. Wonders, State Highway Commissioner of Ohio.

11:15 a. m.—"State Aid," Hon. James H. MacDonald, State Highway Commissioner of Connecticut.

AFTERNOON SESSION.

2 p. m.—"The National Grange and Good Roads," Ex-Gov. N. J. Bachelder, master of the National Grange.

2:30 p. m.—"The New England Plan for Connecting Lines of Trunk Highways," George S. Ladd, special good roads lecturer of National Grange.

3 p. m.—"The Farmers' Interest in Road Improvement," Hon. T. C. Laylin, master Ohio State Grange.

3:30 p. m.—"The New York State Grange and Good Roads Legislation in That State," Hon. F. N. Godfrey, master New York State Grange.

4 p. m.—"Good Roads in the State of Pennsylvania," E. J. Kent, vice president Automobile Club, Pittsburg, Pa.

4:30 p. m.—"Road Maps and Signs," Powell Evans, president Automobile Club of Philadelphia.

WEDNESDAY, SEPTEMBER 22.
CHAMBER OF COMMERCE HALL.
MORNING SESSION.

Convention called to order by Presiding Officer George C. Diehl, national chairman, at 10 a. m.

10:15 a. m.—"Road Situation in the United States as Compared with Foreign Countries," Logan Waller Page, director of Office of Public Roads, Washington, D. C.

10:45 a. m.—"New York State Trunk Lines," Hon. S. Percy Hooker," chairman New York State Highway Commission.

11 a. m.—"Illinois Good Roads," H. H. Gross, president Illinois Farmers' Good Roads League.

11:25 a. m.—"Treatment of Earth Roads," D. Ward King, Missouri State Board of Agriculture.

11:45 a. m.—"Postal Progress League," James L. Cowles, secretary and treasurer.

AFTERNOON SESSION.

12 noon.—Practical demonstrations and road inspections.

2:30 p. m.—Complimentary luncheon will be served at the Randall Track Clubhouse.

THURSDAY, SEPTEMBER 23.
CHAMBER OF COMMERCE HALL.
MORNING SESSION.

The convention called to order by Presiding Officer George C. Diehl, national chairman.

10:15 a. m.—"Macadam Roads," A. B. Fletcher, secretary Massachusetts Highway Commission.

10:45 a. m.—"Bituminous Road Materials," Provost Hubbard, chemist United States Office of Public Roads.

11:15 a. m.—General discussion.

AFTERNOON SESSION.

12 noon.—Boat ride on Lake Erie. Passenger steamer City of Detroit will leave foot of Superior street. Complimentary luncheon will be served on board.

8:30 p. m.—Theatrical performance at Chamber of Commerce Hall by the Hermit Club, of Cleveland. Music by Hermit Club Orchestra.

Speedway to Be Brick Paved.

A brick surface is to be placed on the course of the Indianapolis Motor Speedway at Indianapolis, this decision having been reached after a demonstration with a number of different materials. The paving work is now in progress, and will require about 3,500,000 brick. At the recent races on the course it was demonstrated that the crushed stone and oil surface would not be satisfactory for the purpose. The brick course will be the only one of its kind in the world. The company is also building an aerodome on the grounds for the aviation meet in October. It will be 300 feet long and 60 feet wide.

It is reported that the Japanese Government has purchased a motor truck for the Imperial Arsenal in Tokio from the firm of Laurin & Klement, Jungbunzlau, Bohemia. The truck is equipped with a four cylinder 18-22 horse power motor, and designed for useful load of 1½ tons. It is to be used for transporting military equipment between the arsenal in Tokio and machine shops which are located at considerable distance.

Maintenance and Repairs

Roadside and Emergency Repairs.

By H. H. Brown.

Perhaps one of the best of the old proverbs for the motorist (especially he who drives his own car) to keep in mind is that "an ounce of prevention is worth a pound of cure," or to translate this into the language of the motorist, "an ounce of oil is worth a pound of new babbitt metal." It is probably a fact that the majority of roadside breakdowns, barring tire trouble, might be avoided by careful inspection of the car from time to time.

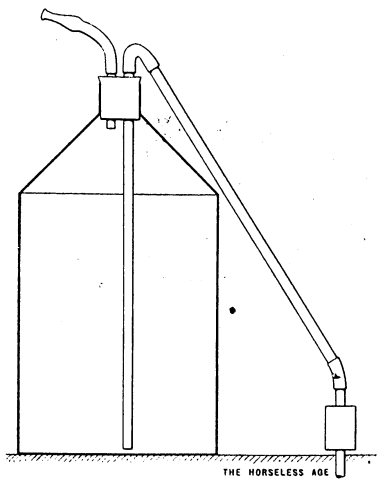
However, accidents will happen in the best regulated machines (as well as families), and in many cases are unavoidable. For instance, a stone or other obstruction may cause a leak in a low hung gasoline tank. A ball may crack in a bearing and untold havoc may result from this cause.

In a more or less permanent repair, made in a shop or garage, one is able to take a reasonable time to study how to do the job. Then, the tools and materials being at hand, it is in most cases a comparatively easy matter to proceed. However, in the emergency repair the circumstances are quite different. In the first place, tools, materials and skilled help are generally conspicuous by their absence. Then, again, little time may be given in which to figure out a method of getting over the difficulty. The following occurrence illustrates this latter point: Some time since a breakdown occurred on a road on which there was a trolley line that led to the nearest town, a distance of about 5 miles. The nature and extent of the trouble had been barely ascertained when the trolley car came in sight. It had been previously ascertained that the cars ran but once an hour, and it was then after 5 o'clock. As the town was a small one, if this first car was missed the chances for an all night stop of the machine at this point would have been exceedingly good. Fortunately in this case familiarity with the general features of the parts involved and their general dimensions allowed of working out a plan of action on the trolley while on the way to town which would allow for possible errors in estimation of dimensions, so that all was done within an hour and a return made on the next car to the machine, which was then able to proceed on its way in less than ten minutes.

To partially offset these disadvantages sightliness, durability and the comfort of passengers do not have to be considered to the extent that is only natural in the case of a more permanent repair.

The following incident may illustrate this assertion: Some time ago a chassis was delivered by an agent to a body builder in a town about 50 miles from the home city of the agent. When one of the salesmen attached to the agency went for the car it was discovered that the copper tubing fitted with the proper unions for connecting the carburetor and gasoline tank was not in evidence. To have waited till it could have been obtained would have meant a day's delay, to say nothing of the time and carfares of the salesman. In this case, however, a 5 gallon kerosene can, with a stopcock at the bottom, as well as 10 or 12 feet of rubber tubing, was available. One end of the tubing was slipped over the stopcock on the can and made tight with twine. The can was then placed on the footboard to the left of the driver and the tubing led under the bonnet, and connected in a similar manner to the carburetor. This makeshift device only took about ten minutes to rig, and enabled the car to be driven a distance of between 50 and 60 miles, with only one filling of the extemporized tank on the road, and that at less than 15 miles from home.

It is seldom that two precisely similar



accidents happen to a motorist nowadays, and it is still more seldom that the same means of effecting a temporary repair are available. It is well, however, to figure out how else such a repair might be effected with the means at hand.

This is a good practice for a variety of reasons. While the method used may have been the best at the time with the means at hand, yet in another case the same means may not be available, or, owing to differences of the break, other means may have to be resorted to. Then, again, while there is, of course, nothing like practice, yet if one accustoms himself to figuring the way out of imaginary emergencies, when the real one comes he is much more likely to get out of it easily than if he had not given any thought to the matter.

Let us take the case in which the tank and carburetor connection was missing. It will probably have occurred to some that the rubber tubing might have been used to make connections direct between the regular tank and the carburetor. This, of course, might have been done, and probably would in case the 5 gallon can had not been available. However, there were quite a few practical reasons against this course.

In the first place, there was no stopcock at the tank. Secondly, a joint made between the nipple at the tank and the rubber hose could hardly be considered reliable under the circumstances, to say the least. It will readily be seen that quite a good sized leak might occur which would not affect the operation of the machine, but would perhaps leave it stranded at some very inconvenient point.

On the other hand, in using the can, the joint at the can was constantly under two pairs of eyes, those of the driver and the front passenger, and as the top of the can was off any undue loss of gasoline would soon have been noticed, and the defect sought and remedied.

To show what may be done in case of an accident, let us suppose that the gasoline tank has a leak in it which renders it for the time being useless, and that the gasoline pipe is broken off. On going to the nearest grocery store we find that the owner sells gasoline in ordinary cans, which are closed by a good cork stopper, of which he has plenty. Other than that, nothing is available, except what is on the machine.

On examination we find that a considerable length of the tubing leading from the carburetor is in good order. This is led up till it projects above the floor boards. Further examination shows us that we have quite a few feet of copper tubing which runs from our generator to our headlights. Also four pieces of rubber connecting tubing used to connect the lamps and the generator to the copper tubing.

In the first place a cork is used to form a reducing coupling between the gasoline piping and the smaller copper piping formerly used for the acetylene gas lead. A length of the copper acetylene lead is passed through the cork of the gasoline can until it almost touches the bottom. A smaller length is then just passed through the cork and a length of about a foot of rubber tubing placed on it. By a length of the copper and two small lengths of the rubber the can is now connected to the carburetor pipe. The can in this instance is placed to the left of the driver. By blowing into the short tubing on the can the gasoline will flow to the carburetor and will continue to do so, owing to the siphon action.

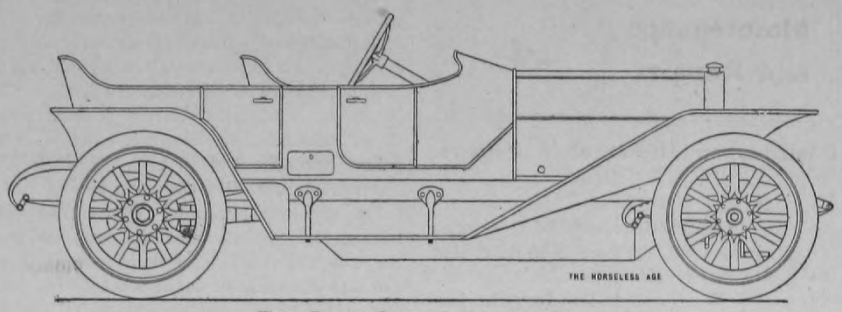
Cranked Motor With Gears in Mesh.

G. G. Swackhamer, of White Plains, N. Y., recently caused an accident by cranking his car with the change gear in the first speed position. Mr. Swackhamer's car was brought to a stop in the road owing to a block caused by an ice wagon. He jumped out to crank the engine, but forgot to first move the change gear lever to the neutral position, and the result was that as soon as the engine began to fire the car jumped forward, knocking him down, knocking down two people walking on the sidewalk and smashing a window.

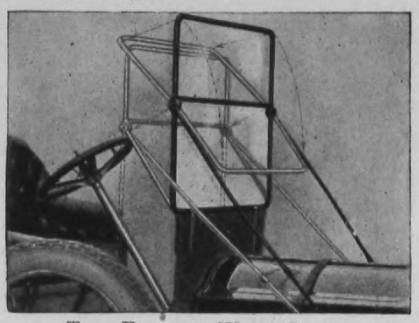
NEW VEHICLES AND PARTS

The G J G Car.

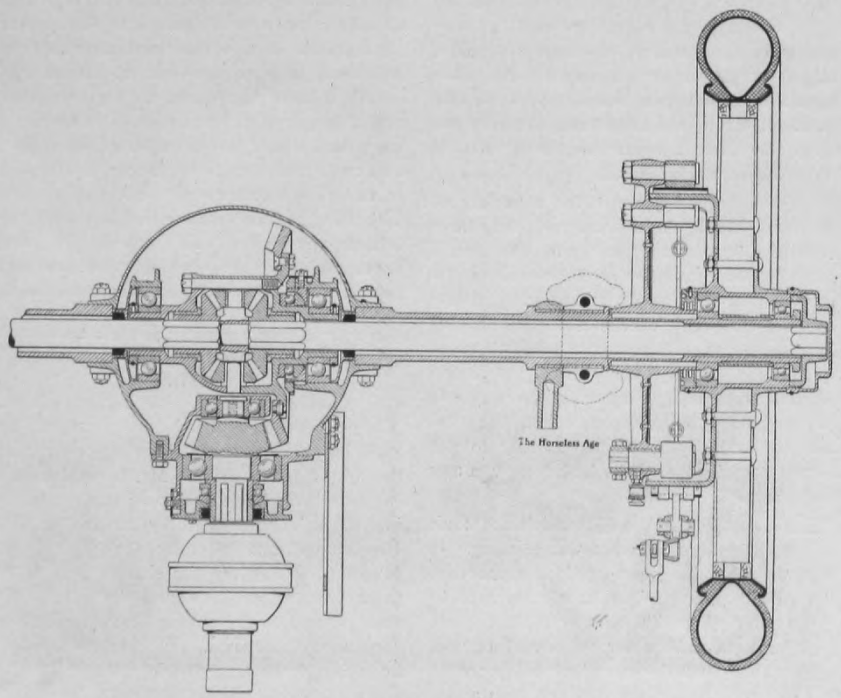
The G J G Motor Car Company, which has recently begun the manufacture of automobiles in White Plains, N. Y., has brought out a runabout model known as the Pirate, and a touring car model known as the Scout, both of 40 horse power, and listed at $2,250 and $2,500 respectively. The motor is a four cylinder vertical one with cylinders cast in pairs, of 4¾ inch bore and 5 inch stroke. The water jacket heads are separate, and the water is circulated through the cooling system by a centrifugal pump. A Bosch high tension magneto furnishes the ignition current. The change gear is of the selective type, with three forward speeds and one reverse. The shafts and gears are made of imported chrome nickel steel, and the shafts run in Rhineland imported annular ball bearings. The clutch is of the conical type, faced with leather, with springs under the leather to insure gradual engagement. The rear axle is of the full floating type, and the driving gears and shafts are of heat treated Krefeld imported chrome nickel steel. The front axle is a single piece drop forging of Krefeld chrome nickel steel, with Elliott type steering heads. The frame is made of heat treated pressed steel, and has four cross members. The motor and change gear are carried on a sub-frame. The frame is supported in front by semi-elliptic springs of alloy steel, 40x2 inches, and in the rear by three-quarter elliptic springs, 56x2¼ inches. The steering gear is of the worm and sector type, and is adjustable for wear. Both cars have a wheel base of 121 inches, a standard tread, and 34x4 inch wheels, with quick detachable rims. The gear ratio is 2½ to 1 for the runabout, and 3 to 1 for the touring car, but the car can be furnished with a special ratio of 3½ to 1. The equipment includes two acetylene head lights, two oil side lamps, an oil tail lamp, a Prest-O-Lite tank, a horn, and a complete set of tools.



THE SCOUT CRUISER TOURING CAR.



THE FRICTION WIND SHIELD.



SECTIONAL VIEW OF ALCO FLOATING REAR AXLE.

Alco Models for 1910.

The automobile department of the American Locomotive Company, Providence, R. I., will next year turn out three chassis models, viz., a six cylinder, 60 horse power; a four cylinder, 40 horse power, and a four cylinder, 22 horse power. The most important change over last year's construction is that all of the new models will have shaft drive, while formerly the 40 and 60 horse power models were chain driven. The rear axle construction used on the two larger chasses is the same as that formerly used for the small town car. The axle is of the floating type, the supporting member consisting of a one piece drop forging, with a large ring in the middle and tubular arms stiffened by ribs above and below. Another change relates to the ignition system. The Bosch dual high tension system will be used, comprising both a magneto and batteries, operating on one set of spark plugs. A new line of aluminum bodies has been designed for 1910, the seat panels consisting of sheet aluminum and the door frames of aluminum castings. The moldings about the panels are rolled in with the aluminum sheet, instead of being attached separately. The prices of the different models have been reduced and are now as follows: Twenty-two horse power town car, limousine or landaulet, $4,350; 40 horse power touring car, $4,750; 40 horse power limousine or landaulet, $5,500; 60 horse power touring car, $6,000; 60 horse power limousine or landaulet, $6,750. The cars are furnished with a very complete equipment, including a top, side lamps, horn, tire brackets, etc.

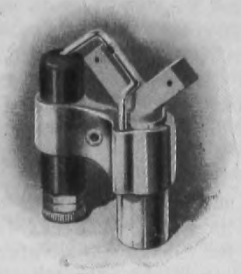
The Friction Wind Shield.

A novel type of adjustable wind shield has been placed on the market by the Newark Rivet Works, 262 Lafayette street, Newark, N. J. As will be seen from the illustration, the shield is divided, as usual, a little above the centre, and is held in any position desired by friction. It is claimed that the shield absolutely stays where placed, but can be adjusted to any position from the driver's seat. The frame is made of seamless brass tubing, with a sub-channel to hold the glass firmly and prevent rattling. The top half can be swung forward to a position substantially parallel with the stay rods, when it will divert the air currents over the heads of the occupants of the car, thereby considerably reducing the air resistance,

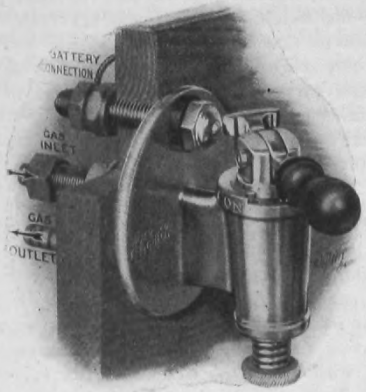
it is claimed. The lower half of the shield may be arranged either vertically, as shown, or, by lengthening the stay rods, inclined rearwardly so as to come as near to the steering wheel as permissible, and this adjustment, in connection with the various adjustments of the top half, gives a great variety of possible combinations.

The Auto Lighter.

The Motor Specialties Company, of 222 Eliot street, Boston, Mass., have brought out a system for lighting acetylene automobile lamps from the driver's seat. The apparatus comprises essentially three parts, viz., a controller, an induction coil and a burner. The controller is a combined gas valve and electric contact device, and is secured to the dash of the vehicle. By a simple turn of the handle to the left the gas from the generator or tank is admitted to the burner, and by the same operation a series of sparks is produced which ignites the lamp. A motion of the handle in the opposite direction turns the gas off and extinguishes the lamps. The controller is automatically locked when in either the "on" or "off" position. The coil is the usual single unit vibrator coil, finished in mahogany and brass. It measures 3x3⅛x5 inches. With each outfit are furnished two burners, which are tapped to fit the standard burner thread, and can be instantly applied to any headlight. A bracket clamped to the burner carries the two electrodes between the ends of which the igniting sparks play. The spark gap is in close proximity to one of the gas jets. Among the advantages claimed for the apparatus are that it enables the driver to ignite and extinguish the headlights from the seat without stopping the car, and obviates the annoyance of matches, especially in a strong breeze. The apparatus can be connected with any source of current.



BURNER.



CONTROLLER.

The Metzger Motor Car Company—Organization and Product.

Articles of incorporation were filed in Lansing, Mich., on September 20 by the Metzger Motor Car Company, of Detroit, a new corporation to manufacture automobiles. The capital stock is $500,000, of which $300,000 is paid in. The stockholders and officers of the company are Byron F. Everitt, president; William Kelly, vice president, and William E. Metzger, secretary and treasurer. The new company will manufacture a car designed by William Kelly, who designed the Wayne and E-M-F cars. Mr. Kelly is one of the pioneers of the industry, having designed and built automobiles as early as 1899. Messrs. Everitt and Metzger are well known to the automobile trade and public, having been officials of the Everitt-Metzger-Flanders Company up to the time they sold their interests in this company to the Studebaker Manufacturing Company, on May 1 last. B. F. Everitt becomes president of the new company, which same position he held with the E-M-F Company. William E. Metzger, the secretary and treasurer of the new company, before his connection with the E-M-F Company was sales manager of the Cadillac Automobile Company, and had a retail store in Detroit.

The new company will manufacture a runabout and a five passenger car, to be sold at popular prices. The models of the new car have been running in the streets of Detroit for some time, and a photograph of one of them is shown herewith. About thirty days ago the new company purchased the plant of the Jacob Meier Company, trunk manufacturers, located at Milwaukee avenue and the Grand Trunk Railroad, Detroit. This plant was built several years ago, and is said to be well located for the automobile business. It occupies 2½ acres of ground. The plant is located between the East boulevard and the Detroit White Lead Works at the viaduct. Additional buildings have already been decided upon. The machinery is being installed, and the company plans to begin deliveries within ninety days.

Gramm-Logan Company Increases Capital.

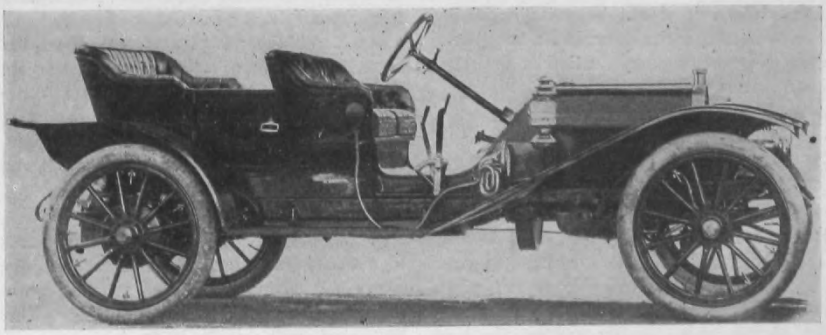
The Gramm-Logan Motor Car Company, Bowling Green, Ohio, held its annual stockholders' meeting at the conclusion of its first fiscal year on September 14. It was decided to increase the capitalization from $100,000 to $300,000, and to increase the size and equipment of the plant. The intention is to treble the output of the company for the coming year. The following officers were elected: A. L. White, president of the Lima Locomotive and Machine Works, of Lima, Ohio, president; B. A. Gramm, vice president and general manager; F. E. Lamb, secretary, and J. B. Wilson, president of the Grand Rapids Banking Company, treasurer.

The New Buildings of the National Motor Vehicle Company.

The National Motor Vehicle Company, of Indianapolis, Ind., have begun the erection of a large addition to their Twenty-second street factory. The new building is of keystone shape, being 154 feet at one end and 99 feet at the other, and 210 feet long. It is of concrete construction to the window sill line and metal lath covered with cement and steel, and wood beam construction from there to the plate line. It has a gable roof. This building, part of which will be two stories, will be occupied by the blacksmith shop and assembling room downstairs, and by the trimming shop upstairs. Much new machinery is being installed.

General Motors Capital Now $60,000,000.

The General Motors Company has filed with the Secretary of State of New Jersey an amended certificate increase in its capital stock from $12,500,000 to $60,000,000. Of this amount $40,000,000 is common stock, and $20,000,000 preferred stock bearing 7 per cent. cumulative dividends. The General Motors Company controls the Buick Motor Company, the Olds Motor Works, the Cadillac Motor Car Company, the Rainier Motor Car Company, the Reliance Motor Truck Company, the Oakland Motor Car Company and a number of parts concerns.



THE EVERITT THIRTY.

COMMUNICATIONS

Why Bushings Turn on Shafts and Not in the Machine Parts.

Editor HORSELESS AGE:

Although this system has been almost universally adopted by automobile designers, I am at a loss to see the advantage of attaching a bronze bushing to the pinion in place of pressing it on the shaft, as apparently there is the advantage of a larger wearing surface by the use of the later method. On a certain popular car there is used a triple gear drilled to receive a 1⅛ inch bushing. The thickness of the bushing amounts to three-sixteenth inch, reducing the inside diameter to three-quarter inch, while by making the bushing fast to the shaft the bearing surface could be increased to 1⅛ inch by the length of the bushing. It seems to me this would add to the compactness as well as the durability of some planetary transmissions. The same rule, of course, would apply to most of the present uses of bronze bushings. WALTER VETTER.

[There are two reasons why your idea is not likely to be adopted by machine designers. In the first place the friction and wear are proportional to the diameter of the friction surface or bearing surface. If you increase the diameter from three-quarter inch to 1⅛ inch, leaving the total pressure on the bearing and the speed of revolution the same, the power loss due to friction would be increased substantially in the ratio of three-quarters to 1⅛, which would be a disadvantage. The pressure per unit of surface on the bearing area would, of course, be less, but as the speed would be greater in the same proportion the bearing would wear at least just as rapidly as the smaller one, unless the regular bearing was altogether too small for the load it has to carry.

The other reason is that, where a bronze bushing is used the wear is not confined to the bushing, and quite often the shafts which run in these bushings are cut and worn to such an extent that they must be renewed. While it is often a very simple matter to renew one of these shafts (this is so in the case you cite, where the shaft probably consists of a short length of cold rolled steel), it would be quite expensive to replace the entire gear if its bore were worn, due to lack of lubrication or for some other reason.—ED.]

Heating a Private Garage.

Editor HORSELESS AGE:

Will you kindly tell me direct or through your columns what you think is the best way to heat a private garage? F. A. F.

[If the garage is not near enough to your home to make it practicable to run pipes from the steam or hot water heating system of the house to the garage, the best plan is to install a small heater of some kind in a separate room outside the garage, and conduct the hot water, steam or hot air through pipes in the garage. The one point to be looked out for is that there must be no communication between the garage and the room in which the heater is located, as in case gasoline should be spilled in the garage the vapor might get into the heater room and be ignited.

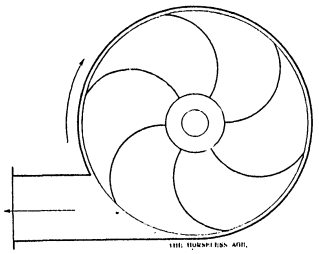
If any of our readers have solved the problem of heating a small detached garage in a simple and effective way, we should be glad for a description of their installation.—ED.]

Centrifugal Pumps.

Editor HORSELESS AGE:

I read with interest the article on centrifugal pumps in your September 8 number, and would like to ask your opinion of the design enclosed. J. J. JENNINGS.

[The blades are too much inclined to the radials at their outer ends, and only the blades at any particular moment opposite the delivery pipe have any useful effect, as the rotor seems to fit closely in the casing



all around, leaving no space for the water to flow. The pump would work, of course, but would be rather inefficient.—ED.]

Queries.

Editor HORSELESS AGE:

As a subscriber to your valued paper, I should like to ask the following questions through your columns:

What are the six principal parts that should be examined in purchasing a motor car that has been run two or three years, what would be the best way to examine and test these parts, and what would be a good test to give the whole car in general?

Is it possible to muffle the exhaust gas of a four cylinder motor too much, and cause undue back pressure?

What are the advantages and disadvantages of the three cylinder, two cycle air cooled motor? Would such a motor, combined with a friction drive transmission and aluminum body, make a good light serviceable, five passenger car of 18 horse power and about 1,200 pounds weight?

"STUDENT."

[Probably the six most important parts to examine on a second hand car are the motor, the change gear, the steering gear, the tires, the brakes and the body. The best plan undoubtedly is to ask for a 50 or 60 mile demonstration, including some steep hills. The motor is really the most important part of all, and in second hand cars it frequently shows a lack of power. The hill test will bring out whether it still develops sufficient power or not. The steering gear can be tested by turning the wheel first one way and then the other, and observing how much back lash it has, that is, how far it can be moved without moving the road wheels. The tires can be easily examined by the eye as to the condition of their threads. If these are much worn and cut, the probability is that a new set will have to be secured at an early date. Probably the best test of the change gear is to open the gear box and examine the teeth. If these are still of normal thickness, the gear is probably in good condition, whereas if the teeth have been worn thin the gear will not last long. To test the brakes, see whether they will hold firmly when set, and if there is still a possibility of further adjustment. The linkages can easily be examined for "shake." Another part that should be given an examination is the body, but this, of course, is a very obvious matter.

If the muffler of a four cylinder motor does not present a sufficiently large passage for the exhaust gases, either because the exhaust openings were made too small in the first place, or because they are choked by carbon and oil, the muffler will cause back pressure on the engine.

A three cylinder two cycle air cooled motor, if well made and so designed that it cools properly, should be a very good motor for a light car. Very much, of course, depends upon the design and the workmanship. A friction drive should be quite suitable for such a motor. We doubt, however, whether you will succeed in keeping the weight of a five passenger vehicle down to 1,200 pounds. We do not know of any regularly manufactured five passenger cars weighing as little as this, and vehicles built in an experimental shop are usually heavier than those regularly manufactured.—ED.]

Starting Six Cylinder Engines on Compressed Air.

Editor HORSELESS AGE:

I want to thank you for your reply in your issue of 8th inst. to my inquiry about starting six cylinder motors on compressed air, without the use of extra cams, valves, etc. In regard to the objectionable check valve, I should explain that I have made a special form of check that works directly oppositely from the usual one, in that it is always wide open except when air pressure strikes it, when it closes, opening again immediately when the air pressure in the pipe is released or cut off.

JOHN W. SLATER.

Motor Horse Power.

Editor HORSELESS AGE:

Will you kindly state in your paper the relative power, hill climbing ability, etc., of

a motor 4½ bore by 4½ stroke, and one 4 bore by 5 stroke, other things being equal?

EDWARD HILL BALDWIN.

[According to the A. L. A. M. formula, which is almost exclusively used in this country, the first of the two motors should deliver 26.5 per cent. more power than the second. According to the German Automobile Technical Association's formula, which takes account of the stroke, the first motor should give 18 per cent. more power than the last. If the compression pressures are fairly nearly alike, the valves of proportionate size, and the workmanship is nearly the same on both motors, the motor of 4½ inches bore is sure to give the most power. —ED.]

Imports and Exports for July.

During the month of July last there were imported into this country 144 automobiles valued at $300,025 and parts valued at $86,432, as compared with 115 automobiles valued at $224,578 and parts valued at $47,369 in July, 1908. Of the 144 cars imported last July, 60 were from France, 55 from Italy, 16 from Germany, 8 from the United Kingdom and 5 from other countries. During the seven months ending with July, 1909, there were imported 864 automobiles valued at $1,592,643 and parts valued at $460,998, as compared with 558 automobiles valued at $1,170,624 and parts valued at $298,755 during the same period in 1908, and 559 automobiles valued at $1,827,590 and parts valued at $466,637 during the same period in 1907.

During July last there were exported 470 American automobiles, valued at $874,685 and parts valued at $87,558, a total of $962,243, as compared with 238 cars valued at $588,560 and parts valued at $55,341, a total of $643,901 during the same month last year. During the seven months ending with July, 1909, there were exported 1,780 cars valued at $4,550,019 and parts valued at $425,870, as compared with 1,528 cars valued at $3,223,166 and parts valued at $390,775, a total of $3,613,941, during the same period last year.

During the seven months ending with July, 1909, there were exported from this country 65 automobiles of foreign manufacture valued at $290,881 and parts valued at $1,000, as compared with 52 automobiles valued at $265,711 and parts valued at $2,702 during the same period last year.

We have received a copy of a "List of Permits for Operating Motor Vehicles in Ontario." It appears that this list is sent to the clerks of all the different cities in the province. We believe that the practice of issuing such lists in printed form is limited to the Canadian provinces. The large number of addresses in the United States contained in the list shows that many American motorists tour in Canada. Of course most of the Americans holding such permits reside in the boundary cities, Detroit and Buffalo, but there are also many addresses farther inland given.

The Frank A. Munsey Tour.

The Reliability Tour from Washington, D. C., to Boston, Mass., and back, organized by newspaper publisher Frank A. Munsey, drew thirty-seven entries as follows:

1—Chalmers-Detroit, Chalmers-Detroit Machine Company, Detroit.
2—Hudson, Hudson Motor Car Company, Detroit, Mich.
3—Mitchell, W. M. Cram, Philadelphia, Pa.
4—Premier, the Motor Car Company, Philadelphia, Pa.
5—Washington, Carter Motor Car Corporation, Washington, D. C.
6—Stevens-Duryea, F. W. Eveland, Philadelphia.
7—Ford, Charles E. Miller & Brother, Washington, D. C.
8—Jackson, Jackson Automobile Company, New York.
9—Maxwell, Lambert Automobile Company, Baltimore.
10—Oldsmobile, Olds Motor Works Branch, Baltimore.
11—Maryland, Sinclair-Scott Company, Baltimore.
12—Pullman, York Motor Car Company, York, Pa.
13—Pullman, York Motor Car Company, York, Pa.
14—Spoerer, Carl Spoerer's Sons Company, Baltimore.
15—Columbia, Frank P. Hall, Washington, D. C.
16—Croxton-Keeton, Croxton-Keeton Motor Car Company, Massillon, Ohio.
17—Croxton-Keeton, Croxton-Keeton Motor Car Company, Massillon, Ohio.
18—Corbin, Corbin Motor Vehicle Company, New Britain, Conn.
19—Hupmobile, Joseph Wiesenfeld, Baltimore.
20—Winton, George F. Whiting, Baltimore.
21—American Simplex, Simplex Motor Car Company, Mishawaka, Ind.
22—Cameron, Cameron Car Company, Beverly, Mass.
23—Atlas, Atlas Motor Car Company, Springfield, Mass.
24—Crawford, C. E. Eckenrode, Baltimore.
25—Acme, N. S. H. Sanders, Boston, Mass.
26—Reno, John J. Loughran, Philadelphia, Pa.
27—Matheson, Matheson Automobile Company, New York.
28—Renault, L. H. Shaab, Baltimore, Md.
29—Hupmobile, Hupp Motor Car Company, Detroit, Mich.
30—Marmon, Nordyke & Marmon, Indianapolis, Ind.
31—Washington, Carter Motor Car Corporation, Washington.
32—Washington, Carter Motor Car Corporation, Washington.
33—Franklin, Franklin Automobile Company, New York.
34—Selden, T. S. Patterson, Rosemont, Pa.
35—Michigan, Michigan Motor Car Manufacturing Company, Detroit, Mich.
36—Elmore, Frank Hardart, Philadelphia, Pa.
37—Pullman, H. Clay Waldman, Jr., Baltimore.

The tour started from Washington yesterday, September 21. The contestants will compete for one grand prize trophy and six other trophies, all of which have been specially designed for the occasion.

The grand trophy has for a base a board slab of Flemish oak, upon which a design of silver is worked out. Engraving and etching are employed to reproduce a touring scene in which a large touring car is shown just making a turn in a country road. On the upper right hand section of the slab the dark sky is lighted by cloud effects in silver, while the upper left part of the space is devoted to the lettering. The relief work of the silver against the dark oak background makes a most attractive contrast. The whole scene is surrounded by a broad band of etched silver.

Plates also form the design for the awards in the six divisions. The plates are oval in shape and 22 inches high, measured through their greatest diameter. The base is mahogany mounted with silver. Near the top of the silver plate is an automobile with the Capitol as a background. Just below this is the inscription, which reads, "Frank A. Munsey Reliability Contest. First prize (name of division), Washington, D. C., to Boston, Mass., and return."

The technical committee, which has complete charge of the run after the start, is composed of Frank H. Trego, of the Chicago Motor Club, chairman; Dr. J. R. Overpeck, of the Quaker City Motor Club, and Jesse L. Cassard, Jr., of Baltimore, Md. Mr. Munsey is the publisher of the Washington *Times*, the Boston *Journal*, the Baltimore *News* and the Philadelphia *Evening Times*, and the contest touches all of the diffeernt cities in which his newspapers are published. Following is the complete itinerary:

	Miles.
September 21—Washington, D. C., to Baltimore, to Philadelphia, Pa. (Via York and Lancaster.)	195.3
September 22—Philadelphia, Pa., to Milford, Pa. (Via Allentown and Delaware Water Gap.)	132.6
September 23—Milford, Pa., to Albany, N. Y. (Via Goshen and Kingston.)	158.5
September 24—Albany, N. Y., to Boston, Mass. (Via Springfield and Worcester.)	194.2
September 25—In Boston.	
September 26—In Boston.	
September 27—Boston, Mass., to New York City (Via Providence, Wilimantic, Hartford, New Haven, Bridgeport.)	239.4
September 28—New York City to Philadelphia, Pa. (Via Perth Amboy Ferry, Atlantic City, Camden.)	194.3
September 29—Philadelphia, Pa., to Baltimore, to Washington, D. C. (Via Wilmington and Newark.)	163.9
Total mileage	1,282.2

Number of running days—7.
Average per day—183.1 miles.

Plantation Rubber Production of the Federated Malay States.

Vice Consul General G. E. Chamberlin, of Singapore, reports that the output of cultivated rubber in the Federated Malay States for the first five months of 1909 shows an increase of 72.5 per cent. over the same period of last year. The production during the first five months of 1909 was 1,976,898 pounds, as against 1,142,084 pounds during the first five months of 1908.

We have received a copy of the Official Guide and Route Book of the Professional Chauffeurs' Club of America. The book, which is bound in flexible leather covers, contains numerous touring routes in all parts of the East and the Middle West, a list of official hotels and garages (not very extensive), and a list of the officers of the club.

Commercial Applications.

The Taxicab Business in Detroit.

By F. E. Watts.

This summer is the first season that taxicabs have been operated to any great extent in the city, so the business is not yet old enough to furnish any conclusive data as to what its future will be. Those who have been interested enough to look into the matter, however, appear to think that good profits will be realized if too many companies do not enter the field. The two companies actively engaged in the operation of cabs both plan to put more vehicles in service in a short time, and at least one new company will probably be started in the near future.

THE DETROIT TAXICAB COMPANY.

This is the oldest and largest taxicab operating company in the city. It is the successor of the Auto Express Company, which formerly operated a delivery service that was fully described in these columns. The development of the auto livery business in the city caused the management of the Auto Express Company to investigate the situation. They concluded that there was more money in carrying people than parcels, so discontinued their express business and established a rather extensive livery service. When the taxicab business first began its rapid growth in New York and some of the larger Eastern cities a few taxicabs were placed at the leading hotels. These proved profitable, and the number was increased. At the present time twenty-six machines are in service, and nineteen more will be added in a short time.

The offices and garage of the company are located on Randolph street, a few blocks from the business centre and from the leading hotels. Up to the present time this building has also accommodated the Detroit agency for the Oldsmobile, but as the new Oldsmobile Garage is nearing completion the sales and garage business will be moved to the new location in a short time.

These changes are at present so occupying the attention of Manager Scrimger that the writer has been unable to get the details of the business for this article. These details will probably appear in an early issue.

A few details of the equipment may be mentioned. The cabs are all Oldsmobiles, equipped with front wheel driven taximeters. Fisk tires and demountable rims are used. The company have also been trying out solid rubber tires and spring wheels made by a local company. Both a hacking and a stand business are conducted. All repairs are made in the company's own shop.

THE TAXI-CAB SERVICE COMPANY.

This company is better known to the general public as the "Yellow Bonnet Taxicab Company" on account of the distinctive color which the bonnets of their cabs are painted. The cabs are Chalmers "30" limousines, and, although not designed for this work, are said to be giving most satisfactory service. Fifteen of them are in operation at the present time. Both a hacking and a stand business are conducted. There are some six stands, located at the principal hotels. Cabs are also sent to the depots to meet all trains and to the numerous boats which arrive from all ports on the Great Lakes.

For one or two passengers the rates are 30 cents for the first half mile or fraction; 10 cents for each quarter mile thereafter, and 10 cents for each six minutes waiting. For three, four or five passengers the running rates are increased to 30 cents for the first one-third mile or fraction, and 10 cents for each one-sixth mile thereafter, the rate for waiting remaining the same. No charge is made for idle mileage in answering calls from points within 1 mile radius from the City Hall, but when cabs are ordered from outside the mile circle a charge of 20 cents for each mile or fraction thereof, from the mile circle to the point ordered, is made under the heading of "extras." Fisk tires and rims are used under a maintenance guarantee on the basis of 3 cents a mile for each cab. The daily mileage of a cab varies widely. But the superintendent, Mr. Gareau, stated that he believed that the average would be about 70 miles.

During the past few months the business has developed into a twenty-four hour rush, but as the company has not been engaged in the service for a year yet no prophecy can be made as to what the demand will be during the winter months. A considerable business is done at special monthly rates, and quite a number of the customers have monthly bills of between $300 and $400. Plans for extending the business are under way, but have not yet taken definite form. It is thought, however, that Packard and Fiat chasses will be used when more cabs are put in service. Minor repairs are made at the garage.

A RETIRED COMPANY.

A call at the large new Woodward avenue garage, occupied by the Postal & Doherty Auto Company, disclosed the fact that they had discontined their taxicab service. At one time they ran five cabs. These cabs were put on as an experiment, and various makes were used, including a White steamer, a Maxwell and an Aerocar. The business was found to pay well, and calls were received during the entire twenty-four hours. It was practically impossible to get good drivers, however, and a few accidents occurred which cut down the profits. The management became convinced from watching the manner in which the cars were handled that the item of repairs would be considerable as time went on, so they decided to discontinue the business. At the time of the writer's visit their cabs had been out of service some months, but they still had about forty telephone calls for cabs each day.

At the present time the problem of getting good drivers, men who will handle their cabs carefully, seems to be the greatest difficulty in establishing a profitable taxicab service in this city. In this connection Mr. Gareau told the writer of one driver who had increased the daily receipts of his stand from about $5 to nearly $40 a day, and who at the same time had decreased the repair bills on his cab in something like an inverse proportion.

Taxicab Business in the South.

While the automobile business in the South has proved very lucrative, the taxicab business is practically in its infancy, especially in Tennessee, where the business is limited to three cities—Nashville, Chattanooga and Memphis. However, the companies operating the machines are well pleased with results.

The State of Tennessee requires every automobile to be listed with the Secretary of State, for which a fee of $2 is required, and the city ordinances also impose a nominal license fee. The fees for licenses are, therefore, of little moment, so that individuals or firms with small capital may engage in the business with profit, and doubtless the next year will see many more companies engaged in this business in Tennessee.

NOVELTY ATTRACTS.

In practically every line of commercial endeavor, if something new or novel is introduced it at first draws patronage by reason of its novelty. If in the meantime the practicability of the innovation is demonstrated an established trade results, and the business is listed among the successful ventures. So far the taxicab business in Nashville promises to be so listed, and the Nashville Taxicab Company, which began operations three months ago, is making arrangements to quadruple its "rolling stock."

The municipal authorities make no very burdensome requirement. A license of $10 for each cab is charged and $12 per year for automobiles in the draying business. No machine may be driven within the business district at a rate exceeding 8 miles an hour, or over the streets in the residence section at a rate exceeding 25 miles an hour. Otherwise there are trouble and fines, which run from $10 for a first offense to $25 for the second and revoking of the license for the third offense.

The introduction of taxicabs in Nashville was attended with the usual rush for rides. The society element especially welcomed the taxicabs, for in days gone by ladies had been accustomed to paying from $3 to $4 for a cab of the "horse" variety in which to make calls and attend the various social teas, card parties, etc., and the reduction in social expenses was very pleasing. The novelty still clings and the business is good—so good, in fact, that the cabmen are on the anxious seat, with "fares" getting fewer and fewer all the time.

SOMETHING OF THE BUSINESS.

The Nashville Taxicab Company was chartered under the laws of Tennessee and capitalized at $30,000, with E. C. Lewis, D. S. Williams, George E. Bennie, J. S. Frazer, George Frazer, Henry Frazer and Banks Bennie incorporators. J. S. Frazer is president, D. S. Williams vice president and Banks Bennie secretary and treasurer. The company maintains a garage at 112-114 Third avenue South, in which the taxicabs are stored and repaired, although the repairs have been of a very insignificant nature. The office of the company is in the same building.

The company operates the Sultan make of cars, manufactured by the Sultan Motor Company, of Springfield, Mass., the cars being 12 horse power, French rating. At the time of writing only three cabs are being operated, but within the month six others which the company has ordered will be placed at the command of the traveling public. The taxicabs are operated from public cab stands—one at the corner of Fourth avenue and Church street, another at Eighth avenue and Church street and the other at Fourth avenue and Cedar street, all taxicabs being in front of the leading hotels of the city and in the business district.

The machines have pneumatic tires and the Stepney spare wheel is used.

The rates are the same day or night. When the flag is lowered on the taximeter 30 cents appears, and this pays for the use of the cab until service to that amount either in driving or waiting has been rendered. Thereafter the taximeter registers 10 cents for each quarter mile or for each six minutes of waiting. For the first half mile or fraction thereof a taxicab costs 30 cents. If the taxicab is driven through a toll gate the passenger must pay the toll, although such a contingency will not arise in Davidson County, where all pikes and ferries are free. While the cabs or touring cars may be engaged by the hour, all such arrangements are made with the officers of the company, the regular rates being charged as are in vogue at the other garages.

Baggage, such as handbags, grips and suit cases, which the passenger may carry inside the cab, are not charged for, although baggage carried outside is charged for at the rate of 20 cents for each package.

The cabs will be promptly dispatched day or night on call to any address within 2 miles of the garage free of charge, but where the distance is over 2 miles a charge of 20 cents is made. When the cab is dismissed at any point over 2 miles from the garage, a charge of 20 cents is made for the return service.

The driver is charged with all amounts registered, and is not permitted to make any reductions therefrom, but will if required give a receipt for the amount paid. If the cab is disabled the service up to the time of such disablement is charged for. A cab ordered and not used must be paid for up to the time the driver is dismissed, including sending charge of 20 cents.

NO DIFFERENCE FOR CAPACITY.

Whether one passenger or four occupy a taxicab the charge is the same, and for this reason ladies with invitations to a party living in the same neighborhood have been enabled to cut down "transportation expenses" considerably, and at the same time go to every party in a taxicab, whereas before, except in threatening weather, the street cars were used. The taximeters are driven from the front wheels.

The Nashville Taxicab Company has no maintenance contract with either tire manufacturers or manufacturers of cars, all repairs being done in the repair department of the company's garage.

The drivers are paid a percentage of the earnings. The daily average mileage of each car is seventy-five. Oil is furnished the drivers free, but gasoline is charged for at the rate of 12 cents per gallon.

While the patronage has been good all along, the officials of the company state that the most revenue comes in between 10 o'clock at night and 2 o'clock in the morning. On Sundays the cabs are busy most all the time.

In Nashville there is an interesting system in the operation of the street cars which plays into the hands of the taxicab company. The street car company has what is termed the "line up," all of the cars on the system being lined up at midnight in the transfer station, one car going out each line, and none after that until the next morning. This may be responsible for the increased patronage of the taxicabs, as many persons miss the midnight car, and have to get home. Whereas formerly the cabs were used, the taxicab now takes its place as it is faster and cheaper.

SPLENDID PUBLIC ROADS.

The man with an eye for investment would naturally ask about the population first and the condition of the roads next. While Nashville has approximately 125,000 inhabitants, they are not all of the class that can afford taxicab rides. In the matter of roads, however, the city is perhaps more fortunate than any city of its size in the South. Nashville is located in the limestone belt, and as a result the materials that enter into roads of the substantial type are easily accessible, and this fact has been noted by tourists who have made cross country runs through this section, the same being most favorably commented upon in their accounts of tours through the South. With bad streets and a big repair account there is scarcely much encouragement to the man in the taxicab business; in fact, the same causes have operated against the owner of machines for pleasure in many cities and towns, and it may be that the fact of Nashville being so favorably located in this respect is responsible for over half the automobiles in the State being owned by residents of this section.

Motor Cab Items from Allentown, Pa.

There are now three companies operating motor cabs in Allentown, Pa. The Allentown Taxicab Company have recently moved to their new garage at 113 South Seventh street. They have seven cabs in service, most of them being Fords. The company's rates of fare are as follows: Day rates, in effect from 6 a. m. to 6 p. m., within city limits, for one or more persons direct to one address, 25 cents per person; for each five minutes of waiting, 10 cents. Night rates, for one person to one address, 40 cents; for two persons to two addresses, 70 cents; for each additional person, 30 cents; for each five minutes of waiting, 10 cents. For calling or shopping, a flat rate of $1 per hour, or fraction thereof, is made between the hours of 6 a. m. and 6 p. m., while cars are let for continuous service for one to four persons at $2 for the first hour and $1 for each additional hour or fraction thereof. The company also makes special rates to a number of points outside the city.

The Maxwell Taxicab Company, whose garage is located at Church and Baumer streets, operates five Maxwell taxicabs and are said to be doing the greatest amount of business in Allentown at the present time. E. A. Krause is the proprietor of the service. The fare in the city is uniform, 25 cents per passenger per trip, day or night. The rates by the hour are $2 for the first hour and $1 per hour thereafter. The company also has a number of five passenger touring cars, which can be hired by the day or hour.

The Hamilton Auto Company, 943-947 Hamilton street, Allentown, operate four Ford taxicabs and charge the same rates as the above mentioned companies. They occupy the whole Roller Rink Building, which affords a floor space of 290x65 feet.

It will be observed that all of the above mentioned companies operate on a hacking schedule of so much per trip, and do not use taximeters.

More Municipal Cars for Milwaukee.

Three new municipal cars will soon be purchased by the city of Milwaukee, if the council committee recommendations are adopted. The water works and the health department will each be given a touring car, while a roadster will be added to the automobile equipment of the fire department. It is the intention of Chief Clancy to provide all assistant fire chiefs with roadsters to replace the two horses each maintains. It is probable that all city owned cars will have the name of the city and department painted on the sides. The purpose of this, it is said, is to avoid the use of municipal automobiles for private uses. This evil has already taken root in Milwaukee. Alderman Stern, father of the ordinance, calls attention to the fact that the President's steam car and many Eastern municipal cars are so designated.

Pennsylvania Railroad to Discard Horses.

It is reported that the Pennsylvania Railroad has decided to substitute electric trucks for all of its horse trucks, and will begin the transformation of its service in connection with its shops at Altoona, Pa. At present the question is being studied whether it is best for the company to build the vehicles themselves in their shops at Altoona, or to have them built by outside firms making a specialty of such work. The company owns a large electric plant, so that the current necessary for charging need not be obtained from a central station.

Taxicab Service in Reading, Pa.

The Reading Taxicab Company, the only concern of the kind in the city, now operate seven Franklin cabs and two touring cars. Rates are 30 cents for the first half mile, 10 cents for each additional quarter mile, $3 per hour, and $1 per hour while waiting. Touring cars rent at $3.50 per hour.

The cars are stored and cared for at the garage of the Reading Automobile Company, 28 South Fifth street.

Commercial Notes.

An automobile line for carrying the mails, passengers and freight is to be established between Las Vegas and Nelson, Cal.

Newton & Woodside, Buffalo, Wyo., are operating a steam car in a public service between Buffalo and Sheridan. The roads in the vicinity are very mountainous.

Automobile stages are being used in the Palo Verde Valley, Cal., for conveying land seekers to the tracts for sale. A trip that formerly required two days is covered in five hours with the autos.

Richard Nye, Santa Barbara, Cal., will shortly inaugurate a sightseeing service in Santa Barbara with two sightseeing cars. One will be operated between Santa Barbara and Montecito, while the other will run to Hope Ranch and Goleta.

The Municipal Hospital in Philadelphia has purchased its first motor propelled ambulance, which was built by the Knox Automobile Company, of Springfield, Mass. The car is equipped with a standard ambulance body, with all conveniences, including electric lights, folding seats, etc. The weight complete is 3,600 pounds.

Charles Ilten, Portland, Ore., will establish a taxicab service in that city with Franklin 18 horse power taxicabs, of which he has bought twelve through the Portland agency. It is expected that all of these cabs will be in operation by November 1. Mr. Ilten will operate the cabs from his new garage at Fourteenth and Burnside streets.

The trustees of Queens County, N. Y., who have charge of the Public Library system, have included in their budget for the coming year an item of $2,500 for an automobile and $1,200 for a chauffeur. The automobile is to be used for transferring books between the sixteen branches and the main library, and to carry the trustees on tours of inspection.

The Motor Transfer Company at Fort Wayne, Ind., has placed four Cadillac taxicabs in service between the depots and hotels, and also for other trips around the city.

The Seeing California Traffic Bureau, of Los Angeles, Cal., has established a service in Pasadena in charge of C. A. Hubert. The Pasadena branch conducts a service from the Hotel Green to Orange Grove, for which trip a 5 cent fare is charged, and also a round trip of the city, including the ostrich farm in South Pasadena, for which the fare is 75 cents.

Chas. Day, of Navajo and St. Michaels, Ariz., will open a garage in Gallup, N. M., and establish automobile services from Gallup to St. Michaels, Fort Defiance, Ganado and Chin Lee; also from Gallup to Tohatchi and Chrystal, and from Gallup to Zuni, and the various posts to the South. Mr. Day has four high powered cars, including a seven passenger Pope-Toledo, which he will employ in the various services.

Philadelphia Garage Owners Organize.

The Philadelphia Garage Association has been organized during the past few weeks, and is said to already embrace 60 per cent. of all the garages of the city. The main object of the organization is said to be to correct the "joy riding" and commission evils. As long as the garages were unorganized it was practically impossible to put a stop to joy riding, because if an attempt was made the chauffeurs would take their cars to other places where they were allowed to take them out whenever they pleased. To incur the enmity of these chauffeurs practically meant bankruptcy for the garage owner. The new organization also plans to conduct an employment bureau which will maintain a register of chauffeurs. Owners of cars may there secure drivers whose records show them to be honest, careful and sober men against the payment of a small fee. Owners storing cars in the garages of members of the association have the privilege of examining the records of applicants for positions free of charge. The means by which the association hopes to defeat grafting and joy riding are explained in the bylaws which contain the following two paragraphs:

"A member (garage) found guilty of paying a commission to a chauffeur shall pay into the treasury the sum of $25, and upon failure to pay this fine promptly shall be reported to the board of directors, and may be suspended by them.

"Each member shall, at the request of an owner, send the owner a car check sheet showing day by day the time his car entered and left the garage during the preceding month."

The Selden Case.

Proceedings in the Selden case are now resting, pending the entering of the decree. As the suit asks for an injunction to restrain the defendants from infringing the patent and for damages for the infringement already committed, it is expected that the decree will order the issuing of injunctions. Defendants then will have thirty days in which to file an appeal to the United States Circuit Court of Appeals. Ordinarily, this is the highest court to which a case of this kind can be carried. A petition can, however, be made to the United States Supreme Court, and if this court finds that the case involves questions which have never before been decided by it, it may take the case up. It is stated that very many such appeals are declined each year, but the Selden case admittedly involves novel points, and it would not be surprising if it were taken up by the Supreme Court.

As to the line of action that will probably be taken against other infringers, nothing can be learned at present. This matter will probably come up for decision before the executive committee of the Association of Licensed Automobile Manufacturers. The members of this association, as licensees under the patent, are interested in seeing it upheld, and it is understood that the association virtually conducted the litigation, although the complainants named in the suit are George B. Selden and the Electric Vehicle Company, now the Columbia Motor Car Company. Mr. Selden is the patentee and owner of the patent, the Columbia Motor Car Company are sole licensees under the patent, and the members of the Association of Licensed Automobile Manufacturers are sub-licensees.

It is to be presumed that aside from conducting the case in the Court of Appeals with vigor, the complainants will immediately take steps to enforce the rights conferred upon them by the patent against all other infringers. Suits have already been brought against some thirty or forty manufacturers, and whether preliminary injunctions are applied for on the strength of the decision remains to be seen.

Around Long Island Tour.

The New York Automobile Trade Association will hold its second annual "Around Long Island Tour" on Tuesday, Wednesday and Thursday of next week. Last year the trip was completed in two days, the run to Montauk Point being made on one day and the return the next. The start on the first day will be at Columbus Circle, New York, and the first day's destination is the Orient Point Inn. The second night's stop will be at the Irving Hotel, Southampton, and on the evening of the third day the tour will end at the Automobile Club of America in New York. The total length of the route is 335 miles. The roads are in good condition almost all the way, and if last year's event is a criterion the tour will be more an outing than a contest.

LEGISLATIVE and LEGAL

The Selden Decision.

One of the most celebrated cases in the annals of patent ligation was decided in the lowest court last week, when Judge Hough at New York sustained the Selden patent. The case against the Ford Company had been pending for six years, and the long delay before a decision was rendered caused interest in the case to wane, to a considerable extent, in recent years. It probably also lulled many of those interested in the outcome into a false feeling of security. The importance of the decision makes it worth the while to briefly review the litigation. The entire automobile world is interested in the matter, because not only the manufacturer of an infringing article but also the seller and user thereof are liable to the inventor or the owners of the patent.

The Selden patent, of which infringement was alleged, is No. 549,160, which was issued to George B. Selden, of Rochester, N. Y., November 5, 1895. Application for the patent was made as far back as 1879 (on May 8), the issuing of the patent being delayed by the applicant by making changes in the claims or taking such other steps as are allowed by the patent law. The broad claims of the patent were first drawn attention to by the Commissioner of Patents in his annual report for 1895, and the claims were printed in a special article in THE HORSELESS AGE of December, 1896. Although the existence of the patent was thus early brought to the attention of the motor vehicle industry, no heed was given it by experimenters during the next few years, and no decisive steps appear to have been taken to compel its recognition by the industry until the patent was sold to the Electric Vihicle Company, of Hartford, Conn., which was in 1900.

Suit for infringement was then brought against the Winton Motor Carriage Company, of Cleveland, Ohio, at that time the principal American makers of gasoline automobiles in the United States, and their New York agents. Defendants entered a writ of demurrer, claiming that the patent was void for lack of patentability, but this was overruled on November 9, 1900. The Winton Motor Carriage Company some time later acquired a license under the Selden patent. The claims under the patents were then strongly urged, and about 90 per cen. of all American manufacturers of gasoline automobiles were induced to take license under the patent, and formed the Association of Licensed Automobile Manufacturers in New York in May, 1903. Under the terms of the license agreement each member of the association has to pay a license fee on the selling price of his product, of which nearly equal parts go to the Electric Vehicle Company and the association, respectively. The first action under the patent taken by the association was against Smith & Mabley, agents for French Charron cars. This suit was brought in April, 1903, but was settled out of court.

Among the few important manufacturers at the time the Licensed Association was formed, who did not join, was the Ford Motor Company, of Detroit. A suit was brought against the company and against its New York agents in October, 1903. It is this suit which has now been decided by Judge Hough. The complete opinion, with the exception of foot notes, follows:

The application for the patent on which these actions are based was filed in 1879—or more than sixteen years before the grant was made.

The principal claim in suit (No. 1) reads thus:

"The combination with a road locomotive, provided with suitable running gear, including a propelling wheel and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device and a suitable carriage body adapted to the conveyance of persons or goods, substantially as described."

The second claim varies from the first only in requiring the "suitable carriage body" to be "located above the engine," while the fifth claim sets forth substantially the same combination, but specifically describes the engine as comprising a plurality of cylinders with "pistons arranged to act in succession during the rotation of the power shaft."

These three claims are alleged to be infringed by all the defendants.

This statement of complainants' position seems sufficient to show that the subject matter of these suits is the modern gasoline automobile. The defendants are severally the manufacturer, seller and user of the Ford machine (a well known American make) and the maker and importer of the Panhard, a celebrated and typical French product. If these defendants infringe, it is because complainants own a patent so fundamental and far reaching as to cover every modern car driven by any form of petroleum vapor, and as yet commercially successful.

Such a claim lends interest even to such a record as is here submitted, and requires careful examination, to the end that the parade of forces in this court may at least serve to shorten and simplify the certain conflict in the appellate tribunals.

Upon one question of law all counsel are agreed—the patent claims under consideration are all for combinations; there is, of course, no agreement that the combinations set forth are patentable, and none as to the interpretation of their language if valid at all, but there is no denial that in form nothing but combinations are claimed.

This is emphasized because it seems to open and simplify the discussion. Selden does not pretend to have invented any new machine or combination of matter in the same sense that Whitney invented the cotton gin or Howe the sewing machine. He does not in application or claim specify any one mechanical device for which in some branch of art a prototype cannot be found; there had been and were in 1879 running gears, propelling wheels, steering mechanisms, gas engines, etc., of many forms, and his patent covers no one form of any of these parts of his "road locomotive." He does assert that he selected, adapted, modified, co-ordinated and organized the enumerated parts (including the usual mechanical adjuncts of each part) into a harmonious whole capable of results never before achieved, and of an importance best measured by the asserted fact that after thirty years no gasoline motor car has been produced that does not depend for success on a selection and organization of parts identical with or equivalent to that made by him in 1879.

If this be true, it may be held at once that in such a mental operation and such an important result therefrom, invention, and that of a high order, undoubtedly does reside. Where Bradley, J., declined definition, he would be a bold man who tried it, but I am sure that invention is easily discernible as that which vitalizes Selden's selection, and if that selection and its results have been truly described.

Broadly speaking, the defense in these cases rests on a denial of the truth of the foregoing summary of Selden's performance, which denial has two parts: (1) Selden did not do what he now asserts, and (2) defendants' combinations differ from Selden's, being neither identical nor equivalent.

In considering what Selden did, and the meaning of the words in which he described and claimed his achievement, it is to be remembered that whether his combination constitutes invention and whether it possesses novelty and utility are primarily questions of fact, as to which the very grant of the patent raises a presumption in favor of complainants, while the demurrer decision (in Electric Vehicle Company vs. Winton Motor Company, 104 F. R. 814) is here controlling authority to the effect that on its face, plus all matters of which the court can take judicial cognizance, the patent is valid.

To ascertain, therefore, how far defendants have succeeded in meeting the burden of proof, which in all matters of fact lies on them, it seems fair to begin by discovering from all the evidence what was the state of the art when Selden filed his application in 1879.

But what is the art as to which this inquiry is to be made? On this preliminary point it seems to me that defendants' testimony and argument have taken too wide a range, or at least laid undue emphasis on matters of little moment. This invention does not belong to the steam engine art, nor that of any engine, regarded alone; nor is it fruitful to examine carefully the development of traction engines, whether primarily designed to haul "trailers" or transport persons and goods over their own wheels. Boats also, and tram cars, propelled by engines of any kind furnish but a limited field for useful investigation; the inquiry is, how stood art (and science, too) in 1879, in respect of a self propelled vehicle with a considerable radius of action over ordinary highways, and capable of management by a single driver, and he not necessarily a skilled engineer?

Or (to use a phrase frequently occurring in the testimony and exhibits) what was known of the "horseless carriage" industry in 1879, either at home or abroad?

The answer given by the evidence is entirely plain—there was no such industry, the art existed only in talk and hope, no vehicle even faintly fulfilling the requirements above outlined had ever been built, and there is no competent and persuasive evidence that any experiment had ever moved a hundred feet, or revealed an organization warranting the expectation that it ever would do so.

Some examination of the kindred arts, above alluded to, serves to explain this situation. For more than one hundred years steam, as a prime motor, had dominated the world of mechanic art. Steam as the power for a self propelled road vehicle had been exhaustively worked over, and patents obtained, from Trevithick (British 2,599 of 1802) to Monnot (U. S. 197,485 in 1877), and the result was the traction engine; it made no difference whether it carried passengers or hauled freight, the actual type and only type was a boiler on wheels, of enormous weight, slow speed and small radius of action.

But the numerous experiments with steam road wagons had (however meagre the success attending them) served to make known to that wholly ideal and fictitious person, "the man skilled in the art," something of the organization of any road vehicle capable of operation by a small crew. Steering mechanism operated by wheel before the driver, independent turning of the fore wheels, the chain drive, as well as beveled gear connection between power and driving shafts, devices for disconnecting power from running gear and letting engine run free, plans for brake control of quite

a modern sort, and stowage of motive power in parts of the vehicle remote from passengers—all had been practiced or suggested. From patents and publications scattered over two continents and more than two generations there can be reconstructed (and defendants have done it on paper) something that is very far from even a good theoretical road wagon, but which does contain most of the elements of Selden's combination—and this represents the art, known to the man skilled in both theory and practice, a good mechanic, with a scientific education and widely read in the technical literature of all civilized nations, by whose incredible knowledge the achievements of patentees are so often measured.

Obviously if a fairly good road wagon cannot be reconstructed in 1909 out of materials so industriously collected from the scattered knowledge of 1879, it is desirable to ascertain whether there then existed some one lack, whether the art then required some one thing which was wholly missing—in order to produce a practical self propelled road vehicle.

It seems to me plain that there was such lack, and it may be stated in the language of one of the numerous inventors who procured long and elaborate patents relating to road locomotion, and never (so far as this record shows) did anything more.

Savalle (French 77,644 in 1867) says in a certificate of addition dated March 16, 1869:

"I have tried to apply to road locomotives several motors operating by air expanded by the heat produced, *either by the explosion of the gas,* or by air forced over a metallic surface, heated by coal or other combustible, or also *by petroleum.*

"These *divers forms of motors* apply perfectly when it concerns the *traction of omnibuses* or other large vehicles of this kind; but when it is necessary to apply this kind of locomotion to *light carriages,* only carrying one to six persons, or to drive a velocipede, these means become impracticable by the large space which they require."

The lack, the something that had to be supplied before it was worth while to organize the vehicle was the engine. Steam had thus far failed, and this record seems to show that at about the time Savalle wrote the gas engine as a road wagon motive power began to be mentioned in serious publications, and patent specifications.

Savalle was much mistaken in asserting that any of the assorted motors mentioned by him had successfully driven an omnibus or any similar conveyance, but he early hinted at the truth that in some form of motor, actuated by a product of petroleum, would be found, if not the immediate solution of the problem, at least the missing element that would make the solution sure.

This missing element Selden avers he discovered, and it follows that over his engine the conflict in these cases has raged through several volumes. In trying to ascertain, however, the status in 1877-9 of engines in any way resembling Selden's the court is fortunate in having in evidence a book entitled "The Gas Engine," published in 1885 by Dugald Clerk, who has also testified with admirable clearness as an expert for complainants.

It appears that the materials for this book were gathered during the very period of Selden's experiments, while so completely has Clerk furnished a classic on the history of the gas engine art that even counsel who sharply criticise his evidence support their arguments from his book to such an extent that it is not too much to say that many chapters thereof could be reconstructed from their briefs.

In 1879 "internal combustion" engines were well known, and had reached a considerable degree of commercial success—despite the fact that the reasons for their success or more frequent failure were very ill understood.

The fact that fuel might be burned in the engine cylinder itself, that such burning (if of gases) produced an expansion thereof, and that such expansion might be utilized by allowing it to push the piston, was and is the basic proposition.

This knowledge had produced the Lenoir engine in 1860 and the Hugon in 1865, constructed in close adherence to the steam engine of the day, and giving less than one horse power per ton of weight. Both normally used illuminating gas at atmospheric pressure.

The Otto free piston engine of 1867 marked an advance in effectiveness, but no form of gas engine had yet appeared, which (so far as shown) was more than suggested as the propulsive power of a road wagon.

In 1861 Million, and a year later Beau de Rochas, Siemens and others pointed out the advantage of compressing the gaseous fuel before ignition in order that the expansion should be both greater and quicker, with the greatest possible pressure at the beginning of the expansive movement; and in 1872 Brayton in America, and in 1876 Otto in Europe, introduced compression engines, the latter with great commercial success.

The change from a gaseous fuel burning at atmospheric pressure to the same fuel burned under compression was a change of *kind,* for, though formed of the same chemical elements, the compressed fuel possessed a power when used by men who live by breathing atmospheric air, that uncompressed and commercially possible gases did not and could not exert in any non-compression engine even as yet imagined. It therefore seems clear that the phrase "compression type," as applied to internal combustion engines, is reasonably indicative of a class, and appropriately describes an unmistakable and invariable species of the genus gas engine.

The evidence is persuasive that the increasing success of the gas engine, produced in the middle '70s of the last century, repeated dreams (they are no more) of applying a gas engine to a road wagon.

In 1877 Rosenwald (French 116,871) made a picture of a brougham having an Otto free piston engine perched in an apparently insecure position between passenger and driver. His is a paper patent only, and is in my opinion clearly shown to be inoperative for reasons of which one only may be mentioned—the most improved type of Otto engine then known weighed over half a ton per horse power; he did not use the most improved type, and did not propose any improvement or modification which would have prevented his brougham from going to pieces at the first jar of his motor. This patent is the suggestion nearest to Selden, and is mentioned for comparison hereafter.

Although by 1879 internal combustion engines had separated into the compression and non-compression classes, they were (and still are) all known as gas engines, irrespective of the condition of their fuel immediately before the work of preparing it for combustion begins. The term originated doubtless when coal gas was the only gaseous fuel known—but the vapor of petroleum or of any product thereof (gasoline or petrol) is just as much a gas as another, and thirty years ago there was, and there is now, no distinction generally obtaining between engines whose fuel as ordinarily purchased is coal gas, and those using gasoline or crude petroleum, provided that what ultimately burns in the cqlinder is that vapor substance, "capable of expanding indefinitely"—which *is* gas.

But if the substantial difference between compression and non-compression engines was known and recognized, certain other terms of art which have been far too much used in this litigation were non-existent in 1879. A great superstructure of argument has been built upon the difference between "constant pressure" and "constant volume" engines. These terms appear to have been devised by Mr. Clerk, and first used in his book before alluded to, as convenient phrases useful in studying the operation of engines, and classifying their phenomena. The terms are instructive, as is the separation of nouns into declensions and verbs into conjugations, but much of the argument about the words attaches an undeserved importance to them. In all internal combustion motors the result of expanding the burning gaseous fuel is to drive the piston; that is, the cylinder chamber in which the expanding gas is confined gives way on the piston side (so to speak). If the piston head offers no more resistance than will permit it to move under the expansive force produced by the initial compression alone, evidently since the piston moved under that pressure, it will be maintained to the end of the stroke, the expansion produced by ignition serving to keep up that "constant pressure."

If, however, the compressed charge must be ignited before the piston moves, then whatever volume thereof is introduced into the cylinder increases (by combustion) its pressure on the piston head, before the engine operates, and the machine is described as "constant volume."

In both phrases "constant" refers to condition, at the instant piston movement begins, compared with that at the moment the fuel charge is inserted. If between the two moments pressure increases, then the volume is constant; while if volume increases, pressure is constant.

These conditions are theoretic. If in a constant pressure engine the load or piston resitance is suddenly increased, the expansive power produced by compression alone may not start movement before ignition or explosion—and accordingly (if too much importance be attached to phrases) the type of engine has changed. Of course nothing of the kind has occurred—the relation of piston head to cylinder walls relative to time of explosion has changed, and it may nowadays (in many engines) be changed at will to suit load and speed by throttling and by timed ignition. These variations have been observed in all the engines testified about in this case. They occur, or may occur, in all compression engines, and are no more significant of specific or generic differences than are variations in rapidity of breath in different men, or in the same man at different times.

From this attempted outline of the knowledge and achievements of 1879, it seems to me that the way was singularly clear for anyone who would really produce the thing described in Selden's first claim.

Success is never anticipated by any number of failures, and when it is clearly kept in mind that what Selden claims is a combination, and not any one of its elements, the defendant's references to prior patents and publications may be thus finally disposed of so far as this court is concerned.

Much has been said concerning this inventor's personality and there is some importance therein as showing the likelihood of his comprehending his own experiments, and telling the truth about them. The record shows him always interested in mechanical pursuits, receiving an appropriate education for the theoretical side thereof, but not himself a skilled practical mechanician.

His application for a patent on a rubber tire wheel made in 1869 is significant and interesting, and, in view of quite recent litigation in this circuit, instructive. Taking his evidence in connection with his letters and notes, he is shown especially attentive to traction problems from his early manhood. I am persuaded that he carefully studied Brayton's engine and understood it practically—but his knowledge of the theory of thermodynamics seems fairly illustrated by a remark to his workman Gomm when his original engine turned over: "We have struck a new *power.*" There is no satisfactory evidence that before application filed he knew thoroughly anything of Otto's compression engine. All this was not a very complete equipment; but he had the true inventor's enthusiasm, and for more than five years (as the Chief Justice said of Morse—15 How 108): "He pursued these investigations with unremitting ardor and industry, interrupted occasionally by pecuniary embarrassments."

When he was ready to file his application he had completed and experimentally operated one cylinder of a three cylinder engine of the general type Brayton has patented in 1872 and 1874. He intentionally built a plurality of cylinders, to obviate or minimize the necessity for a flywheel, he produced an enclosed crank case (which immediately reduced weight to an enormous extent) and used a small piston with a short stroke (which made possible the speed that would compensate for the loss of piston head area).

This engine (with allowance for adjuncts Selden did not use), but (as experience has shown) should have used, weighed less than 200 pounds per brake horse power, as compared with over 800 pounds in the lightest form of Brayton's, and is capable of

over 500 revolutions per minute, as against less than 250 by any type of gas engine known, built or suggested in 1879.

These I find to be the facts regarding the engine built by Selden before application filed. He then caused to be made a model and mechanical drawing of his suggested vehicle and actual engine and submitted the same with specifications and claims to the Commissioner of Patents.

Avoiding for the present the language of his original application, and the effect of the numerous changes therein during its many years in the Patent Office, was the thing fairly revealed by the model and drawings, and conceived under the circumstances above set forth—the embodiment of a combination patentable in 1879?

I think the answer is emphatically yes; that which is not obvious to skillful men is usually (as remarked by Mr. Clerk in his evidence) invention, and certainly what Selden shows in his model, and by the drawings which have remained unchanged for thirty years, was anything but obvious. The inventive act is shown by comparing Selden and Rosenwald. If the latter's brougham had actually carried its engine, and traveled even a little, he might nevertheless (on defendant's own argument) have found his patent invalid by American law, because each part of his vehicle was doing just what it had always done, without any new "co-operative law," while his engine in particular was the same motor which before it was applied to the brougham had perchance driven a lathe and might tomorrow do something else. Rosenwald might have been held a mere aggregator (however successful), but Selden's combination cannot be taken apart and each element recognized as something that had done the same thing or sort of thing before.

The adaptation of the engine alone was something never before attempted (so far as shown); such adaptation might have involved an infringement on Brayton, but that did not prevent Selden's combination from being strikingly new, useful if it would work, and eminently patentable.

To sum up what is shown to have been the mental concept embodied in 1879 by Selden's model and drawings—with Brayton's engine in mind he organized a new road vehicle; to be sure, he did substitute one old and well known prime mover (gas) for another (steam), but in so doing he devised and used an arrangement of Brayton's engine never before attempted, one that Brayton himself never suggested, made or patented, and without which the road vehicle was an impossibility.

This mental concept constituted invention, if capable of reduction to operation, and if *any operative* example (not *all* operative examples) thereof was shown by the patentee.

If this doctrine be admitted or found, defendants before attacking the operativeness of Selden's vehicle seek to limit the scope of the patent by asserting that the combination is not infringed by any vehicle whose engine is not substantially identical with that described in drawings and specifications—notwithstanding the language of the claim "liquid hydro-carbon gas engine of the compression type."

Thus it is asserted that since Selden and Brayton show a spray of petroleum mixed with and carried by compressed air into the combustion chamber, they do not show a true gas engine; that the use of a carburetor separate from the engine proper and producing gaseous mixture which it feeds to the engine is something outside the patent and avoiding infringement; that a water jacket being shown by Selden in a peculiar and unusual equivalent, or attempted equivalent, is something outside the combination, and when used by defendants differentiates defendants' engine and combination from anything that infringes; and that since Selden evidently shows in his drawings ignition by a constant flame, he is confined thereto, and cannot use electric ignition, while defendants by using the same do vary the combination.

I have already tried to show that Brayton's petroleum engine, Lenoir's illuminating gas engine, and an Otto machine driven by gasoline are now, and were in 1879, not only "gas engines" in the sense that they all operate on the same scientific principles, but they were known as and called "gas engines" by those best qualified to speak.

To make gas in one place rather than another must be an immaterial variation where a primary patent (such as this by complainants' contention) is under consideration; water jackets were old in 1879, and had been used in many forms, and both flame and electric ignition had been used and were well known to gas engineers of the day, although in 1879 it seems to me that the flame method was by far more successful than the electric as applied to compression machines.

The force of these objections, based on the face of the drawings and specifications, as compared with the claims, depends on whether the patent is viewed as a primary or pioneer one, or the contrary, and this in turn depends on the state of the art at the time of invention.

The art I have attempted to describe at perhaps too great length, because upon its condition this whole litigation seems to hinge.

If I have correctly apprehended it, there was clearly room for a pioneer patent, and it must now be held that on its face and in view of the art, Selden's is such a patent. This means that Selden is entitled to a broad range of equivalents and this rule as applied here results in this crucial inquiry: Was Selden (or anyone else) entitled in 1879 to appropriate as one of the elements of any patentable combination a "liquid hydro-carbon gas engine of the compression type"?

I think he was, and so was any other inventor, but he was the first so to do. If this be true, then the use or disuse of any then well known mechanical appliance which will increase the efficiency, usefulness or commercial success of such combination, without changing what defendants call its co-operative law, is on the one hand open to Selden, and on the other will not free defendants from infringement.

Although there were in 1879 many liquid hydro-carbon gas engines of the compression type, there was not one which in its then form could be made an element (and the most important element) in a road wagon combination, and the radical difficulty was the same that Savalle had confessed to ten years before.

Selden (on paper certainly, whether actually will be considered later) solved that difficulty, and such solution gave him the right to claim broadly the *thing* which was the leading element in his invention—when used in his combination. Thirty years have passed, and counsel admit that no successful gasoline motor car fails to use a liquid hydro-carbon gas engine—of the compression type—with a short rapid stroke, and enclosed crank case, and a plurality of cylinders.

These are the very *things* which are at the foundation of success. To be sure (as will be considered more fully later) no very great degree of success can be reached without improvement over 1879 in carburetors, and electric ignition, and increase of knowledge concerning the respective mechanical possibilities of two, four and six cycle engines; the faster also the reciprocating parts of an engine move the greater the necessity of constant and abundant lubrication, and Selden's lubrication is confessedly primitive, and finally the great difference between any results Selden's most optimistic supporter can claim for him in 1879, and the successes of 1909, arises from increased compression, so that engine weight per brake horse power has now been reduced to about 10 pounds.

But these are non-essential, if, in 1879, Selden could lawfully use as an element in his patentable combination, the "compression type," or species of a whole genus of engines. As already stated, I think he could, and did, and further showed and made an exemplar of said "type."

Thus far the claims and specifications have been treated as though they were presented to the commissioner in 1879, in the shape they left his office in 1895. This was not the case; nothing remained in 1895 of the language of 1879 but the description of the vehicle and engine (and not all of that); the claims were reworded and the specification amplified many times, and usually after a rejection made or criticism offered by the examiner, Selden did nothing by way of amendment or reply for about two years—the extreme limit of inactivity permitted him by these rules of Patent Office practice.

By these means he received in 1895 a patent for an invention of 1879, and in the meantime had never built a motor car, and never succeeded in getting anyone sufficiently interested in his theories to experimentally try them out with larger means and better mechanical ideas than Selden himself had.

During the later years of this period, and while Selden was in very leisurely fashion combating examiners who evidently had small conception of what was meant by light self propelling vehicles usable on the common roads, Duryea, Olds, Ford and others in America, the Panhard and Peugeot companies (and many others) in France were experimenting with actual cars, and in 1894 a public race meet was held in France, whereat cars now as archaic in appearance as Selden's demonstrated that they actually could propel themselves from Paris to Rouen at about 12 miles an hour. The engines of some of them were modified Ottos, and "liquid hydro-carbon gas engines of the compression type," and it must be found that when Selden's patent issued there had been developed engines answering to his phrase, which as a matter of history are not derived from his engine—that others reached his type without knowledge of him or his labors; indeed (while certainty is impossible), it is my belief from this evidence that Selden has contributed little to motor car advancement in the United States, and nothing at all abroad. As a matter of fact, I believe that nearly all the cars made in the United States when these actions began were modeled on French ideas, and used engines descended from Otto through Daimler, and not from Brayton through Selden or any other American. In short, this American patent represents to me a great idea, conceived in 1879, which lay absolutely fallow until 1895, was until then concealed in a file wrapper, and is now demanding tribute from later independent inventors (for the most part foreign) who more promptly and far more successfully reduced their ideas to practice.

But the patent speaks from the date of its issue, and unless Selden did something unlawful during his sixteen years' wrangle with examiners, or unless intervening American rights, available to defendants, sprang up while Selden was rewording claims—he is within the law, and his rights are the same as those of the promptest applicant.

Without prolonging discussion, it may be held briefly that Selden did not overstep the law. He did delay; he was not in a hurry. He could not get anyone to back him, and doubtless appreciated that if he was ahead of the times it was wise not to let his patent get ahead too. If he had gotten his grant in 1880, without a moneyed backer, the patent might and probably would have expired or nearly so before anyone saw its possibilities; and if the business world had seen them within seventeen years, that term would then so nearly have expired that Selden would never have been able to get to final hearing before it ran out. At best, an accounting and not an injunction would have been his lot. The difference he may well have considered as a lawyer, and personally I believe he did think of it.

If he did not delay unlawfully, what intervening rights did he permit to spring up?

Remembering that Selden clearly showed a "liquid hydro-carbon gas engine of the compression type" in 1879, and actually manufactured one, I think it clear that his original claim was wider than any of those in suit.

The third claim as originally filed read thus:

"The combination in a road locomotive provided with suitable running gear and steering mechanism, of a *gas engine,* traction wheels, and an intermediate clutch or disengaging device, substantially as set forth."

It is true that throughout the original papers he speaks continually of "Gas Engine L," that being the alphabetical designation given his motor in the drawing submitted; but the claim quoted shows how wide was his original demand, and without further elaboration I hold with complain-

ants that all subsequent changes of claim are in diminution or contraction of this first statement of invention.

The file wrapper, cross examination thereon, and argument concerning it form a bulky volume, but it seems to me sufficient to quote from the amendment of June 6, 1889, when Selden amplified his specification by inserting the following:

"I have succeeded in overcoming these difficulties by the construction of a road locomotive propelled by a liquid hydro-carbon engine of the compression type, of a design which permits it to be operated in connection with the running gear, so that the full carrying capacity of the body of the vehicle can be utilized for the transport of persons or goods, and which, by dispensing with skilled attendance and with steam boilers, water, water tanks, coal and coal bunkers, very largely reduce the weight of the machine in proportion to the power produced and enables me, while employing the most condensed form of fuel, to produce a power road wagon which differs but little in appearance from and is not materially heavier than the carriage in common use, is capable of being managed by persons of ordinary skill at a minimum of trouble and expense, and which possesses sufficient power to overcome any usual inclination."

And at the same time he put what is now Claim 1 into substantially its present shape.

The language last quoted is in the final specification, it describes the *thing* which Selden conceived and pictured in 1879; and in 1889 the man skilled in the art, though he knew more than he did in 1879, did not know as much as Selden sets forth in the quoted words. It was still possible for the gasoline compression engine to be made part of a patentable road wagon combination. No one in the United States had passed, or even caught up with Selden—while foreign efforts have been fairly and attractively told by Mr. Krebs, of the Panhard Company. He quite fully depicts the history of meritorious and successful efforts in road locomotion apparently as ingenious as Selden's, and more vigorously pursued, but they did not begin until after 1879, and in 1889 were still clearly behind Selden's concept.

Defendants have advanced many other arguments based on the contents of the file wrapper.

Thus the original third claim above set forth declares a combination *in* a road locomotive, while the first claim in suit covers a combination *with* a road locomotive. The change is declared to be an abandonment of the original combination. It is further shown that some patent examiner rejected certain claims, referring to the Pinkus patent (*supra*), and thereupon Selden amended the claims and disavowed and disclaimed Pinkus. The argument based on this is that since Pinkus' "co-operative law" is the same as Selden's, the disclaimer of Pinkus was in effect an abandonment of the very combination now relied on.

I have already indicated my view of the major premise of the last proposition, but these arguments, and many others of the same ilk, cannot prevail if it be true that Selden clearly showed in 1879 the *thing* he had invented. If so, he could rewrite the description of that *thing* as many times as the rules of practice permitted down to 1895. That such rewriting is all Selden did I believe to be true.

Defendants now urge that Selden's invention is inoperative. The one cylinder engine built by Selden on the three cylinder casting in 1877-8 was put in evidence as Exhibit 47. Thereafter the cylinders of Exhibit 47 were all bored out or rebored, new working parts fitted to them, and the engine put into a vehicle, the whole called Exhibit 89, completed in the winter of 1905-6, and constituting the first physical embodiment of Selden's patent. The complainant licensee, Electric Vehicle Company, also constructed a new engine from the patent drawings (Exhibit 132) and a complete vehicle (Exhibit 157).

Defendants aver that neither of these vehicles is a Chinese reproduction of Selden's drawings, and have devoted volumes of print to recording and arguing about the performances of Exhibit 89.

In my opinion Exhibit 89 as constructed was such Chinese reproduction, Exhibit 157 was not—complainants having changed the water cooling device, used only electric ignition and made some other departures from the mechanical details shown in the drawings. But these variations were (as previously indicated) within the range of equivalents permitted to a primary patent.

The evidence on the subject of operativeness is the most flagrant example of unsupervised testifying I have ever seen or heard of.

Whether in 1905 Exhibit 47 was any better than scrap, whether Exhibit 89 would start on flame ignition, whether Exhibit 132 showed diagrams revealing volume or pressure constant, were perhaps interesting but unimportant questions. They raised a false issue over which months of time and volumes of print have been expended.

The serious and I think only question was and is whether a machine made in substantial conformity to drawings and specifications, without going beyond the range of equivalents permitted, was operative, even though rudimentary. Exhibit 157 answers to this description, and its performances may I think be thus summarized—it is a wretchedly poor car for 1905; there were probably as good, if not better, cars in 1895, but it is a marvel of invention for 1879—and that is more than enough for the purposes of these cases.

One instance of alleged prior use remains. Before 1879 Brayton undertook to furnish an engine which would drive an omnibus to certain men in Pittsburg. It is shown that he endeavored to adapt his then well known engine to traction purposes. That he failed utterly is clearly proved; the reasons for his failure are not so clear, but the failure is enough to invalidate the defense.

No litigation closely resembling these cases has been shown to the court, and no instance is known to me of an idea being buried in the Patent Office until the world caught up to and passed it, and then embodied in a patent only useful for tribute.

But patents are granted for inventions; the inventor may use his discovery, or he may not, but no one else can use it for seventeen years. That seventeen years begins whenever the United States so decrees by its patent grant. That the applicant for patent rights acquiesces in delay, or even desires delay, is immaterial to the courts so long as the statute law is not violated. On these principles complainants are entitled to a decree.

The Panhard machine does not in my judgment infringe the second claim. Construed as they have been in this opinion, infringement of claims one, two and five by the Ford machine, and of one and five by the Panhard can hardly be said to be denied. It is so found, and decrees will pass accordingly.

C. M. Hough,
September 8, 1909. U. S. D. J.

Spark Plug Patent Litigation.

A. R. Mosler & Co., of New York, have commenced a suit in the United States Circuit Court in New York against the Auto Supply Company for infringement of the well known Canfield United States patent No. 612,701, granted October 18, 1898, for spark plugs, and owned by them. This patent is claimed to broadly cover a spark plug provided with a deep chamber or recess around the electrode for the purpose of preventing an injurious accumulation of soot or other foul matter on the insulation of the electrode, which is a feature of many spark plugs now upon the market in this country. Messrs. Mosler recently acquired the Canfield patent from the Association Patents Holding Company, a subsidiary organization of the Association of Licensed Automobile Manufacturers.

The City Council of Pasadena, Cal., has so amended the automobile ordinance of the city as to permit the transfer of a license from one car to another, if the original car is sold.

To Manufacture Motor Trucks in the Far West.

The Spokane Motor Car Company has been organized with a capitalization of $600,000, and incorporated under the laws of Washington, to manufacture in Spokane an original type of commercial automobile. The incorporators are V. E. Funkhouser, Portland, Ore., president; Edward Schulmerich, Hillsboro, Ore., vice president; F. M. Skiff, Portland, secretary; A. L. MacLeod, Portland, treasurer, and Thomas Bilyeu, Portland, general manager, who, with F. H. Whitfield, of Portland, and W. P. Lafferty, of Corvallis, Ore., compose the directorate.

President Funkhouser announced in Spokane that work on a plant to give employment to 150 mechanics would begin in a short time. The product will be confined to heavy commercial cars, propelled by gasoline, with power applied directly to all four wheels. A fifth wheel construction enables the car of 17½ feet length to turn within its own length.

The truck has no rear axles. The rear wheels are supported by two suspension axles, supported themselves by steel frames and blocks on each side. The axle of the front wheels "plays" up and down in a groove 6 inches long, enabling the truck to pass over obstructions from 6 to 24 inches high without noticeably disturbing the platform. The loading space is so arranged that the load will be distributed on all four wheels, instead of the entire load being carried on the rear wheels, in order to get sufficient traction. A four cylinder gasoline engine is used, generating 50 horse power. The company plans to manufacture the car in several different sizes, from 1½ to 7 tons capacity.

To Build Cars in Oswego, N. Y.

The Pell Motor Car Company has been organized at Oswego, N. Y., with $150,000 capital stock, to manufacture low priced automobiles. The directors for the first year are C. C. Place, A. N. Radcliffe, John P. Miller, D. W. Pell, E. D. Long, H. A. Wilcox and C. A. Bentley. The election of officers will take place at an early date. The company has secured quarters in the Ontario Industrial Building now in course of erection, and will begin work just as soon as the building is finished. A model car has already been built to order outside. The organization of this company was first announced in these columns about a month ago.

Short Measure Gasoline.

Rudolph Baumert, Indianapolis manager of the Standard Oil Company, was arrested by Isidor Wulfson, inspector of weights and measures in that city, for giving short measure in selling gasoline. W. B. Craig, an automobile owner, made the complaint, and investigation showed there were 4½ pints short in 20 gallons. Baumert was fined in police court, but has taken an appeal to a higher court.

OUR FOREIGN EXCHANGES

Benz & Cie.'s Annual Report.

The annual report of Benz & Cie., the well known German firm, for the business year which ended on April 30 last, is not at all satisfactory. A reason assigned for this fact in the report is that during the past year the entire business was transferred to the new, large and modernly equipped factory, and this removal had a retarding effect on the work for months, besides causing considerable difficulty in the acquisition of new skilled metal workers. Interruptions were also caused by the necessity for acquainting the workmen with the new machines. This made it impossible to materially increase the output, while, on the other hand, the expenses were considerably increased by the enlarged scale of operations. The report continues that during the current year the output has been constantly enlarged, and a favorable balance is to be expected. The gross earnings of the company for the past year amounted to 2,092,094 marks, as compared with 2,342,341 marks the previous year. The sales expenses rose from 1,036,655 marks to 1,345,617 marks. The operating expenses amounted to 369,782 marks, as compared with 362,973 marks. After writing off 320,367 marks, there remained a surplus of 56,326 marks, which was carried forward. The company distributed a dividend of 15 per cent. in 1906-1907, and of 8 per cent. in 1907-1908, but for 1908-1909 the dividend was passed.

British Patents Act.

According to Consul Horace Lee Washington, of Liverpool, the result of the first year's working of the British patents act has been that $2,500,000 of foreign capital has been introduced into the United Kingdom, as the following indicates:

The value of the land and premises acquired by foreign firms who have decided to carry on their manufactures in this country in order to maintain patent rights is estimated at $635,000. The expenditure for buildings was $880,000; plant and machinery, $895,000, making a total of $2,410,000. The annual local assessments on these new enterprises is estimated at $135,692. In addition it is stated that a great many firms have arranged for English factories to manufacture their patented articles on a royalty basis. A specialist in factory property stated in a recently published interview that his firm was in negotiation with several German and American firms for the acquisition of sites and factories, principally in the chemical, engineering, electrical and rubber making trades, and that a French firm of pottery makers are seeking a site for a model village. He estimated that twenty-four firms are already manufacturing there as a result of the act.

Royal A. C. Does Not Want Speedways.

The Royal A. C. of Great Britain and Ireland held a discussion of the Lloyd George Road Improvement Funds Bill on September 3, and unanimously adopted the following resolution:

"That the general committee of the Royal Automobile Club and associated clubs expresses its satisfaction with the Development and Road Improvement Funds Bill (Par II), and further expresses the hope that the attention of the Road Board will be specially given to the improvement and widening of existing roads for facilitating motor traffic, rather than to the construction of special motor roads."

The Scottish A. C. executive and legal committees held a joint meeting on September 1, and the discussion brought out the fact that the views of these committees are substantially identical with those of the Royal A. C.—that is, they hold that the construction of speedways should be deprecated, and the improvement of existing roads encouraged.

French Exports for Seven Months.

The French exports of automobiles for the first seven months of the current year show a material improvement over the corresponding figures for last year, and only a slight decline over the record year of 1907. The value of the exports during the first seven months of 1909 was 85,687,000 francs, as compared with 77,694,000 francs during the same period in 1908, and 89,865,000 francs during the same period in 1907. The distribution of the exports among the different countries was as follows:

	Francs.
United Kingdom	38,207,000
Belgium	10,363,000
Germany	6,072,000
United States	5,395,000
Argentine	4,369,000
Algiers	4,000,000
Russia	2,966,000
Spain	2,120,000
Switzerland	2,085,000
Italy	1,941,000
Brazil	722,000
Austria-Hungary	623,000
Turkey	385,000
Various countries	6,439,000

Five of the above named counties have reduced their imports of French automobiles in comparison with the previous years, particularly Germany, whose imports show a decline of 1,679,000 francs; Brazil, 630,000 francs; Turkey, 71,000 francs; United States, 53,000, and Spain, 14,000 francs. The imports of the other countries show an increase, especially those of Belgium, which imported for 3,600,000 francs more French automobiles than during the first seven months of last year. The imports of foreign cars into France remain in almost negligible quantity, the aggregate value for the first seven months of the year being hardly 4,000,000 francs.

Brazilian Rubber Exports.

Consul George H. Pickerell, of Para, transmits the following statistics and comments on the shipment of rubber from that Brazilian district for the past three fiscal years ended June 30 (kilo = 2.2 pounds):

	United States.			Europe.		
Quality.	1907. Kilos.	1908. Kilos.	1909. Kilos.	1907. Kilos.	1908. Kilos.	1909. Kilos.
Fine	8,785,388	7,086,966	8,730,908	9,894,955	11,158,327	9,616,696
Medium	2,024,044	1,501,987	1,752,602	1,597,343	1,890,246	1,732,844
Coarse	5,839,035	4,414,167	6,074,267	3,245,317	3,452,788	2,684,025
Gaucho	1,627,631	1,655,160	2,504,856	4,653,064	5,263,165	5,138,673
Total	18,276,098	14,658,280	19,062,633	19,390,679	21,764,526	19,172,238

"Contrary to the anticipation of producers the rubber production of last year has been considerably greater than that of the previous equal period, and has almost reached the amount produced in 1907, the year of greatest production. Notwithstanding this unexpected large yield prices have shown an enormous tendency to rise, and it would seem from present reports that the end has not yet been reached; $1.65 per pound f. o. b. New York is high when one considers that just a little more than one year ago the same article was selling in the same market for 63 cents. It is too soon to tender any opinion upon the coming season's crop, but I feel sure that every effort will be made to take advantage of the present high prices. The effect of all this good fortune will hardly be felt before 1910, but some in anticipation of another successful year have commenced to lay plans for increasing and improving their present production facilities."

Lion Motor Car Company Organized.

The Lion Motor Car Company, of Adrian, Mich., was formally organized at a meeting at the Griswold House at Detroit on September 15. The new company is capitalized at $350,000. The plant is to be located at Adrian, that city having granted a bonus of $15,000 for the factory. The officers are as follows: President, Henry C. Bowen, Adrian; vice president, Fred Postal; secretary, Leslie Robertson, Adrian; treasurer, William E. Morey; assistant treasurer, William Shierson. The company plans to produce 2,000 cars next year. Work on the remodeling of the building was ordered begun at once. It is generally understood that the manufacture of the machines will begin the later part of this year.

Successful experiments are under way, near Nottingham, England, with a British-made agricultural motor. It is claimed to do plowing and harvesting at one-sixth the cost of ordinary methods.

MINOR MENTION

The Phœnix Automobile Accessories Company, of St. Louis, Mo., have established a branch at Kansas City, in charge of Chas. Thayer.

The W. A. Patterson Company, of Flint, Mich., one of the largest carriage concerns in the West, has broken ground for a new factory building for manufacturing automobiles.

According to a report from Anderson, Ind., the Indiana Rubber and Insulated Wire Company is erecting a new building in Jonesboro, Ind., to experiment with automobile tires.

The Kissel Motor Car Company, of Hartford, Wis., has doubled its capital stock in order to provide for the growing business. The capitalization now is $400,000. Several additions are being built at Hartford.

Mr. Greenlaw has purchased all of Mr. Wordingham's interest in the Wordingham Foot Horn Company, of Milwaukee, and the name of the company has been changed to the Wordingham Manufacturing Company.

The new factory building of the A. O. Smith Company in Milwaukee, Wis., is nearing completion. The main building, which measures 1,025x287 feet, and is of solid concrete, steel and brick construction, is now under roof.

Wm. B. and Milton O. Bard, of Johnstown, Pa., have secured a patent on a four wheel drive, and are at present constructing a machine embodying the invention. They are planning to organize a company to manufacture the machine.

In the recent Lowell stock chassis race the cars finishing first to fifth were all equipped with Michelin tires. In the race for the Vesper Club trophy the first five places also fell to cars equipped with Michelin tires, and in the contest for the Yorick trophy first and second places were secured by cars fitted with Michelins.

Horace De Lisser, president of the Ajax-Grieb Rubber Company, has offered a trophy to be known as the Ajax Cup for the Star Tour, which started September 20 at Kansas City, Mo. This cup will be awarded to the contestant in the runabout division in either the dealers' or owners' class who crosses the finish line with the best score.

The Embree-McLean Carriage Company, of St. Louis, Mo., have entered the automobile field, and plan to turn out about 500 cars the coming season in three models, as follows: A 30 horse power light roadster, with 105 inch wheel base; a 35 horse power light touring car, with 116 inch wheel base, and a 40 horse power seven passenger touring car, with 120 inch wheel base. All three cars will be equipped with four cylinder, four cycle motors and three speed selective steering gears. The first cars will be ready November 1.

The Overland Automobile Company have let the contract for a new building for its Toledo, Ohio, plant, to be located on Central avenue.

It is reported that the receivership of the Kauffman Buggy Company, of Miamisburg, Ohio, will shortly be terminated, and that the factory will be sold to a company which plans to make automobiles.

The Nordyke & Marmon Company inform us that they have not issued a statement to the effect that they will not take part in track races in the future, as was reported in one of our recent issues.

The Great Western Motor Car Company, Peru, Ind., held its annual meeting on September 14, and elected the following directors: Milton Kraus, R. A. Edwards, E. A. Myers, Albert Kittner, R. H. Bouslog, W. S. Mercer and A. L. Modurtha.

An improved steel guide post for country crossroads, which can be produced at low cost, has been invented by B. H. Cooley, of Campbellsport, Wis., and will be manufactured there. It consists of a 2 inch cast iron pipe, with a special interchangeable cap.

The York Motor Car Company, of York, Pa., who have been represented in San Francisco by Frank O. Renstrom for a number of years past, have decided to open a factory branch in that city, and have sent C. B. Gardiner there to represent them.

In Youngstown, Ohio, there are said to be about 125 electric vehicles in operation, and the Electric Storage Battery Company, of Philadelphia, is planning to establish a branch there for assembling batteries and doing repair work. A site on Belmont avenue is being considered, and the branch may be opened within a month.

The Hartford (Conn.) Auto Parts Company at its recent annual meeting elected the following officers: W. H. Cadwell, president and treasurer; F. H. Bogart, vice president and manager; F. L. Martin, secretary. The company manufactures universal joints and other parts. The company has increased its capital stock from $50,000 to $100,000.

This year Richard G. Wagner, of Milwaukee, Wis., president of a syndicate of beet sugar manufacturers, inspected the beet sugar crop from an automobile, and shortened his annual tour of beet sugar fields by one-half. The factories as well as the fields are widely separated throughout the State. Mr. Wagner was able to drive directly into the fields and inspect the crop without leaving the car.

E. T. Rogers and R. T. Overbolt, who are said to be connected with a well known Wisconsin automobile company, are endeavoring to interest Des Moines, Ia., capitalists in a proposition to locate a factory there for the manufacture of automobiles for farm use, ranging in price from $500 to $800. Messrs. Rogers and Overbolt went to Des Moines on the invitation of the Commercial Club, and while there were entertained by the Greater Des Moines committee.

Leslie Elliott, of Pomona, Cal., has bought a building on West State street, and will establish a tire repair shop there.

The Sellers Motor Car Company, which began manufacturing automobiles in Hutchinson, Kan., last summer, is now said to be turning out three cars a week, and plans to produce 200 cars for next season.

Nine cars have been entered for the twenty-four hour race, to be held on the Brighton Beach "motordrome" on Friday and Saturday of this week, viz., two Loziers, Buicks and Rainiers each, and Fiat, Palmer-Singer and American Roadster.

A meeting was recently held at the office of Mayor Breitmeyer, of Detroit, to discuss a proposition to establish a permanent automobile exhibition in that city. It was attended by representatives of most of the leading manufacturers. No definite action seems to have been taken.

Space diagrams and application blanks have been issued for the tenth National Automobile Show, which is to be held at Madison Square Garden January 8-15. First allotments of space will be made October 7. M. L. Downs, 7 East Forty-second street, New York, is secretary of the show committee.

The St. Louis branch of the Fisk Rubber Company, of which A. N. Stanley is manager, will soon have a new two story building, with an office and a salesroom on the first floor, and a repair room on the second floor. The present quarters of the company, at 3907 and 3909 Olive street, have become inadequate.

The Charles Waugh Company, of Cambridge, Mass., an old established carriage manufacturing company, has entered the automobile business and secured the agency for the trucks made by the American Motor Truck Company for Boston and vicinity. The Waugh Company makes bodies for these trucks to suit the different requirements.

The Reo Motor Car Company, of Lansing, Mich., on September 15 presented all their employees who had been with the company for a year or more with a check for a sum equal to 5 per cent. of their wages for the year. The company made a similar present to their employees a year ago. This year the aggregate of the checks amounted to $10,000, which is $3,000 more than the amount last year.

Following the resignation of Alfred S. Koto, assistant manager of the Warner Instrument Company, of Beloit, Wis., it is announced that Mr. Koto, with Thomas Odee, will start a manufacturing plant at Beloit. It is said that the product will consist of automobile devices, parts and accessories. Mr. Odee has been superintendent of the gasoline engine department of the Fairbanks-Morse Manufacturing Company at Beloit for several years, and is an experienced designer and builder. The T.

A. Johnson wagon works factory has been leased for the new plant.

Club Notes.

The new clubhouse of the Dixon (Cal.) A. C. was dedicated on September 17. The club owns its own garage, the use of which is free to members and their friends.

Motorists of Athens, Sayre and Waverly, Pa., organized a club at a meeting held on September 7, starting with a charter membership of sixty-two. The officers of equipped with tachometers, which is to be of of Athens, president; Frank A. Bell, of Waverly, vice president; J. T. Corbin, of Athens, secretary, and C. C. West, of Sayre, treasurer. A committee on constitution and bylaws was appointed.

New Commercial Vehicle Concern in Minneapolis.

The Robinson-Loomis Motor Truck Company have been incorporated in Minneapolis, with $50,000 capital stock, and have secured a plant at Second avenue North and Seventh street. The company will manufacture the Gopher truck, and handle the Reliance trucks and delivery wagons in the Northwest. T. F. Robinson, president and general superintendent, has been engaged in the commercial vehicle business for some years, having been manager of the only exclusively commercial garage in Minneapolis, while F. L. Loomis, secretary and treasurer, was formerly sales manager for the Reliance Motor Truck Company.

The Gopher truck, Model A, is a two cylinder, 22 horse power vehicle, while Model B is equipped with a 30 horse power motor. Both machines have force feed lubrication and a water cooling system. Engine speed is controlled by spark and throttle levers on the steering column. The cars are fitted with a selective type of change gear, giving three forward speeds and one reverse. The rear axles are of solid square section, 2x2 inches, while the front axles are of 2 inch I section. The car has a wheel base of 98 inches and a side chain drive to the rear wheels. The 1 ton model sells at $1,800 and the 2 ton at $2,200.

Overland Southern Company Organized.

The Overland Southern Company has been organized at Atlanta, Ga., and on October 15 will occupy the Peachtree Auditorium as a garage. The building is at present being overhauled and remodeled. H. L. Hopkins, manager of the Atlantic Refining Company, is president of the Overland Southern Company. R. C. Smith, formerly of Lansing, Mich., who has been connected with the Reo interests, will be sales manager of the company, and John N. Willys and F. A. Barker, of the Overland Automobile Company, will be members of the advisory board of the Overland Southern Company. The territory of the new company will comprise North Carolina, South Carolina, part of Virginia, eastern Tennessee, Georgia, Florida, Alabama and the West Indies. The company plans to open a showroom on Peachtree street in the vicinity of the Auditorium.

Rambler Factory to Drop Forge Its Own Crank Shafts.

Thomas B. Jeffery & Co. have just put in a giant forging hammer, for making all crank shafts, connecting rods, front axle yokes and other heavy forgings. It has a falling weight of 3,500 pounds, making it capable of striking a blow of approximately 15,700 pounds. The anvil block weighs 70,000 pounds, and the total weight of the hammer is 98,000 pounds. This press has been set up on a foundation of solid concrete 16 feet deep and 15 feet square, with cushions consisting of oak timbers. In addition to this a 500 ton drawing press for the shaping of brake drums, clutch cones and other heavy drawn steel parts, has been installed. This press weighs 60,000 pounds.

Overland Capital Increased.

Directors of the Overland Automobile Company held a meeting at the factory in Indianapolis on the afternoon of September 15, and voted to increase the capital stock from $800,000 to $1,500,000. It was also decided to change the name of the company to the Willys-Overland Company. The company states it will build 20,000 cars during the coming season, of which about 9,000 will be made in Indianapolis and 11,000 at Toledo, Ohio. Recently three large factory buildings have been completed in Indianapolis.

Ohio Agencies Consolidated.

By the incorporation of the Charles Schiear Motor Car Company, with a capital stock of $25,000, the Southern Ohio Motor Car Company, of Columbus, and the Evanston Auto and Garage Company, of Cincinnati, have been merged into one corporation. The incorporators were Charles Schiear, C. Roy Clough and others. A branch will be operated at 3705 Main avenue, Cincinnati, and another at 61 East Spring street, Columbus. The principal part of the wholesale business will be conducted at the Columbus branch, of which C. Roy Clough will be manager. The corporation has about fifty counties in central and southern Ohio for the Hupmobile and Velie lines. Others will be added as soon as contracts are signed.

Wheel Company to Make Motor Buggies.

The Whiteside Wheel Company at Indianapolis, which has devoted its attention to the manufacture of wheels, will bring out a high wheeled car for the season of 1910. It will be known as the Vaughn runabout, and will have 38 inch wheels, fitted with 2 inch solid tires. The engine will be of the two cylinder, 20 horse power, Beaver type, while the Vaughn friction transmission will be used.

Transcontinental Dash Has Fatal Ending.

A car which started from Philadelphia at noon on Saturday on a transcontinental trip for the Philadelphia *Press*, carrying a messenger who was to deliver a message from President Taft to the president of the Alaska-Yukon Exposition at Seattle, was wrecked at 3 o'clock in the afternoon near Reading, Pa., and the courier, Henry L. Buckley, was mortally injured, and died later in the Reading Hospital. Other passengers of the car were more or less injured, and the trip was immediately called off. It appears that the car got beyond the control of the driver, and collided with a telegraph pole.

Lipman to Manufacture Cars.

Carl E. L. Lipman, of Beloit, Wis., who has been engaged in the manufacture of automobile parts, particularly circulation pumps and speed indicators, for many years, is at present constructing a six cylinder, 35 horse power car, to sell at $1,500. The car has a very long wheel base and 34 inch wheels. Mr. Lipman is at present looking for a suitable location for a factory.

Business Trouble.

An involuntary petition in bankruptcy was filed September 9 in the United States District Court against the Kelsey Company, Inc., manufacturers and dealers in automobile and bicycle supplies, 45 Niagara street, Buffalo, N. Y., by Wm. E. Kelsey and others. Kelsey presented a claim for $3,555.52 on a note, and other petitioners presented claims for amounts on open accounts. It is charged that the alleged bankrupt expressed its willingness to be adjudged a bankrupt, and admitted its inability to pay its debts.

Bids for Ohio Tags.

Bids for furnishing the Ohio State automobile department with 35,000 sets of tags for the year 1910 were opened by the Secretary of State September 15. Five bids were submitted, all of which were under the price for the present year, 50 cents a set. Samples of the tags will be furnished by each bidder, and these will be given a thorough physical and chemical test by Professor Edward Orton, of the ceramics department of the Ohio State University.

When translators not versed in technical matters are asked to make translations of letters, etc., containing technical terms exceedingly queer expressions are sometimes coined. The *Marine Review* reports a case where a Syrian interpreter in translating a letter in Arabic to a Manchester firm made use of the term "water sheep," which was finally made out to be an hydraulic ram. The Arabs, in adopting a name for this modern mechanical appliance, evidently followed the lead of the French, who call a ram a "mouton." An Italian translator of an article on gasoline motors spoke of the crank shaft as the elbow tree.

Garage Notes.

The Packard Motor Car Co. has recently opened a branch in Hartford, Conn., on Allyn street.

The Washington Boulevard Garage, 41-3 Washington Boulevard, Detroit, Mich., has been opened for business.

W. J. Courtney and W. N. Wesp, Newhampton, Ia., have purchased the Putney livery property, which they will remodel into a garage.

The Horton Motor Co., who have stores at Minneapolis, Minn., and Mayville, N. Dak., are building a garage in Devil's Lake, N. Dak.

Ramsthel Brothers, Grand Island, Neb., will shortly open a garage in the Donner Building, which has recently been purchased by H. L. Hayden.

A three story cement block garage building is to be erected on the Schriver property on North Perry street, Johnstown, N. Y. Work on the building may begin this fall.

The R. G. Dobbins estate, Philadelphia, are erecting a garage building at 253-9 North Broad street, at a cost of $28,000. Work on the building was started September 15.

Guy Bailey has purchased the interest of his uncle, E. C. Bailey, in the Bailey Garage in Grundy, Ia. Young Mr. Bailey has been connected with the business for some time.

The Studebaker Automobile Sales Co., Columbus, Ohio, has leased a new building at North Fourth and Chestnut streets, in which it will conduct a garage and agency. A. J. Pray is general manager.

Mayor Wm. F. Brooks, of West Somerville, Mass., is erecting a 150x55 feet garage on the site of the historic Porter's Hotel on Massachusetts avenue, North Cambridge, which has been torn down.

Leece & Watterson, Bishop, Cal., have erected a corrugated iron garage in the rear of their store for their commercial vehicles. The building will also serve as a salesroom for gas engines and pumps.

F. B. Henderson, of New York city, will erect a garage on Cheyenne street, between Fifteenth and Sixteenth streets, Denver, Col. The building will cost $25,000, and will have a warehouse and salesroom.

The Metropolitan Motor Car Co., Seattle, Wash., will erect a one story concrete garage building, 70x100 feet. Bruce A. Griggs is manager of the company, which has the agency for the Acme and Pullman cars.

L. B. Vollmer, Monrovia, Cal., has installed a charging plant in R. B. Cowan's garage on Lemon avenue, and will open as an electric garage on October 1. Mr. Vollmer handles the Detroit electric and the Columbus electric.

H. Schaffer, of Fullerton, Cal., is heading a company of Santa Paula, Cal., capitalists which has purchased the California Hardware and Tool Co.'s shops and will remodel the same into an automobile and oil tool repair shop.

E. W. Alfriend, Atlanta, Ga., is planning to erect a new building on Peachtree street, with a front of white enameled brick and plate glass, two or more stories in height, the first story of which will be used as an automobile salesroom.

Carl Jones and Louis Indra, Green Bay, Wis., have opened a garage on North Broadway under the style of the West Side Garage. Mr. Jones was formerly manager of the Kruger Garage at Oshkosh. The new company intends to handle several lines of cars.

The Empire Motor Car Co. has been organized in Syracuse, N. Y., and has secured headquarters at 244 West Genesee street. The company will handle Regal cars in eighteen counties of central New York, and are introducing them to the public by exhibiting at the New York State Fair this week. Geo. D. Wilcox is manager of the new company.

The Rambler Automobile Co., Cleveland, Ohio, has taken a lease of a new building to be erected on Sixty-fifth street and Euclid avenue. The building, which is to be completed by February 1, is to have ground dimensions of 60x100 feet. The front portion of the first floor, 60x60 feet, will be used as a showroom, and will have a polished maple floor and frescoed walls. Geo. S. Patterson is manager of the company.

The Reading (Pa.) Automobile Co. have established a branch store in Pottsville, Pa., at 202 South Centre street, which premises they have leased for a number of years. The company handle Buick and Franklin cars. H. O. Koller, of the Reading Automobile Co., will manage the branch, which is to be known as the Pottsville Motor Car Co.

The Kenny Motor Car Co., which has just secured the agency for Rambler cars in Brooklyn, New York, and vicinity, has purchased a corner property at Sterling place and Bedford avenue, Brooklyn, where a modern building, including a garage and a storeroom, will be erected immediately. The members of the firm, Wm. F. and T. A. Kenny, are well known Brooklyn business men.

New Incorporations.

Fry & McGill Motor Supply Co., Denver, Col.—Capital stock, $100,000. Incorporators, John E. Fry and James McGill.

Lloyd Automobile Co., Portland, Ore.—Capital stock, $40,000. Incorporators, W. E. Cook, C. B. Lloyd and L. Templeton.

Western Garage, Marysville, Cal.—Capital stock, $10,000. Incorporators, J. E. Coombs, W. G. Humphrey and H. B. P. Gardiner.

Evansville Taxicab Co., Evansville, Ind.—Capital stock, $10,000. Incorporators, Gustav Zeidler, J. F. Charley and A. O. Harnishfeger.

Miller Motor Co., New York, N. Y.—Capital stock, $30,000. Incorporators, Chas. Miller, Lawrence H. Cummings, Geo. W. Schaefer.

Dahl Punctureless Tire Co., Minneapolis, Minn.—Capital stock, $50,000. Incorporators, A. N. Dahl, Benj. Dahl and F. H. Stevens.

The Taxicab Co., Cleveland, Ohio.—Capital stock, $10,000. Incorporators, Moses R. Braily, F. E. Braily, C. B. Gaw and R. M. Gaw.

The Red Ball Automobile Co., Enid, Okla.—Capital stock, $10,000. Incorporators, W. H. Hill, Geo. J. Emrick and Orie J. Wilkinson.

Wright-Rye Motor Co., Troy, N. Y.—Capital stock, $40,000. Incorporators, Wm. D. K. Wright, Wm. H. Rye and George A. Hubbard.

Maxwell-Briscoe-Toledo Co., Jersey City, N. J.—Capital stock, $2,000. Incorporators, S. A. Anderson, L. H. Gunther and H. O. Coughlan.

Anti-Friction Wheel Company, Pittsburg, Pa.—Capital stock, $150,000. Incorporators, Thos. Bernston, Geo. D. Williams and Geo. L. Lothamer.

Connersville Auto Supply Co., Connersville, Ind.—Capital stock, $4,000. Incorporators, A. E. Goble, Alva Adams, Ray Thornburg and John Keucht.

Mosher Automobile Co., Anderson, Ind.—Capital stock, $6,000. Incorporators, A. T. Mosher, J. E. Van Deventer, J. L. Vermillion and E. E. Young.

The St. Paul Motor Vehicle Co., St. Paul, Minn.—Capital stock, $100,000. Incorporators, John Vieregge, Alma Vieregge, Felix Joswich and Jessie Joswich.

The National Automobile Co., Cincinnati, Ohio.—Capital stock, $50,000. Incorporators, D. Linn, Abraham Tuttleman, E. M. Harris, J. L. Kohl and Edward E. Keeney.

The Acorn Motor Car Co., Cincinnati, Ohio.—Capital stock, $20,000. Incorporators, Henry Louhier, Wm. C. Meyer, Emilie M. Maitre, B. F. Bryan, William Elwood.

The Ohio Electric Co., Toledo, O.—Capital stock, $75,000. Incorporators, Henry P. Dodge, Rathbun Fuller, Henry E. Marvin, James Brown Bell and Robert R. Lee.

The Bergen and West Side Motor Car Co., Jersey City, N. J.—Capital stock, $100,000. Incorporators, Chas. E. and Martha L. Collard, and Beverly D. Sparks. (To carry on a general garage business.)

The Euclid Automobile Co., Cleveland, Ohio.—Capital stock, $25,000. Incorporators, John H. Watson, Jr., W. D. Turner, N. J. Webster, R. E. Robinson and J. C. Reforth.

The Toledo-Mitchell Co., Toledo, Ohio.—Capital stock, $10,000. Incorporators, J. J. Vollmayer, Fredk. C. Schaal, Samuel McIntyre, William A. Cavanaugh, William C. Vollmayer and W. H. McIntyre.

Petrie Auto Co., St. Louis, Mo.—Capital stock, $10,000. Incorporators, C. G. Petrie, T. D. Petrie, F. M. Curlee, Roy Britton and A. D. Brown.

East St. Louis Automobile Co., East St. Louis, Ill.—Capital stock, $2,500. Incorporators, M. L. Harris, Carl C. Housmann and J. R. McMurdo.

Victoria Motor Car Co., Minneapolis, Minn.—Capital stock, $50,000. Incorporators, C. H. Robinson, A. W. Armatage, R. H. Rose, J. W. Hohman.

St. Paul Motor Vehicle Co., St. Paul, Minn.—Capital stock, $100,000. Incorporators, J. A. Vieregge, Alma Vieregge, Felix Joswich and Jessie Joswich.

Ideal Auto Starter Co., Indianapolis, Ind.—Capital stock, $25,000. Incorporators, W. K. Bellis, R. T. Snapp, S. A. Woodard, N. D. Woodard and R. L. Smith.

The Franklin Motor Car Co., Columbus, Ohio.—Capital stock, $10,000. Incorporators, F. H. Lawell, R. M. Todd, G. S. Ferguson, M. L. Welch and H. L. Clevenger.

Indiana Auto Parts Co., Marion, Ind.—Capital stock, $75,000. Incorporators, G. R. Stewart, Richard Ruddell, H. D. Reasoner, F. C. Stephenson and J. D. Kennedy.

Trade Personals.

E. B. Lausier has been appointed assistant manager of sales of the Timken Detroit Axle Co., Detroit, Mich., and the Timken Roller Bearing Co., Canton, Ohio.

W. F. Reynolds, who has been Texas representative for the Franklin Manufacturing Company, has been made manager of their new branch house at Pittsburg.

J. S. Draper, sales manager of the Mora Motor Car Co., of Newark, N. Y., is at present in Atlanta, Ga., with the object of establishing an agency for Mora cars there.

Carl A. Broesel, sales manager of the Simplex Automobile Co., of New York, was in St. Louis last week, with the object of establishing an agency for the Simplex car there.

R. G. Stanton, formerly with the H. O. Harrison Co., of Los Angeles, Cal., has been appointed sales manager of the Oldsmobile branch of the Woolwine Motor Car Co., of the same city.

The Pope Manufacturing Co., of Hartford, Conn., inform us that their engineer, L. B. Hubbell, has not resigned, as was stated in our last week's issue. The report originally appeared in a Wilkes-Barre paper.

H. J. Snider, who recently entered the employ of the H. H. Franklin Manufacturing Co. as assistant to one of their office department managers, has been appointed manager of the Albany branch of the Franklin Automobile Co.

C. B. Warren, Pacific Coast representative of the F. B. Stearns Co., Cleveland, Ohio, has resigned his post to enter business for himself in St. Paul, Minn. He will be associated with Burney Bird in handling the Maxwell and several other cars.

Claude E. Cox has resigned his position as engineer and assistant manager of the Interstate Automobile Co., of Anderson, Ind., and has assumed a similar position with the Wilcox Motor Car Co., of Minneapolis.

At a meeting of the board of directors of the Oakland Motor Car Co., Pontiac, Mich., held on September 14, to elect a successor to the late E. M. Murphy, former general manager, L. L. Dunlap, factory manager of the plant, was appointed.

New Agencies.

Atlanta, Ga.—A. J. Haas, Winton.

San José, Cal.—W. T. Warren, Renault.

Philadelphia, Pa.—Frink & Co., Kline Kar.

Hartford, Conn.—Brown, Thomson & Co., Lozier.

Philadelphia, Pa.—Longstreet Motor Car Co., Alco.

Waltham, Mass.—Waltham Automobile Co., Winton Six, Stevens-Duryea, Overland, Marion, Stoddard-Dayton, Winton Model K, Regal and Speedwell.