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...EVERY WEDNESDAY...

Devoted to Motor Interests

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THE HORSELESS AGE

E. P. INGERSOLL, EDITOR AND PUBLISHER.

PUBLICATION OFFICE:
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Telephone: 6203 Cortlandt.
Cable: "Horseless,"
New York and London.
Western Union Code.

ASSOCIATE EDITOR: P. M. HELDT.

ADVERTISING DEPARTMENT:
C. W. BLACKMAN, Manager.
H. W. DOHERTY, New England.
GEO. H. KAUFMAN, Western.

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Importer's Salon Secession.

During the past week it was announced that a number of leading importers of cars had taken space at the Madison Square Garden show, and would therefore not exhibit at the Importers' Salon, as the management of the Madison Square show makes it a strict rule that all exhibitors there must not exhibit at any unsanctioned exhibition. When the Importers' Salon was first announced, we stated in these columns that if a division of exhibits were necessary owing to lack of sufficient floor space in the Madison Square Garden building, one into American and foreign made cars would be the most rational, as it would be productive of the least inconvenience to show visitors. It seems, however, that any division of exhibits must always be more or less detrimental to exhibitors at the smaller show, especially if there is considerable difference in the size of the two.

When the Importers Salon' was first organized it was naturally expected that it would be joined in by all the importing firms, and in early published statements of the probable exhibits about all the foreign cars represented in this country were mentioned. Then the bugaboo of the non-sanctioned show boycott was raised, and importers came to realize that if they patronized the Salon they would be barred from all sanctioned local shows. This rule of the N. A. A .M. against unsanctioned shows has been in force for several years, and the Association can therefore hardly be accused of having made an offensive move against the Salon, the boycott applying, moreover, to all unsanctioned shows, and not especially to that of the importers. This accusation was made, however, by the management of the Salon, who threatened to retaliate by taking into the Salon a select few of American manufacturers, making it an exhibition of quality, and leaving the Madison Square affair an exhibit notable only for its size. Since this retaliatory move, more or less strife has been manifest between the two show managements. In the past, few foreign cars have been exhibited at any but the New York show, but to judge from the agitation among importers over the N. A. A. M. boycott against unsanctioned shows, quite a number of the larger importing firms expected to exhibit at the more important local shows this season, particularly at Boston and Philadelphia.

Meanwhile exporters were not excluded from the Madison Square Garden show, but were even offered floor space in the main hall, between American exhibitors, instead of being confined to the restaurant as last year. The importing firms not directly interested in the organization of the Automobile Salon were therefore given the choice of taking space at the Madison Square Garden show (which will undoubtedly draw a far greater attendance), and enjoying the privilege of exhibiting at any local exhibition they choose, or participating in the special show for foreign cars and being barred from all local sanctioned shows. To partly offset the disadvantage of being barred from local shows, the management of the Importers' Salon has recently rented a hall in Boston for holding a show of imported and other cars. But even this inducement, it seems, was insufficient to bring all importers into the Salon, and space for about a half-dozen leading foreign makes has already been taken at the Madison Square Garden. With this division among importers in show matters, the chances of success of the Salon have unmistakably shrunk.

Classification of Cars.

The deep line of demarkation which until recently separated the cheap and light runabout class from the big, powerful tour-

ing cars has almost entirely disappeared, and cars may now be bought at practically any price from $500 to $5,000. It is obviously desirable to classify in some manner the large variety of styles and forms of construction, but classification, except on the basis of price, is practically impossible. Of course, the number of cylinders generally increases with the price, and sliding gears are more common on the more expensive, and planetary gears on the lower priced cars, but classification on this basis would be very unsatisfactory, as there are too many and important exceptions to these rules. For instance, while the sliding gear transmission generally goes with the more expensive type of car, it is also found, in one instance at least, on a car selling at less than $1,000, while the planetary gear, besides its almost universal use on light runabouts, is used also on several $2,000 cars. Consequently, if any classification is to be attempted, it must be on the basis of price, as is already the practice in touring car competitions both here and abroad.

After due consideration, we have reached the conclusion that the following classification best fits the conditions:

Class I, cars selling at $500—850;

Class II, cars selling at $900—1,350;

Class III, cars selling at $1,500—2,200;

Class IV, cars selling at $2,500 and over.

The first of these classes includes practically all single cylinder runabouts and some single and double cylinder tonneau machines, some as high as 10 nominal horse power. The second class is rather heterogeneous, but will consist chiefly of two-cylinder touring cars, some quite big and powerful, and others of the smaller type but of superior quality. This class will undoubtedly meet the needs of the greatest number of purchasers—all those who require a four-passenger car with a surplus of power, but who are limited to a comparatively low price; also those who want a runabout of superior merit, although few runabouts will exceed $900 in price. The third class will include almost exclusively 4-cylinder touring cars of comparatively light and simple construction, and will also attract a large number of buyers, certainly a far greater percentage of the total than have bought cars within this range of price before. The fourth class, finally, is a class of luxurious touring cars and will be bought by a comparatively small class—those who appreciate high quality of mechanical work and who can afford to pay for it.

As a mere estimate we should say that 20 per cent. of all cars that will be sold next year will be of Class I; 50 per cent. of Class II; 25 per cent. of Class III, and 5 per cent. of Class IV.

It may be observed that Class II has been developed from Class I, as a result of the demand of users of Class I machines for something better—i. e., either more powerful, more roomy and comfortable, or of better mechanical workmanship. Similarly, Class III has been developed from Class IV to meet the need of lower prices in order to extend the market for this general type of car. Thus the former large gap between big touring cars and small runabouts has been entirely filled up, and practically every purse, as well as every taste, can now be suited.

Three-Point Suspension.

Of late the three-point support for engines and gear cases on running gear frames seems to be considerably gaining in favor among designers. Patents on particular arrangements have recently been issued in this country and in England, and at least one prominent French car is known to embody this feature. When a front vertical engine is thus supported, its crank case is formed with two sidewardly extending arms fastened to the main frame bars, and with a bracket near the front crank bearing, which rests on the front cross member of the frame. On a gear case the arrangement is usually reversed; that is, the two sidewardly extending arms are at the front end of the case, and the central bracket resting on a frame cross member is at the rear.

The general advantage of a three-point support over the usual four-point support is that it reduces the strains on the supporting arm or brackets of the casing, and on the casings themselves, and consequently admits of a considerable saving in weight. The reduction of these strains is particularly important, as the parts sustaining them are nearly always of aluminum, a metal of only moderate tenacity.

The advantage of a three-point support is perhaps best illustrated by the example of a three-legged stool. Such a stool will stand firmly on almost any ground, however uneven, while a four-legged stool with legs of equal length will be shaky on any but an even floor. During use an automobile frame is wrenched out of shape more or less, and may then be compared to an uneven floor on which a four-legged stool will not stand firmly; that is to say, if all the arms of the casing were not bolted firmly to the frame, the frame would sag away from one or two of them. As things are, it is impossible for the arms to separate from the frame, but instead very severe strains are set up in the arms, and if they are not heavily ribbed they may break—an accident not at all uncommon on high-powered cars.

With a three-point support, however, a machinery case unfastened would always rest on all three arms or brackets, however much the frame might be twisted out of shape, and when the brackets are bolted down the only strain on them is that due to their square seat on the frame, which can be made quite small by suitably forming the bearing surfaces of the supports.

Of course, with three-point supports the engine and transmission will get out of line easier, as the casings do not add to the stiffness of the frame, but this can easily be provided for by introducing Oldham couplings between engine and gear box, and in the countershaft.

Anti-Friction Bearings for Transmission Shafts.

The reduction of frictional losses in speed changing gears, and the improvement of their efficiencies of transmission, are matters which rightly demand serious attention upon the part of designers, as a reduction in the rate of wear of the gear shafts and bearings and the realization of a greater proportion of the engine power at the driving wheels results from any improvement in this direction.

Although ball and roller bearings have been used from the earliest inception of the automobile art in this country in wheels and axles, these anti-friction bearings are just beginning to be applied to the gear shafts of a very few high grade American machines. Certain makers of imported cars of the highest repute have, for some time, employed ball bearings upon their gear shafts with most flattering results, and it may be regarded as a good sign that the practice is beginning to become current in this country. A ball bearing when employed upon a driving axle is called upon to withstand not only the pressure corresponding to the tractive effort of the vehicle wheels, but also the crushing stresses

due to the load carried, which latter partakes somewhat of the severe character of a suddenly applied force when the car is operating at speed over rough roads. Such a bearing, on the other hand, when employed upon a gear shaft may operate under very light pressure, as, for instance, when the power is transmitted by direct drive from the engine to the axle through universal joints; or it may be subjected to moderate pressure, when the power is transmitted through one or more intermediate gear shafts and not directly by a through drive but under no circumstances do the bearing pressures of the gear shafts compare in magnitude or fluctuations of their intensity with axle pressure.

It can, therefore, hardly be doubted that, if ball bearings are found to be a safe proposition upon driving axles, they will prove so in a more eminent degree upon change speed and transmission shafts. Indeed, it may be considered a little remarkable that their general use for the latter purpose has not become general long since, as a more efficient substitute for the bronze bushed, plain bearing so commonly used. The latter type soon loses its accuracy of fit through wear, and cannot, as a rule, be adjusted, but must be fitted with new bushings from time to time. The ball bearing may readily be adjusted, although it very seldom requires it, and as when used upon change speed shafts it would be plentifully supplied with lubricant, it should operate under very favorable conditions and effect a very noticeable saving of power over plain bearings, especially in cases of considerable bearing pressures.

Direct Drive Not Adapted for Gasoline Business Wagons.

Most of the commercial vehicles which have lately been adopted for delivery service or for light trucking have been produced by adapting bodies suited to business purposes to chasses designed for pleasure vehicles. The running gears, speed changing and transmission devices thus made use of for commercial service are those which were intended for the speeds demanded in runabout or touring service, and when these chasses have been fitted with delivery bodies or truck platforms, the driving wheels have generally been geared down considerably, or even to the extreme limits of which the designs were susceptible, in an attempt to meet the requirements of low speed, heavy load service under urban conditions.

Horizontal engines, two-speed planetary speed-changing devices with direct drive upon the high speed and single chain transmission to live axles have characterized the popular makes of business wagons of this class, and although they have in many instances been geared down to the limit, practice seems to show that they are too fast upon the direct drive to suit the heavier grade of service, at least, to which they are applied, as their maximum speeds are far in excess of the legal limit, and their load-carrying ability much less than it would necessarily be with a diminished speed capability.

It is hardly practicable to secure a greater reduction between the engine shaft and the rear axle than one to four, owing to limits which expediency sets to the sizes of the front and rear sprockets, as the minimum number of teeth on the forward one cannot well be less than 10 and the maximum number of teeth of the rear sprocket cannot safely exceed 40, as this allows but 6½ inches road clearance when used with a 32-inch wheel, and assuming that a heavy chain of large pitch is employed.

If the engine of such a vehicle runs up to 850 revolutions per minute, when delivering its full power, as it may reasonably be expected to do, the vehicle speed will be twenty miles per hour if equipped with 32-inch wheels—a rate which it would seem ought not to be allowed to the operator of a delivery wagon intended for service on city streets and carrying a heavy load. If the full power of such an engine as here assumed was so arranged as to drive the car at a maximum speed of ten or twelve miles an hour, it would prove sufficient to draw more than twice the load that it would handle under the conditions above specified.

It would therefore seem that the direct drive from a planetary change speed gear through a single chain is not applicable, as a general method, to city delivery work which contemplates the moving of loads of considerable magnitude, on account of its furnishing too slight a reduction of gear between the engine and drive wheels.

The danger of accident to vehicles, the operation of which have high speeds at their command; the annoyance of possible conflicts with the speed laws, and the realization which will probably come to the owners of such cars concerning the expensiveness of high speeds over rough pavements, are considerations which may be expected to lead to the gearing down of business vehicles to maximum speeds much lower than those of which they are now ordinarily capable.

It seems rather evident that a speed reduction other than that obtainable through sprocket ratio must be supplied to these vehicles. This may be obtained by the use of a change speed gear of the Panhard type, in which one pair of gears, possessing any desired reduction ratio, is always interposed between the engine and the driving sprocket. By this means, the speed of the countershaft carrying the two driving sprockets giving motion to the rear wheels, would be so reduced as to render the rest of the speed reduction well within the capabilities of the sprocket ratio. There are other methods, no doubt, by means of which the desired speed reduction could be obtained, but it can hardly be doubted that a double reduction method of some sort will have to be resorted to as a substitute for the present method upon most vehicles of this class.

Reimported Automobiles Dutiable.

In the matter of the protest of J. T. Millhouse, Board No. 3 of the United States General Appraiser has decided that the automobile concerned, which is valued at $2,000 and assessed at 45 per cent. ad valorem, is dutiable. The protest against duty charges was based upon sections 483 and 504 of the Tariff Act and upon the claim that the automobile was imported in February, 1902; exported in August, 1903, and reimported in May, 1904.

In the opinion of the Board, which was written by Judge Somerville, there is no evidence that the car is of American manufacture, and while it might, under the law, be regarded as a household effect, it had not been in use abroad for one year, the period required to make its entry free of duty possible. It was held that the length of time during which it had been used by the present owner in the United States had no bearing on the case. The evidence showed, the opinion states, that repairs, amounting to $500 had been made to it while abroad, and as section 483 expressly provides that exemption from duty can only be extended to goods not advanced in value by any means while abroad, this fact alone would be sufficient to prevent its entry free of duty. It was further pointed out that the federal courts had repeatedly ruled that the reimportation of an article is a new importation and duty can be assessed accordingly. The protest was overruled.

The Use of Electrical Measuring Instruments with Gasoline Cars.

By Albert L. Clough.

Unless a gasoline automobile be equipped with a trustworthy supply of electrical energy from primary or storage batteries or from a good dynamo or magneto, its ignition will prove unreliable or even ineffective, and its performance will be entirely discreditable.

A general recognition of this fact has aroused a general desire among automobile users for handy means of testing their batteries, and has resulted in the placing upon the market of quite a variety of electrical instruments designed to be conveniently used for this purpose. These instruments now form a part of the equipment of a great many progressive motorists, but there may be some readers of THE HORSELESS AGE who do not understand the advantages in which their use results, or just how to use them.

VOLTS AND AMPERES.

A battery or other source of electricity possesses a certain tendency to cause electricity to flow—that is, an electrical pressure. This may be likened to the pressure or "head" of water contained in an elevated tank or reservoir. This electrical pressure which the battery possesses causes no electricity to flow so long as no path is provided along which the current can travel; that is, so long as no wire or other conductor connects the carbon and zinc poles of the battery between which the electrical pressure, due to the chemicals of the battery, is acting. Water pressure does not act to produce a flow of the liquid, until a faucet is opened, and a battery cell which is on "open circuit," without a conducting path of wire or other apparatus, from one pole to the other, may be likened to a water pipe with its faucets closed. When, however, the zinc and carbon poles of a battery are connected by a continuous conductor, such as wire or other metallic bodies, electricity passes through this "closed circuit" from one pole of the battery to the other, and the strength of the current or the rate of supply of electricity is proportional to the freedom with which the wire and other parts of the closed circuit will allow it to pass, or, in other words, the current is proportional to the "smallness" of the resistance offered by the wire, the battery cell and other portions of the closed circuit. In a similar manner, the rate of flow of water under pressure is proportional to the freedom with which it can pass through faucets and pipes and to the lack of frictional resistances due to small or rusty pipes and nearly closed faucets. The water pressure, which would be measured in pounds per square inch, corresponds roughly to the electrical pressure in volts, and the current of water which might be measured in gallons per minute, may be regarded as analogous to the electric current which is measured in amperes. The instrument which measures the electrical pressure is the voltmeter, and that which shows the volume of the current or the rate of flow of electricity is called the amperemeter or ammeter. When the two instruments are combined in a single case, the combination is called a volt-ammeter.

PRINCIPLE OF ACTION OF INSTRUMENTS.

When an electric current is passed through a wire wound about a piece of soft iron this iron becomes a magnet, of a strength nearly proportional to the current passing about it, and this magnet may be made to attract against the action of a spring, a small pivoted piece of soft iron which carries a pointer moving over a scale and graduated in divisions which may be so proportioned as to represent amperes flowing in the wire, or the pressure in volts which are applied to it. Or, as is more often the case, the coil of wire may be used without its soft iron core and a small pivoted piece of soft iron so arranged as to be drawn into the wire coil by the magnetism due to the current to be measured against the pull of a spring. The moving soft iron portion is, of course, provided with a pointer moving over a graduated scale. An instrument of this construction is said to be of the solenoid type, and the greater part of the packet instruments provided for automobilists are of this kind.

DIFFERENCE BETWEEN AMMETER AND VOLTMETER.

The coil of the ammeter consists of a few turns of very coarse wire and offers practically no resistance to the passage of current, so that when the instrument is connected by means of good conducting wires to the poles of a battery cell, the current which flows is practically the greatest that the cell is capable of furnishing, and may be regarded as its maximum current on "short circuit," that is, through a circuit of practically no resistance except that due to the materials of which the cell is composed.

On the other hand, the coil of the voltmeter is composed of a large number of turns of very fine wire and, when connected to the poles of a battery cell, offers so great a resistance or obstruction to the electrical pressure that only a very minute current flows. The current which does flow is, however, in proportion to the electrical pressure or voltage, as is also the magnetic attraction of the coil within the instrument, which thus can be graduated to read in volts.

COMBINATION INSTRUMENTS.

Within the volt-ammeter there are two coils which act upon the same pivoted armature of soft iron—an ammeter coil of a few coarse turns, and a voltmeter coil of many fine turns. These two coils are usually connected together at one end to a common terminal and their free ends brought out to separate terminals. Most of these measuring instruments intended for automobile use are made in watch-case form of a size convenient for the pocket, and while by no means to be regarded as instruments of precision, are, if carefully used, sufficiently accurate for the rough measurements required, and, if their readings cannot always be regarded as of absolute value, they are still of value for purposes of comparison. The ammeters vary in range from 0 to 15 amperes to 0 to 30 amperes with 1 ampere scale divisions; and the voltmeters from 0 to 3 volts to 0 to 10 volts. A volt-ammeter of this class may have ranges of 0 to 20 amperes and 0 to 5 volts.

CONNECTIONS OF INSTRUMENTS.

The ammeters require to be connected to the circuit by a conductor of good electrical conductivity, as a considerable current is to pass, and these instruments are generally provided with a permanently attached flexible, insulated cord of high carrying capacity terminating in a metallic connection pin which is touched to one pole of the cell or circuit which is to be tested. The other terminal of the instrument is frequently a metal pin or spur which protrudes from the case and to which one end of the ammeter coil is connected, its other end going to the flexible conductor. When the tip of the flexible cord and the spur on the instrument case are in simultaneous contact with the two poles of the battery cell or circuit, a reading in amperes should be obtained.

As the pocket voltmeter passes so slight a current, no special precautions need be taken to provide it with leads of high conductivity, and it is usually fitted only with screw binding posts for the reception of ordinary wires.

The volt-ammeter usually carries a flexible, highly conducting cord with metal tip terminal and the case bears two spurs which correspond respectively to the ampereage and voltage coils; or it may be provided with two flexible cords normally connecting the voltage coil and a push button which gives connection to the ampere coil. A single scale with two sets of graduations, corresponding to volts and amperes, is employed upon this instrument. With meters of the solenoid type, it makes no difference which of the two terminals—the cord or the spur—is connected to the carbon pole of the cell and which to the zinc, but with instruments (used to a small extent) which employ a permanent magnet in their construction, the proper terminals have to be connected to the carbon and to the zinc respectively, in order to secure a reading. These instruments, if they are to give reliable service, must be carefully handled and not placed loosely in the tool box to be battered by wrenches and other heavy objects.

AMMETER BEST FOR DRY BATTERIES.

Of the two instruments—the voltmeter and the ammeter—the latter is by far the

more useful, and if only one is bought, the ammeter should be the one selected. The volt-ammeter, of course, makes a very useful combination, but the voltmeter alone is not of very great service to the user of primary batteries.

TESTING CELLS AT PURCHASE.

One of the first uses to which the automobilist is likely to put his instruments is in the selection of dry cells from the electrical supply dealer. The ammeter will assist him in selecting cells from the dealer's stock which are in good condition; *i.e.* not deteriorated by age, weakened by accidental short-circuting or previous use, or rendered useless by careless handling. A 2½-inch by 6-inch dry cell ought to show about 12 amperes on the ammeter during a momentary test. This figure is by no means exact, as cells of this size are intentionally made to have different resistances for use under different circumstances, but a cell of this size which shows less than ten amperes should hardly be accepted for automobile work, while as high amperages as 14 or 16 are not unattainable with cells of this size. The larger size of dry cell (3¾ x 8 inches) should give an amperage in the neighborhood of twenty. A test of this sort is easily made. A number of cells may be placed upon the counter, the ammeter held in one hand and the tip of the flexible cord in the other and the cord tip and the spur or projecting pin of the instrument simultaneously brought into firm contact with bright portions of the zinc and carbon connections of each cell, and the instrument read just as soon as the needle is substantially at rest. The cells which show the highest reading will naturally be chosen. If a voltmeter test be made of a number of cells taken at random, a good instrument will show each of them to have an electrical pressure of very nearly 1.5 volts, and this figure is very little reduced, although the cell may be nearly exhausted, when it is not likely to test less than 1.2 volts. A cell may, under certain conditions, test 1.5 volts and still be incapable of furnishing a current of any practical volume, and it is thus evident that a voltmeter test is no safe criterion to apply to the acceptance or rejection of dry cells. What the automobilist most wishes to be assured of, is whether a cell will actually deliver a good volume of current, and of this an ammeter test assures him, but a cell which might test 1.5 volts by the voltmeter might contain within it a bad connection of the binding post to the zinc or carbon, or perchance the chemicals in the cell might have nearly dried out, so as to offer a great or nearly total obstruction to the flow of current. In either case the usefulness of the cell would be practically nil, notwithstanding the electrical pressure which actually existed within it.

VOLTMETER FOR STORAGE BATTERIES.

The case of the automobile user who employs storage cells for ignition is entirely different. The ammeter is of practically no value to him, as a storage cell will deliver a larger current than the instrument will measure, and these pocket instruments should not be connected to accumulators, for more than one reason. The condition of a storage cell is determined by use of the voltmeter. When a cell has been used until its voltage is reduced to about 1.7 volts, it should be recharged until it shows about 2.3 volts or slightly over. If these figures are not found correct for some particular type of accumulator, the user will soon determine by experience what are the correct ones in his particular case.

TESTS OF INDIVIDUAL CELLS.

Another use which may be made of the ammeter is in the occasional testing of the individual cells after they are in service in the battery of the machine. This test is made exactly as is the test of separate cells at the time they are bought. After considerable use, the cells will be found to show a materially lessened ampereage under test, and the question arises at what point of the progressive diminution of current output the cell should be discarded. This will depend somewhat upon the current which the coil requires for its successful operation and upon the condition of the reserve battery, which must be relied upon in the event of the failure of the one under consideration.

If the spare battery is in first-rate condition, one may be justified in running the other battery nearer to the point of exhaustion than under other circumstances. In a battery which is to be kept in thoroughly reliable condition, one may perhaps not be far wrong in discarding a cell when its ampereage has fallen to about 5 amperes, although this figure is by no means absolute. No doubt, cells exhausted to this point, are capable of some more service, especially if they are used in parallel groups, as then they are called upon to deliver only one-half of the current which would be demanded when used in a single series.

PARALLELING BATTERIES.

To put the two sets in parallel, it is only necessary to connect by a short wire the two battery binding posts from which the wires run to the switch, when the two sets of cells are in parallel, no matter upon which switch point the switch lever is placed. Half the current passing to the coil flows from each set of cells, thus reducing the work required of each.

The chemicals contained in dry cells are designed to cause reactions which tend toward the maintenance of a continual supply of electricity independent of the amount which is withdrawn, but as a matter of fact, if a large current is demanded for any length of time, or if a current of any considerable volume is supplied nearly continuously for a long time, the chemical reactions prove inadequate and the current flowing becomes weak or nearly ceases. This partial or total failure of the cell as a source of electricity is termed polarization, and it may be but a temporary condition which is removed after the cells have had a period of rest.

After a cell has been used considerably, it is more prone to polarize, and will become polarized after a shorter period of use, or upon the withdrawal of a smaller amount of electrical energy, than when the cell was fresh.

PECULIARITIES OF DRY CELLS.

Sometimes, although a cell which has been inactive may show a good ampereage when tested, after it has been used for a short time the current will be found to have diminished to a very small volume. A cell that is in this condition is very untrustworthy for any sort of severe service. Some idea as to whether the battery on a car is subject to excessive polarization may be obtained by taking an ampere reading from each cell both before and after a trip of considerable length. Some cells will very likely be found weaker than others, upon the final test, and if any are to be discarded these should be the ones.

CURRENT CONSUMPTION OF COILS.

Just how low the current should be allowed to run in the primary circuit of the coil depends too much on circumstances to make an exact answer possible. Under ordinary conditions it may be considered inadvisable to allow it to fall below, say, 6 amperes. The volume of this current is readily determined by means of the ammeter, as follows: Place the engine upon the "center," so that the timer closes the circuit, and, in case the coil is of the vibrator type, close the switch on the battery which is to be tested; then touch the respective terminals of the ammeter firmly, one to the support of the vibrator and the other to the support which carries the vibrator contact screw; this will cut out the vibrator and give a reading for the full primary current. If the coil has no vibrator, set the timer "on center," leave the switch open and touch the terminals of the ammeter respectively to the switch lever (or common point of the switch) and the battery point corresponding to the set to be tested.

The ammeter may conveniently be used for locating accidental breaks in the continuity of the primary circuit. Some of the most common forms in which this source of trouble manifests itself are enumerated in an article entitled "Locating and Remedying Spark Troubles" which appeared in these columns on September 14th and September 21st of the current year.

If the primary circuit is closed, except at the accidental break, the ammeter will show the flow of a current when its terminals are simultaneously connected to points in the circuit which include the break, and when an indication of the instrument is obtained, one may know that the defect has been located, at least approximately.

Transmission Gears—Safe Working Stress.

By Thos. J. Fay, E.E.

As the pitch line velocity of a gear increases, the safe working stress, in pounds per square inch, decreases. It is reasonable to assume that, for speeds less than 100 feet per minute, the effect of speed is scarcely worth noting, but as the speed is increased above this point, all authorities agree that the value of the metal decreases quite rapidly and must be reckoned with, else the result will be *"pour passer le temps."* If we assume that 40 to 50 carbon steel, hammered and hardened, has a safe tensile strength of 40,000 pounds per square inch quiescent load, then, it is believed, the effect of speed will be about as indicated by the following formula, viz.:

$$S.=\frac{40000}{\sqrt{1+0.50\,v}}=\text{Equivalent Safe Stress.}$$

in which V is the pitch line velocity in feet per minute. This formula is a modification of the formula by Prof. Harkness. The tabular valves obtained by means of this formula are as follows:

PITCH-LINE VELOCITY IN FEET PER MINUTE	EQUIVALENT SAFE WORKING STRESS IN POUNDS PER SQ. IN.
100	33,058
200	27,698
300	25,316
400	22,988
500	21,333
600	20,000
700	18,778
800	17,857
900	17,021
1,000	16,260

NOTE.—In motor car work the pitch line velocity should not exceed 1,000 feet per minute in any case.

Using these values, we may note, for illustration, that a low speed pinion on the driving shaft of a motor car will stand a load as follows: Assuming 18 teeth 5 pitch, the pitch diameter is $18/5=3.6$ inches and the pitch circle is $\frac{3.6\times 3.1416}{12}=0.942$ foot in circumference, hence the pitch line velocity is 942 feet per minute for 1,000 revolutions per minute of the driving shaft. Hence the safe working stress is

$$1+\frac{4000}{\sqrt{0.5\times 942}}=16666$$

in pounds per square inch

Having thus established the safe working stress in the metal under consideration, we may now proceed with the discussion of the utilization of the same: Slater Lewis states that $W=S\,P\,F\,Y=$ safe pull in pounds, in which S is the safe working stress in pounds per square inch; P, the circular pitch of gear teeth; F, face of gear in inches, and Y, a factor depending upon the obliquity and number of teeth in the gear. Lewis deduced constants representing these Y values, and used them in connection with his formula. The following are revised constants—by the writer—taking into account the effect of hardening, thus making it possible to apply this excellent method in connection with motor car transmission gears, the constants of Lewis being available for use only when reference is had to cast iron and steel gears not hardened, hence not so capable as hardened gears.

No. of Teeth.	Y.	No. of Teeth.	Y.
14	0.090	29	0.1273
15	0.093	30	0.128
16	0.096	32	0.129
17	0.100	34	0.130
18	0.1035	36	0.132
19	0.019	38	0.134
20	0.113	40	0.135
21	0.115	45	0.138
22	0.1165	50	0.140
23	0.118	60	0.1425
24	0.119	75	0.145
25	0.120	100	0.1475
26	0.1225	125	0.1487
27	0.125	150	0.150
28	0.1265		

NOTE.—This table is limited in its application to hammered and hardened, 40 to 50 carbon steel, the same to be, in ever respect, the best obtainable.

Having thus set down a method by which the ability of a gear may be estimated, a concrete illustration of the method may not be out of place. Taking again the 18-tooth 5 diametral pitch pinion, at 1,000 revolutions per minute, we have:

$$W=S\,P\,F\,Y=\text{pull in pounds}$$
$$=16666\times .628\times 1.25\times .1035$$
$$=1355\text{ lbs.},$$

in which the face "F" is taken as double the circular pitch, which is good practice in motor car work.

Knowing the pull in pounds, we may determine the horsepower as follows:

$$\text{H. P.}=\frac{2\,\pi\,R\,S\,W.}{33000}$$

in which R is the pitch line radius of the gear in feet; S the angular velocity of the gear in revolutions per minute; W the pull in pounds. Hence for the pinion in question:

$$\text{H. P.}=\frac{6.28\times 0.15\times 1000\times 1355}{33000}=38.6\text{ H. P.}$$

If, however, it is desired to know the pull W, instead of the horsepower ability of a given gear, the following method will suffice:

$$P.=\frac{\text{H. P.}\times 33000}{2\,\pi\,S}=\text{Torque-pull in pounds at one foot radius,}$$

and:

$$\frac{P}{R}=W.$$

Hence for a motor of, say, 38.6 horsepower (actual) rating, the value of W of an 18-tooth 5-pitch, 1¼-inch face pinion would be adequate, because for this motor

$$P.=\frac{38.6\times 33000}{6.28\times 100}=202.\text{ T.-pull in pounds at one foot radius,}$$

and:

$$\frac{P}{R}=\frac{202.8}{0.15}=1355.$$

$=W$ of the required pinion, which corresponds to the ability of the 18-tooth pinion previously considered. The value 0.15 is the pitch line radius in feet of that pinion.

As a general rule, the first speed pinion is likely to be overworked, if anything, because of its low diameter, whereas, on the other hand, the remaining gears are usually large enough in diameter to limit the pull upon them to a safe point. The practice of making the pinion and its meshing gear of a coarser pitch and wider face than the rest of the gears is with a view to overcoming this trouble.

NOTE.—This article was received at our office before the publication of our recent article on change gear design.—Ed.

Shop Testing of Motors.

The subject of motor testing has repeatedly come up for discussion in these pages, but always with reference to some particular method. It is the purpose of this article to deal with the subject in a more general way, in order to show the requirements and limitations of such work, and to briefly outline the various methods in most common use.

The specific objects of commercial motor testing are to determine whether the moving parts are properly seated in their bearings; to find the conditions under which the best results are to be expected, the range through which successful operation may be obtained, and the power which the machine is capable of developing. To do this, the useful work is transmitted to some form of mechanism by which it is absorbed, and which furnishes at the same time means of calculating its value. Such an apparatus is called an absorption dynamometer. Its different forms will be taken up in detail presently.

In commercial motor testing—by which is meant a manufacturer's tests of a series of duplicate engines—the process may either be carried out independently in each case, or one particular motor may be used as a standard, and the others merely compared to that. In other words, if one engine has been accurately tested in every detail, and the results have been reduced to proper units, so that an absolute rating is obtained, other engines which are precisely similar to it in every respect, may be tested with sufficient accuracy for this purpose by a comparison of data step by step, with that of the primary test.

The horse-power furnishes an absolutely general, albeit much abused method of comparing engines of any and all types. But if for a limited group, a single type of engine, an equally satisfactory means of comparison be obtained by quicker and less laborious methods, the horse-power as a unit may be neglected for the time being.

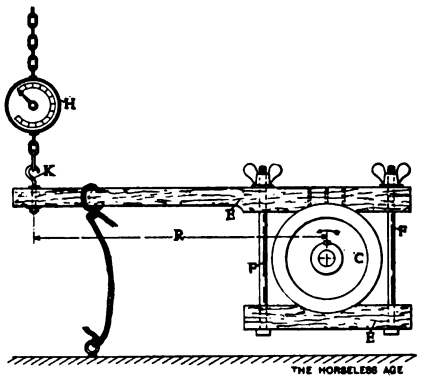
A new engine, before it is ready to undergo a power test, must pass through a process to get the moving parts into proper working condition. This process may last from a couple of days to a week or more, according to the degree of closeness with which it has been fitted. It is first connected to be run by a belt. In this way the bearings may become seated without the danger of overheating, which would exist if its own power were used at first. After a suitable length of time, connections are made, and the motor is turned by its own effort. After several hours of running in this way, some sort of load is applied to steady its action. This may be either some form of friction brake, a screw-propeller revolving in a tank of water, or the power may be made use of in "running in" other "green" engines. When it has at length begun to run with considerable freedom, and to act normally, the real test is applied. If, then, it fails to come up to the required standard, the load is again put on, and it is run several hours longer in this way, under the assumption that the unsatisfactory result is due to friction.

In the test itself, three things are to be accomplished—the setting of the carburetor and timing of the ignition for maximum power and speed; the adjustment of the dynamometer to impose a steady load, increasing by uniform increments, and the observation of the factors of speed and load from which definite results are to be calculated.

The matter of carburetor adjustment must vary somewhat with the form used. But with any type having a throttle which does not alter the proportions of the gas, it is well to run the engine under a medium load at about half throttle with the spark set to keep the speed about normal, and to then adjust the gas and air for maximum speed. If the carburetor does not control the mixture uniformly, the adjustment must be made with the throttle wide open, the spark set partly back, and a partial load placed on the engine to prevent its racing.

In adjusting the dynamometer for the different loads, it is essential to allow a proper interval after each change has been made, to permit conditions to become settled, for the great amount of energy stored in the flywheel of a gas engine makes it capable of carrying considerable overload for a few seconds. Because of this and certain other considerations dependent of the type of dynamometer used, at least half a minute, and preferably a much longer interval, should be allowed to pass before taking any readings.

Tabulated blanks should be prepared before each test, and the data entered according to some fixed system, so that no error can arise from a misunderstanding of results. Results should always be checked up in a general way as fast as they are obtained, by comparison with the primary test, referred to above, or with the average of values already taken from other tests. Unusual results may come from one of three principal causes. These are, error in observation, error in the instruments, and fault of some sort in the engine. Weather conditions also affect the results to a certain extent. To correct for errors in reading the instruments, at least three sets of observations should be taken where any degree of accuracy is desired. By frequent calibration of the instruments and the use of corrections for readings obtained from them, error from the second cause may be avoided. If the questionable data be traced to the engine itself, it will usually be found to extend over several observations and will show a tendency one way or another, which may be traced to improper adjustment somewhere, as to the engine being yet a little stiff.



SKETCH OF PRONG BRAKE.

Absorption dynamometers may be divided into two classes. those employing mechanical means, and those which make use of electricity for using and measuring the power. The most common and simplest of the mechanical forms is known as the Prony brake. This dynamometer depends on the friction of a brake upon a wheel and the measurement of the effort necessary to keep it from revolving with the wheel. A good form is shown in Fig. 1. The brake consists of two pieces of oak scantling, E E, shaped to fit over the rim of the brake-wheel, C, which is either put on in place of the flywheel or clamped to it directly. The blocks are held in place by two long bolts, F F, which extend between them on either side of the wheel. The tension of the brake is regulated by wing nuts working on these bolts. The load is carried by an ordinary spring scale H. Three or four holes three-sixteenths of an inch in diameter are drilled in the beam to permit of oiling the pulley from time to time. A rope should be fastened loosely to the bar and passed to a ring in the floor, so that the brake will not fly back should the engine "kick." Provision for cooling the brake is made by casting the rim of the wheel in the form of a trough, so that it may be kept partly filled with water while running. Circulation of the cooling water is effected by piping.

Before any readings are taken, the scale is balanced with the engine at a standstill. This gives the unbalanced weight of the apparatus, and is a correction which should be deducted from all subsequent values obtained. The horse-power absorbed by the brake is obtained from the formula:

$$(1) \qquad \text{H. P.} = \frac{2\,\pi\,r\,N\,W}{33{,}000}$$

Where r = length of beam from center of wheel to point of support on scale, in feet.
N = number of revolutions per minute.
W = corrected scale reading in pounds.

The rope brake used in some factories, is a variation of the form just described. It strands of hemp rope, wrapped around the brake-wheel, and kept in position by the flanged blocks. One end of the rope is suspended from above by a spring balance, and a variable weight is hung from the other.

The horse-power formula is similar to that just given, except that the load, W, is obtained by deducting the average pull on the spring balance, from the total suspended weight. Then,

$$(2) \qquad \text{H. P.} = \frac{2\,\pi\,r\,N\,(W^1 - w)}{33{,}000}$$

Where r = radius of the brake-wheel plus the radius of the rope taken in feet.
N = number of revolutions per minute.
W^1 = suspended weight in lbs.
w = average balance reading.

For a more complete description of the rope brake, see an account of the Pierce dynamometer in Vol. XIII., page 195, of this paper.

A very necessary precaution to be observed in the use of the Prony brake in any of its several forms, is to maintain as nearly constant conditions of lubrication and temperature as is possible at all times. To this end, plenty of oil should be used on the wheel, and the flow of cooling water should be so regulated as to keep that in the wheel just about at the boiling point.

Another type of dynamometer, simple in application, but dependent on rather more

complex principles, is the fan or blower. An ordinary blower may be used, and the load varied by changing the opening of the inlet and outlet gates. The action of a fan is very stable, and it requires no means of cooling, but it has the disadvantage that the actual values of the load must ordinarily be obtained by calibration, as the accurate calculation of the power absorbed is a rather difficult problem.

A very simple application of the fan principle was described in this paper some time ago (Vol. XII., page 211). It is known as Renard's fan dynamometer. The device consists of a light wooden beam bolted at its center to the end of a horizontal shaft which is mounted on rigid bearings and so arranged that it may be coupled to the crank shaft of the engine. Two aluminum plates of disk form are bolted to the beam at equal distances from the center, to act as fan blades. Holes are bored in the beam at equal intervals to permit of varied adjustments being made. This form recommends itself for its structural and operative simplicity. The only factor to be observed during a test is the speed, as the load is a direct function of the angular velocity of the fan. Hence all values may be obtained from the speed alone, either by calibration or by calculation. Several dynamometers of this type have recently been installed in the laboratory of the Automobile Club of France, one of which is shown herewith.

A still different method of absorbing work is to use a screw-propeller running in a tank of water. This gives satisfactory results in some respects, but is open to the same objection as the blower fan in that it requires calibration.

The electric dynamo furnishes perhaps the most satisfactory method of absorbing the output of an engine and measuring it accurately at the same time. The ordinary way is to drive the dynamo directly by the engine, and to use current generated either for useful work, or to absorb it in some form of variable resistance. For accurate results, the dynamo efficiency must be taken into account. This is obtained either from a calibration curve, or by calculating it from data observed during the test. But, as has already been shown, for purposes of comparison with other tests of a similar nature, the absolute value is not essential, and hence, in ordinary work the efficiency factor may be disregarded. The formula for horse-power obtained in this way is:

$$\text{H.P.} = \frac{CE}{746}$$

where C = current in amperes; E = pressure in volts.

The reading may be simplified by using a horse-power-meter, which is merely a watt-meter graduated to read in horse-powers. For the formula for dynamo efficiency and a complete discussion of the subject, see an article in THE HORSELESS AGE, Vol. XIII., page 577.

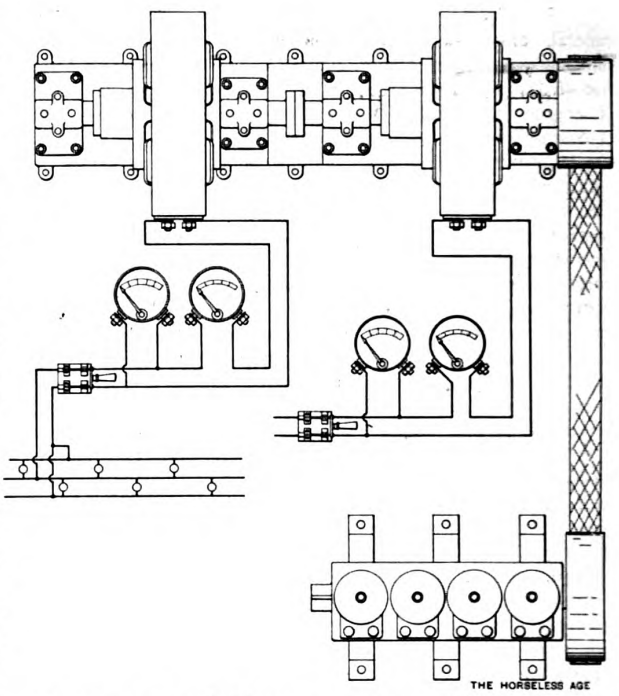
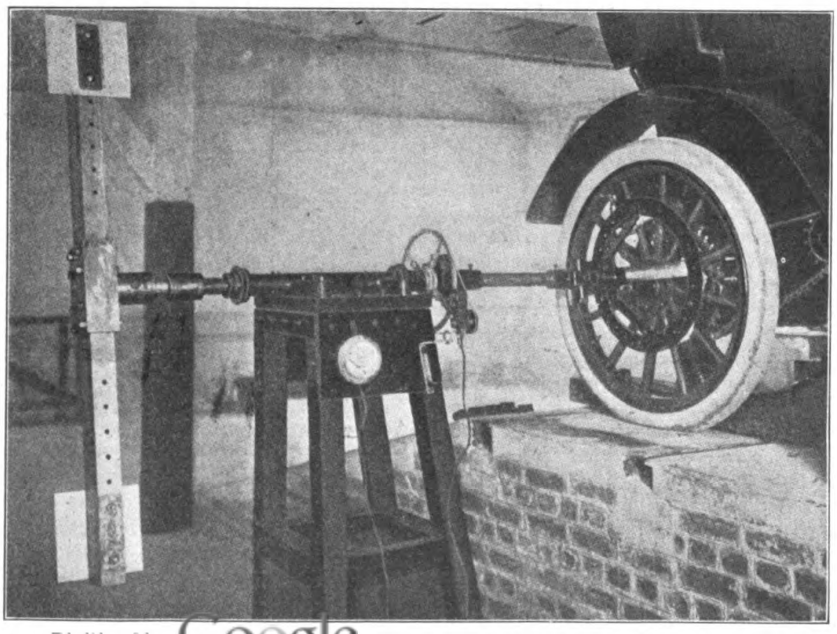


DIAGRAM OF BALL'S METHOD OF GASOLENE MOTOR TESTING.

Another electrical method requiring more apparatus, but entirely satisfactory in that the generator efficiency may be neglected without affecting the result to any extent, was described by F. H. Ball, in a communication published in the issue of July 6, of this year.

He proposes to use a motor-dynamo, or a dynamo driven by a motor, and to load the dynamo by resistance. The motor is so placed that it may, at will, be belted to the gas engine under test. In starting a run, the motor is put in operation, and the dynamo loaded, presumably, nearly to its full capacity. When they have been in operation long enough for conditions to become constant, readings of the load on the generator and the current which the motor is taking from the line are observed. Then the motor is belted to the gas engine and when the plant has been set in motion by the motor, the gas engine is permitted to ignite and take up its share of the load. The instruments showing the consumption of the motor will now give different readings, and the difference of the old and new observations will obviously be the precise measure of the output of the gas engine. Besides the advantage of reading the power directly, this method is advantageous in that the motor has a steadying effect on the engine, and prevents the abrupt variations in speed which characterize the gas engine under test, which makes the reading of data more easy on that account. The drawback to this method is that several sets of pulleys must be provided for connecting the engine and motor, in order to run the engine at different speeds. A diagram showing the arrangement of such an apparatus is given herewith.



RENARD FAN DYNAMOMETER IN TESTING LABORATORY OF THE A. C. OF FRANCE.

In some cases, manufacturers test their motors after they are mounted in the car, either by jacking the machine up and driving some form of dynamometer from one of the driving-wheels, or by placing it on a roller dynamometer and "braking" the rollers.

These methods are really a combination of motor testing and vehicle testing, and while useful for light cars of the runabout order, where a saving of time and labor is of greater importance than accuracy of work, in the case of larger machines, it would hardly be feasible, for the larger engines are so nicely fitted, and require such close watching during the running in, that all parts must be thoroughly accessible at all times, and hence the work is best done on a regular stand.

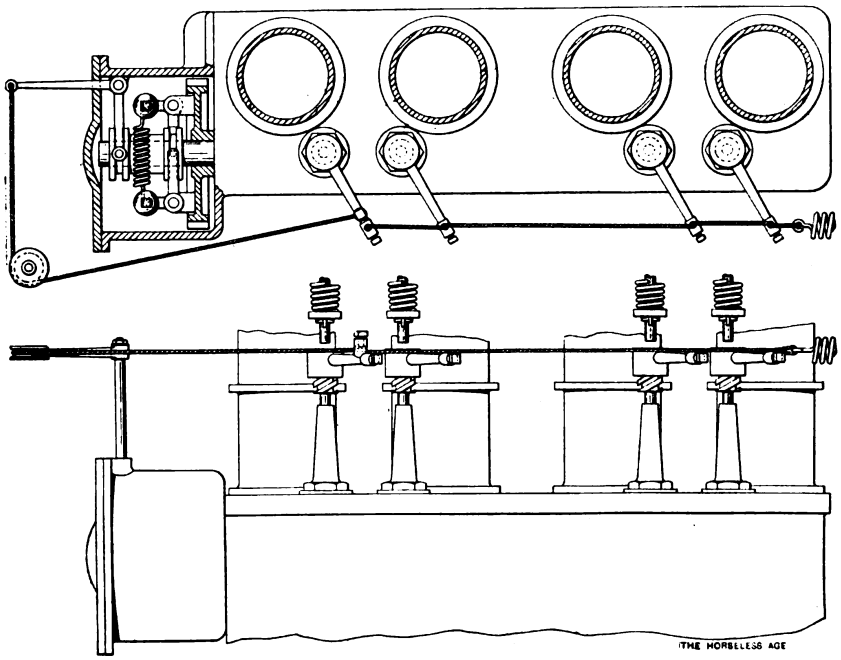
The choice of a method of testing is governed largely by questions of expense and convenience. The tester is usually restricted to the use of such apparatus as is already in stock, and is moreover hampered during the busy season by the constant demand for finished motors to fill orders from the field. That is the time when an inflexible system must be followed.

For the tester's work is a check on the operation of the whole plant, and any let-up in his vigilance may allow the passage of a defective part, whose subsequent failure will do much injury to the manufacturer. The testing department ranks next in importance to the draughting room. The reputation of the firm and the volume of another year's business are vitally affected by its management.

The floor of the garage should be kept free from oil as a precaution against fire and also to save the tires.

The Germain Throttling Governor.

The Germain Automobile Works, which control the Daimler patents in Belgium, have in recent years developed a type of car which differs in many respects from what may be considered standard practice. The cylinders, for instance, are made of steel and worked out of the solid block, and have copper water jackets attached. Perhaps the most interesting feature of their new type of car, known as the Germain-Standard, is the motor governing system which acts by varying the lift of the inlet valves. A plan view and a side elevation of the parts constituting this governing system are shown herewith. It will be noticed that the push rods by which the valves are lifted are provided at the upper ends with enlarged heads which are cut with steep-pitch square threads. These threaded heads take similarly threaded caps which are provided with radial arms. The motor is fitted with mechanically-operated inlet and exhaust valves, which are located on the same side of the cylinder and operated by a common camshaft. This camshaft at its forward end carries a centrifugal governor consisting of two governor weights on pivoted bell cranks, the free arms of which engage with a groove on a sliding sleeve on the camshaft. The two weights are drawn toward the shaft by means of two coiled springs, one on either side of the sliding sleeve. The sliding sleeve is provided with another groove at its forward end with which engages one arm of the bell crank, the shaft of which has bearings in the casing surrounding the governor. One arm of this bell crank extends forward above the governor casing, and at its outer end has secured to it a thin steel wire rope which passes over a pulley and connects to the arm of the threaded cap on the most forward valve rod. It will be noticed that the arms on the different valve rod heads are connected together by means of the same kind of wire rope. The action of the system is as follows: When the speed of the motor increases, the governor weights fly out from the shaft under the action of centrifugal force. This moves the sliding sleeve forward, and through the intermediary of the bell crank and the wire rope, causes the valve rod heads to turn on their threads, and thereby shortens the valve rods, which results in a reduction of the lift of the inlet valves. The engine then only receives a partial charge, and its speed is immediately reduced. When the engine slows down again, the governor weights are drawn toward the camshaft by the two coiled springs uniting them, and the valve rod heads are drawn back into their original position by another coiled spring at the rear end of the engine, specially provided for the purpose.



GERMAIN THROTTLING GOVERNOR SYSTEM.

Change in British Patent Law.

American inventors who intend taking out patents in Great Britain will be interested in the following act of Parliament, which takes effect January 1, 1905, and which changes certain provisions of the existing patent law:

Where an application for a patent has been made, and a complete specification has been deposited by the applicant, the examiner shall, in addition to the inquiries which he is directed to make by the patents, designs, and trade-marks act of 1883, make investigation for the purpose of ascertaining whether the invention claimed has been wholly or in part claimed or described in any specification (other than a provisional specification not followed by a complete specification) published before the date of the application and deposited pursuant to any application for a patent made in the United Kingdom within fifty years before the date of the application.

If as the result of this official search it appears that the invention sought to be patented has been wholly or in part claimed or described in any such specification the applicant will be informed, and will have the opportunity of amending his specification so as to confine it to so much of his supposed invention as he may desire to patent in view of the specification to which his attention has been called by the comptroller of patents.

The sections of the patents, designs, and trade-marks act which regulate the time for depositing a complete specification shall have effect as if references therein to the period of nine months were references to the period of six months.—Frank W. Mahin, Consul Nottingham, England.

TOURING ROUTES

Motoring In the Tropics.

By A. S. H.

Weeks of intense cold and piercing wind of the winter of 1904 had made us long for a glimpse of summer, so, after some careful consideration, we decided upon a trip to Jamaica, taking with us our steam automobile. Our first care was to provide ourselves with extra parts for the machine and some suitable clothes for the hot weather, and having done this we engaged our passage on the United Fruit Company's steamer "Admiral Dewey," sailing from Boston, February 27th, and found that the cost of carrying our automobile would be only fifteen dollars for the round trip

Saturday morning at ten o'clock we steamed away from Long Wharf while the shivering crowd behind waved hurried farewells and the snow fell fast on the slippery

ON THE ROAD TO BLUE HOLE.

decks. Not until we had been two days out at sea did some of us, who had been less fortunate than others, make our first appearance on deck to bask in the warm sunshine, for there was already a great change in the temperature, and we now laid aside our wraps. Soon we commenced to explore our craft, even visiting the hold where we found the cargo to consist solely of a horse, a crate of hens, and our automobile. There were fifty-five passengers on board, and our accommodations were excellent—the staterooms compared favorably with those of an ocean liner, and the table was plain and good. We were impressed with the cleanliness of the ship which was a pleasant surprise after past experience.

Tuesday dawned as fair as the previous day, with of course a noticeable rise in temperature, and the unhappy man who first appeared in a duck suit and tan shoes afforded much mirth, but we all soon followed his example. Unfortunately most of us did not foresee that our winter clothes would more than fill the space that our summer ones had occupied in the trunk, so

PASSERS-BY.

that we were obliged to go ashore with a large part of our wardrobe on our arms. The ocean was wonderfully smooth and the "Dewey" rolled so little now that even the most uncertain sailors regained their spirits and many were impatiently waiting their turn at Shuffle Board. The beauty of this evening surpassed anything that I have ever seen before. The sky was cloudless and the sun in all its glory sank into the summer sea, while the full moon was already up and transforming daylight into the brightest of moonlight nights.

Wednesday, at eight in the morning, we passed Watlings Island, or San Salvador, and at four in the afternoon Cuba appeared above the horizon, but unfortunately the clouds gathered about us and we could see but little until we skirted along the South shore and ran within a mile or two of Cape Maysi. The heavy surf beat against the steep cliffs and the gray terraces rose above one another until they faded into the mountains beyond, while the lighthouse on the beach was the only suggestion of life. By this time it had become rough and many passengers began to look anxious until Captain Israel assured us that it would be smooth as soon as we rounded the point, and of course he was right. At all events we were too much excited over the prospect of reaching land in the morning to think of being sea-sick again. The moon appeared that night in spite of the heavy clouds, from which came occasional bright flashes of lightning, but the effect was so grand and the air so soft and sweet that we were tempted to spend the night on deck.

BLUE HOLE.

The following morning, Thursday, March 3d, we arose at four that we might see the entrance of the harbor of Port Antonio, and we certainly felt repaid for our trouble, as we came on deck just in time to see one of the most picturesque scenes imaginable. The moon was still high and there was not a breath of wind to ripple the glassy water. On the left, within a stone's throw of our vessel, stood the small lighthouse on the point, sending out its red flashes, and a fishing boat drifted lazily between us and the land, while on the right within an equally short distance rose a small island with palm trees overhanging the water's edge. Before us the high mountains were outlined against the sky and the little town of Port Antonio was just visible in the valley. A steamer from Boston had arrived just before us and we dropped anchor, while waiting for her to land her passengers and pull away from the dock, so we leisurely watched the break of day, but with growing enthusiasm, as one by one the objects on land became more distinct and gained color by the gorgeous sunrise. The roosters on shore, not to speak of the dogs, also hailed the sun with delight, and the sleeping town gradually awoke. At 6:30 we landed and drove hurriedly to the Hotel Titchfield to secure rooms, choosing those in one of the cottages, which are built in the bungalow fashion and have a door and window at each end opening onto a piazza. This being done we returned to the wharf to get our baggage through the custom house and found that our automobile had been unloaded from the steamer, and not having been crated it was ready for use. As we had expected, we were obliged to make a deposit at the custom house of twenty per cent. of the value of the machine, which sum was returned when the automobile was shipped back again. The officers of the United Fruit Company showed us every attention, at once having our tank filled with gasolene and giving us much information about the character of the different roads over which we expected to travel. They also telegraphed instructions to their branch office in Kingston to send gasolene to a place in the interior which we intended to visit, where it could not be obtained.

After breakfast a line of carriages, drawn chiefly by mules, stood waiting in front of the hotel to convey the new arrivals to the points of special interest, but many an enthusiastic sight-seer looked with longing glances at our automobile, and an occasional man went so far as to suggest our making a paying business of carrying passengers.

Our first morning's ride was to Blue Hole, a picturesque spot seven miles from the hotel, and the accompanying illustration will give the reader an idea of the road which wound along the shore.

As the temperature at noon averaged about 90 degrees in the shade, we were glad to return to the hotel for luncheon, which

was served in the cool dining-room overlooking the harbor. The middle of the afternoon we found was the popular time for sea bathing, and at the foot of the hill, in front of the hotel piazza, men with row boats were always waiting to convey guests to the bath houses, which are built on piles in shoal water a mile from the land, but just inside the coral reefs. This arrangement insures the finest of bathing with safety from sharks. The temperature of the water is about 85 degrees Fahrenheit, and it is so clear that one can see bottom at a great depth.

The evening was spent in packing for our automobile trip, and we arranged to leave all unnecessary baggage at the hotel. We were called the next morning at four, but to our disappointment found the rain falling in torrents. By ten, however, the sun had come out and we decided to start. A large extension bag and dress-suit case were wrapped in rubber and strapped on the back of the automobile, as well as the extra shoes for our double-tube tires, while on the small seat in front we arranged our waterproof robes and raincoats and some provisions. We left Port Antonio by a picturesque road, following the short to Annotta Bay, which is a distance of thirty-four miles. The streams were swollen by the heavy rain, and while most of them had bridges, yet a number we were obliged to ford with the water coming over the hubs of our wheels; even the road in places was covered by water. Finally we stopped in a beautiful spot on the high cliffs to eat our luncheon, and were entertained by the natives, continually passing back and forth to the nearest market with loads of vegetables or fruit poised on their heads.

We had met at the hotel, before starting, a gentleman from Kingston who owned one of the three automobiles on the Island, and he was therefore able to give us much information about the roads. He warned us that on our way to Kingston we should come to a place where the road had been washed away by the hurricane of August, 1903, and advised us, before attempting to go over the beach, to hire four or five natives to pull our machine through the sand. When we came to this place, however, not seeing any people about, we decided to take our chances on pushing through alone, and ran as far as possible into the sand until we came to a standstill. We then looked about for help, and found a Coolie near by who was willing to push while my husband held the throttle wide open and the gauge registered 475 pounds steam pressure. The accompanying illustration will not only show the difficulties which we encountered for half a mile, but will give the reader an idea of the amount of baggage which we carried.

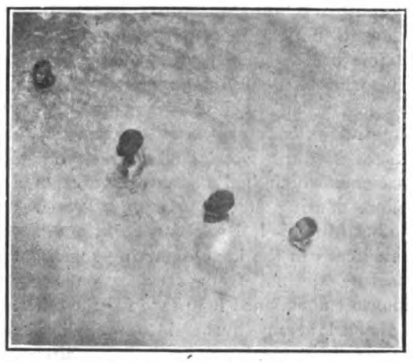
(I think that on our next trip in Jamaica we shall dispense with our evening clothes which we had been advised to take.) A coat hung up inside the hood hides the driver from view in this picture, as he

CROSSING THE BEACH.

runs beside the machine. The hour being midday the heat was intense, and we congratulated ourselves many times over the fact that our automobile had a cover under which we could seek shelter from sun as well as rain.

Just beyond Annotta Bay we turned into the pass which crosses the mountains and is the principal road to Kingston. Here we climbed steadily uphill for nineteen miles and went through the beautiful Castleton Gardens. This road, twisting and turning through the mountains, which are extremely precipitous, is a wonderful piece of engineering. It is so carefully laid out that there is not a grade of over eight per cent. and the road is macadamized all the way. The scenery is wonderful, and the foliage luxuriant even on the highest mountain peaks. Occasionally we came upon one of the picturesque native huts which are thatched with the cocoanut palms woven in and out like basket work. One fact which often impressed us was that in all our journeys about the Island we never found ourselves alone for more than two or three minutes at a time, so incessant is the travel of the natives, old and young, to the nearest town. They frequently walk twenty-five miles each way, carrying heavy loads upon their heads while those more fortunate place their burden in baskets hung upon the backs of their donkeys or mules and plod along beside them.

From the top of the pass we coasted eleven miles down the mountains, emerging upon a wider macadamized road which carried us by Constant Spring Hotel. We ran into Kingston just after dark, and a small boy on a bicycle guided us to the Myrtle Bank Hotel, a large establishment with a courtyard facing on one of the main



DIVING FOR PENNIES.

streets of the city. On the opposite side of the buildings there is a large piazza where one dines, looking out upon a beautiful garden sloping to the water's edge. Our accommodations for the night were very comfortable, the rooms being large and airy and the food well-cooked and served with an abundant supply of native fruits. These we tried in turn, the ever-attentive black waiters telling us what part to eat and our occasional mistakes afforded them much amusement.

On the little pier at the foot of the garden we joined in the common sport of throwing half-pennies to the negro boys who made a practice of diving for them. The person who throws the piece of money tries to mislead the youngsters as to the direction in which he intends to send it, but one of the five or six boys invariably comes up triumphantly and, depositing the coin in his mouth, is ready for another game.

The following morning we were joined by two friends who arrived by train from Port Antonio and, after luncheon at the Myrtle Bank, we all rode in the automobile to Spanish Town, which is the ancient capital of the Island and stands on the banks of the Rio Cobre. The distance

MYRTLE BANK HOTEL.

was about fifteen miles and the road good. We passed the night at the Rio Cobre Hotel, which we found both comfortable and attractive, but our friends decided to start at once for Mandeville, as the next day would be Sunday, and the train would not run. We breakfasted at 5:30 the following morning, and were ready to continue our journey by the time the sun was up. Our road this day led us through Old Harbor, May Pan, Clarendon Park, and then into the mountains again. Another snap shot from our little pocket kodak will, I am sure, give a better idea of the miles of beautiful road which we passed over than my words can describe. While spinning gayly along my husband suddenly brought the automobile to a standstill and remarked that he thought he had heard a slight noise a minute before. We looked back and there some distance from us lay all our baggage in the middle of the road! I tremble now when I think of it, for probably two minutes later it would have been picked up by a passer-by and we would have been robbed of our entire outfit for the journey. From Clarendon Park to Williamsfield, a distance of twelve miles,

TYPICAL OF ROAD FROM SPANISH TOWN TO MANDEVILLE.

we found that we had climbed from an elevation of 187 feet to one of 1,300 feet and seven miles further on at Mandeville we had reached an elevation of 2,131 feet. Owing to the even grades and good roads our speed in reaching this height had actually averaged fifteen miles an hour. We were most delighted on this particular ride with the wonderful orange groves through which we passed for the last fifteen miles before reaching Mandeville. The trees were heavily laden with the fully ripened fruit which lay strewn along the roadside, and we could reach out from our automobile and pick either the blossoms or the oranges hanging from the branches.

We stopped at Williamsfield for two cans of gasolene which had been sent to us from Kingston. We reached the Brook's Hotel at Mandeville in time for luncheon, and our automobile caused some excitement, both among the natives and the guests who flocked from the dining-room to see us unload our baggage. Our two friends were awaiting us, but a heavy tropical shower commenced early in the afternoon and put a stop to the ride which we had expected them to take with us. Time did not hang heavily upon our hands, however, for we passed a delightful afternoon on the piazza where tea was served, and we told one another of our various experiences. According to our usual custom we prepared in the evening for another day's journey. We were told that the distance from Mandeville to Port Antonio was a hundred miles, and in our hearts we resolved to make it in one day, although we fully realized that we might encounter many difficulties on these wild roads in a strange country. Our reasons for making all possible haste were several, the first being that our friends were to return to Kingston by rail that day, and we longed to surprise them by appearing that night when they least expected us. Then, too, this was Monday, and our passage was engaged on the "Admiral Dewey," sailing Wednesday morning early, and we were desirous of having another day to spend at Port Antonio. We breakfasted alone at 5:15 by lamp light, but the sun was well up and it was nearly seven when we left, for we met with numerous delays. The air was filled with the delicious scent of orange blossoms, and once more we were spinning along through the beautiful groves. Our road was leading us continually downhill until we passed through Kendall and Cave Valley, when we began to ascend again. For eight miles we climbed continually until we reached the top of Dry Harbor Mountain, an elevation of 2,000 feet, and looking down into the valley below, we congratulated ourselves once more upon the power of our little automobile which had carried us for more than three days uphill and down, without a delay of any kind. The extra supply of gasolene which we had received at Williamsfield we had as yet no occasion to use, and it remained in two large sealed cans, packed in a wooden box, which we had placed in the front of the automobile below the seat. Our baggage was so heavy that in going over rough places the rear springs occasionally touched, and I felt somewhat anxious as to whether the great good luck we had had so far could continue throughout our journey.

Perhaps my husband had similar thoughts as he pressed hard on the foot brake and occasionally reversed the engine as we ran down the steep winding road toward

ARRIVAL AT MANDEVILLE.

Brownstown, but at all events we both saw too late a big "thank-you-marm" only a few feet before us, and my warning cry of "Look out!" was unnecessary. The jounce was so great that the box of gasolene bounded from its resting place into the road before us and our machine passed over it with a crash which echoed through the mountains. With wonderful rapidity my husband brought the automobile to a standstill, but not before I had visions of a terrible fire and a very sad ending to our trip, while he calmly remarked "We are smashed up at last!" I sprang out just in time to look back upon a road, strewn with bits of kindling wood, and a waterfall of gasolene, which had cost us fifty cents a gallon, pouring down upon us! This was too hard to bear! I seized one of the dilapidated cans in the hope of saving some, but gasolene spurted from crevices on every side, so I abandoned it to care for the other. I glanced at my husband to see why he did not assist me, but apparently it mattered little to him what became of the gasolene so absorbed was he in viewing his engine which, being in a horizontal position beneath the carriage, had felt the full force of the blow on the packing box. At this moment our attention was turned to the natives, both old and young, who having seen us pass their huts but a few minutes before and hearing the noise, rushed to our assistance surprised to find us both unhurt.

On further investigation we found to our astonishment that the engine was practically uninjured, the case only being badly dented and the automobile had suffered no other injuries except breaking the truss of the forward axle. After an hour's work in repairs we again resumed our journey with thankful hearts, for had we been disabled at this point it would have been necessary to have the automobile towed by mules or oxen fifty miles to the nearest railroad station. As it was we rode into Brownstown triumphantly and were guided to the market-place to obtain water.

Our kodak picture shows a man standing on top of the market tank ready to fill the pail as fast as our steam siphon empties it, and the curious crowd surrounding the automobile, while I seek shelter from the midday sun.

After reaching Runaway Bay our road continued to wind along the shore to St. Ann's Bay and Ocho Rios, where we came upon a stream over a hundred yards wide, which rather appalled us. We stopped short to contemplate the problem of fording it, and then recalled with much satisfaction the fact that before starting, having anticipated difficulties of this kind, we had provided ourselves with a rope and tackle which would enable us to pull the automobile out of any river or mud hole. It did not become necessary, however, to use it, for at this moment a man appeared on horseback and guided us through the shallowest part of the river, but it was not without many fears that we watched the hubs of our wheels sink under water. We reached the opposite side in safety, however, and were much pleased to find our fire still burning.

This day proved to be one full of excitements and narrow escapes. We had gone but a mile or two further on when we met a young woman driving with her two little children and a nurse. The horses took fright at our automobile, rearing and plung-

A PICTURESQUE WATERING PLACE.

THROUGH BANANA PLANTATIONS.

ing until the carriage barely escaped being upturned, and the young mother in her fright threw down the reins and covering her face with her hands burst into tears. We both sprang to their assistance and as the horses started to climb a bank my husband caught them while I helped the children to a place of safety, and returning to the automobile ran it well out of sight of the terrified animals, while they were still being held in their comparatively helpless position. The woman soon became calm and showered us with words of gratitude as we started all safely off again.

I have not enumerated many other adventures which we had in meeting mule teams or donkeys on the narrow mountain roads, and will not attempt now to tell of two other very narrow escapes which we had on this same day, but it is enough to say that throughout our trip we caused no accident, except to a hen who caught her head between one of our front wheels and the mud guard, but was eventually rescued alive and apparently unhurt.

Obtaining water for the automobile throughout our trip was often an interesting problem and afforded us many a picturesque scene. When in the interior we found it best to make our want known to some of the native women, who are always to be found wandering along the roadside and are thankful to earn a few pennies. Several girls would hurry to the nearest spring and, filling five-gallon tin cans, would return carrying them on their heads. To save time we would place the steam siphon in one of the cans while the contents of the others were used to replenish it. In other places our best opportunity would perhaps be in crossing a high bridge where we would call to some of the women who were washing their clothes in the river below, and they would glady assist us. In all parts of the Island we found the natives most obliging, and they were grateful for a small fee in return for their services. A convenient mode of obtaining water is to be seen in the accompanying photograph, which was taken in a mischevious moment by my husband when I thought he was busy "oiling up" while I attended to filling the tank. The siphon not being long enough

A PICTURESQUE WATERING PLACE.

to reach the stream, a small boy is occupied in holding up a vessel of water while I stand with one hand on the hose and the other on the steam valve. The boy on the wall is telling me where to find ripe guavas.

We passed through sugar and banana plantations, in and out of little towns and amongst thatched huts on the shore, and again found ourselves following the road winding close to the water's edge with the high mountains rising abruptly beside us and often we came across most interesting caves. The air was filled with the perfume of flowers which with ferns of every variety grew by the roadside. As the day wore on we discovered that the distance to Port Antonio was fifty miles further than we had thought for. We had already traveled one hundred miles since breakfast and had not taken time to stop for luncheon, so when we pictured traveling half this distance again before dining and the darkness overtaking us, when perhaps we should be stuck fast in that memorable beach with no help near, our hearts sank.

The sun was already low as we rode into the little town of Port Maria, and thus abandoning our original plan inquired for the best lodging house. We were shown to Mrs. McIntire's, a "hotel," consisting of three rooms, where we gladly took refuge for the night, as a heavy thunder storm was already gathering. Our ac-

A NATIVE HUT.

commodations were very primitive, although we were provided with a huge bath tub, built of concrete, which was located in a shed next door. We dined with the two other guests of the house, who proved to be gentlemen from Kingston, and who kindly entertained us with interesting tales of the Island. We were served with native dishes and waited upon by a little negro girl of ten, clad in the usual fashion and with bare feet and arms. We should have slept well that night after the fatigue of the day had not my curiosity been much aroused in the middle of the night by a repeated low pounding, mingled with hoarse whispers, which seemed to come from the next room. We arose and looked about, but on discovering nothing, my husband decided to dismiss the matter from his mind and go to sleep again, declaring that the darkies were either chopping wood or playing "Slap Jacks!" At breakfast the next morning on being asked by our Kingston friends how we had slept, I told my weird tale, which was received with much amusement, and I was informed that we were residing next to the bake shop, and the noise which I had heard was the kneading of bread.

At 7:30 we were ready to resume our journey to Port Antonio, but on leaving the door discovered that a piece of brass tubing connecting the automatic oil pump with the engine cylinder had broken, so out came our soldering kit, and while we worked such a crowd of curious blacks surrounded us that we had hardly room to turn. Our tires were badly worn and we took this opportunity to repair them also, covering the outer shoes in several places with large strips of heavy canvas. It was well we did so, for we soon came to a road which was being repaired, and struggling on over many rough places and pulling through mud up to the hubs of our wheels, we came out upon a stretch of broken stone over which we passed for a distance of five or six miles. As a result our four tires looked as if they had been chewed by rats, and the fifth, which we had discarded the day before, seemed like new in comparison. Patch after patch we were obliged to put on, but all this time the inner tubes had fortunately remained unpunctured.

Jamaican roads are an interesting piece of the native woman's work, for she it is who does the hardest labor. Climbing the mountain side, carrying a large stone upon her head, she may be seen on her way to the roadside, where, depositing her burden, she sits astride upon a pile of already broken stone, and lighting her pipe continues the arduous task of breaking the rock with a small hammer.

At noon she stops to build close by a tiny fire of twigs upon which she sets her iron kettle and cooks her dinner. Old and young women continue this task for their living, sometimes alone, and again in groups working together. The government pays a small amount for each barrel of stone after it is broken and piles by the roadside which have been paid for are marked with tar. At the time of our visit an unusual amount of repairing was being done, as a result of the hurricane of August, 1903, and the roads will probably be in excellent condition by the coming winter.

After passing Annotta Bay we soon found ourselves again upon the beach where the road had been washed away as described in the early part of our adventures, and this time we succeeded in crossing it without any extra help. We planned so that on reaching it our water tank would be nearly empty, in order to lighten the weight, and then putting on full speed we

HOTEL AT PORT MARIA.

rushed into the sand until we came to a standstill. Here we waited until the steam pressure rose to five hundred pounds, when we both got out, and I pushed behind while my husband operated the machine. In this way we succeeded in traveling at a pace as fast as we could run for perhaps a hundred yards at a time, when we would again stop to get pressure up and catch our breath. It seemed to be our fate to cross this stretch of sand when the sun was highest, and I never have felt greater heat than that which I experienced on this day while pushing the automobile at the same time running through the deep gravel and having a cloud of sand mixed with steam pouring into my face. We were told that only two other automobiles had ever tried to cross this place, and that the first was pushed through by the assistance of four men while the second, being a heavier car, had to have boards laid in front of the wheels and be drawn by a pair of horses. A road was being built further inland to avoid going over this beach, and is probably open by this time.

We continued to follow the coast as before, and passing Buff Bay, Hope Bay and St. Margaret's Bay we finally reached Port Antonio at 2 P.M., where we once more joined our friends who had been anxiously watching for us all the morning.

Our automobile was greeted as a hero, having traveled about four hundred miles over good roads and bad, struggling through sand, mud and broken stone, fording streams and climbing mountains, yet ever bearing its heavy burden triumphantly through all. After luncheon we were ready for another ride, and we took our friends for a spin to Golden Vale and back.

That night we repacked our trunks for the journey home, expecting to sail at ten the next morning. On going in to breakfast, however, we were greeted by the welcome news that the "Dewey" had not returned from her trip to Costa Rica, and so probably would not start for Boston until the following day. We were delighted to have this extra time to spend at Port Antonio, and made the most of every moment, bathing, sailing and driving. Our only regret on leaving was that we had not found time to take some delightful horseback rides and also to go fishing, for this, I am told, is one of the greatest sports to be had in Jamaica.

At nine Thursday night, March 10th, we were all, the automobile included, safely aboard the "Admiral Dewey," once more, and, reluctantly bidding Jamaica good-bye, we steamed out of the little harbor at midnight. We were almost as fortunate in having a comparatively smooth voyage home as we had been in coming, and on Wednesday, March 16th, just eighteen days from the time we started, we landed in Boston during the early morning. The weather was the same as on the day we left, a cold wind blowing and the air filled with snow.

New Vehicles and Parts

The Autocar Four-Cylinder Touring Car.

The Autocar Company, of Ardmore, Pa., are getting out for the 1905 season a new four-cylinder, side entrance tonneau model. The car is of distinctive appearance, owing, chiefly, to its exceptionally low construction, and possesses a number of refinements in mechanical design over former Autocar types, although it retains most of their exclusive features. The first model of this type was completed late in August, and has since been subjected to severe and prolonged road tests; a second model with minor improvements is now nearing completion, and the first lot of cars of this type will be finished in January next. The first model has never been put into a "finished" condition, and a number of exteriorly mounted parts, such as spark coil, circuit breaker, radiator, etc., will be changed on the new model, for which reason we are not able to show a correct outside view of the car complete at this time; however, the engine, change speed gear, rear axle construction and frame will all be the same as in the completed model, and what few changes in details are to be made, have been fully decided upon, so a correct description of the final machine can now be given. It may here be stated that the car will weigh about 1,900 pounds in touring condition and is rated at 16 to 20 H. P.

THE ENGINE.

The engine is a four-cylinder upright of 3½ inches bore and 4 inches stroke. It has mechanical inlet and exhaust valves, which are arranged in valve chambers on opposite sides of the cylinders. Both sets of valves are identical and interchangeable. The cylinders are cast in pairs, with heads and valve chambers integral. The heads of the cylinders are closed by threaded brass plugs, and the heads of the water jackets of each pair of cylinders by means of brass plates clamped in place by means of stud bolts screwing into the brass plugs. The joint between the jacket wall and the brass plates is made water-tight by means of a paper gasket. The two pairs of cylinders are bolted down to an aluminum crank case in two halves with a horizontal joint through the center of the crankshaft. The upper half of the case is cast with four integral supporting arms, by means of which the engine is carried on the engine cradle. All crank bearings are entirely supported by the upper half of the case, so that the lower half can be removed without disturbing the crank, connecting rods and pistons. The crankshaft is a drop forging, and has three main bearings—one at either end ond one in the middle of the crank case. The connecting rods are also steel drop forgings with brass bushings at either end. The only crank ends are adjustable. The pistons are made with separate heads, to avoid the necessity of unduly extending or springing the packing rings to force them into their grooves, which is thought to deform rings which have been ground to a perfect circle. The pistons have three rings, viz., a narrow one below the piston pin and two broad ones (⅜ inch) above the piston pin; these latter are slipped into place without extending them, and are separated by a narrow uncut ring or spacer. After the rings are put in place the head of the piston is screwed into place, and is then locked securely by means of a rivet passing through both parts. The piston pin or wrist pin is held securely in a central position by means of a novel spring locking device, which is used in a number of places on the car and will be described in detail further on. It is the invention of one of the company's toolmakers. All the reciprocating parts are made as light as possible, to avoid all unnecessary vibration. The same applies to the structural part of the engine.

Each set of valves is operated by means of a separate cam shaft, the two shafts being enclosed within the engine crank casing and driven by means of spur gears enclosed in separate aluminum casings at the forward end of the engine. The cam gear pinion on the crankshaft drives the gears on the two cam shafts through an intermediate pinion. The two cam shaft gears are bolted to hub flanges secured to the cam shafts, the bolts passing through oblong slots in the web of the gears, which allows of adjusting the gears slightly for wear of the teeth. The cams are, of course, hardened, as are the cam rollers at the lower end of the valve rods, and their pins.

The explosive mixture is furnished by a new design of carburetor with float feed, nozzle spray and supplementary air admission. The carburetor is located low down at the inlet side of the engine, and connects to the different inlet valves by means of a cast brass manifold, drawn brass tubes and union glands. In the manifold casting is formed a vaporizing chamber consisting of an enlargement of the pipe in which are arranged several layers of wire gauze. The mixture of air and gasoline vapor formed in the carburetor is drawn through these layers of gauze and is claimed to be rendered more homogeneous thereby. The cast brass manifold and brass tubes of the inlet system are polished. A butterfly valve located in the inlet tube serves to throttle the engine, and is controlled from the steering wheel, the same as the spark timer, as will be described in detail further on. The gasoline tank, with a capacity of 15 gallons, is located under the front seat. It has two compartments, one of which is of 12 gallons capacity, and the other of three. The pipe to the carburetor leads from the 12-gallon compartment, and the small compartment ordinarily remains filled; but if the supply in the main compartment should unexpectedly run out on the road, the two compartments can be thrown into communication by opening a valve, and the reserve

supply of three gallons thus be made available. The feed of the gasoline from the tank to the carburetor is, of course, by gravity.

IGNITION.

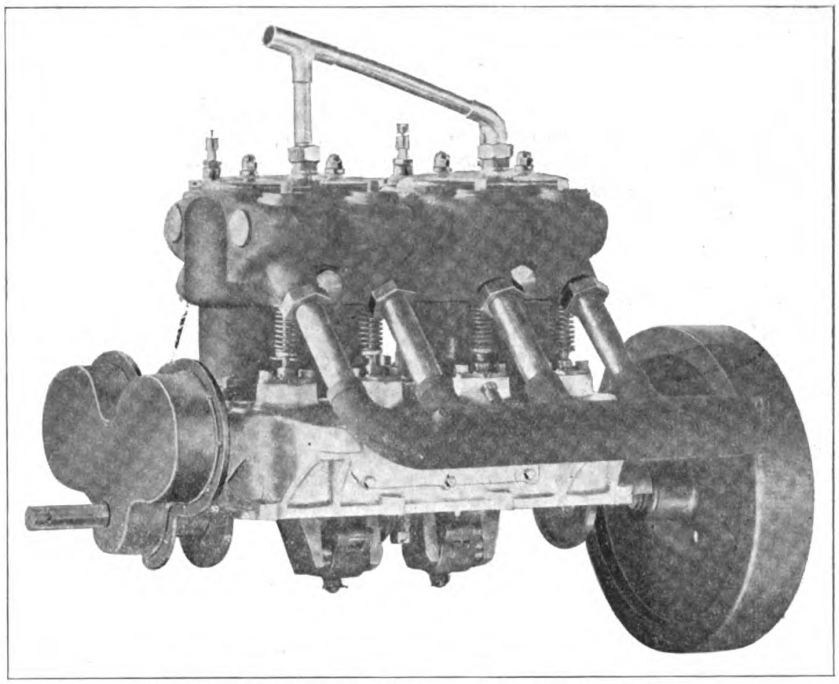
Ignition is by jump spark, the spark plugs being screwed into the plugs over the inlet valves. The necessary current is supplied by two batteries of dry cells carried in the rear seat. A quadruple spark coil is located on the dashboard and is provided with a switch which, in its three different positions, connects the coil to one battery alone, the other battery alone or the two batteries in parallel, respectively. The contact breaker, or commutator, is of the internal roller type and is located back of the dash in direct view of the operator, in a nearly upright position. Its shaft is driven from the inlet valve cam shaft by means of enclosed bevel gears.

An interesting system of lubrication is used for the motor. All parts of the latter are lubricated by splash in the crank case, and the oil is constantly circulated through the crank case and an oil supply tank by means of a positively driven gear pump. The supply tank is made of aluminum and is secured to the bottom of the crank case. Two overflow pipes extend up into the crank case to the height at which it is desired to carry the oil level. The oil pump is located at the rear of the crank case, in the direct line of the commutator shaft, and is driven by the same pair of bevel gears, which are provided with ball thrust bearings. The pump takes its supply from the oil supply tank and continually delivers oil into the crank case at a point where it splashes over the working parts most effectively. The surplus oil constantly returns from the crank case to the supply tank at the bottom thereof through the overflow pipes. The crank case is formed with a partition wall at the center, to prevent all the oil running to one end of the case when ascending or descending a steep hill. The pipe connection from the pump to the crank case passes through a circulation tell-tale on the dashboard, giving the operator a constant indication of the manner in which the circulating system performs its function.

The exhaust gases are led from the exhaust valve chambers through short steel tubes, a malleable iron manifold and another large steel tube to an "ejector" muffler located in front of the rear axle at the right-hand side.

COOLING SYSTEM.

The cooling system comprises a combined tank and radiator forming the forward wall of the bonnet, and a centrifugal circulating pump, resting on the engine cradle and gear driven from the rear end of the exhaust cam shaft. The radiator is of the flanged tube type, the tubes being arranged horizontally. A fan is arranged back of the radiator, being mounted on a hollow, stationary stud secured to the top of a brass fan bracket, which in turn is fastened to the engine cradle. The hollow stud on which the fan revolves is filled with grease and provides sufficient lubrication for a long period of use. The fan is driven by belt from the front end of the crank shaft, at a considerable increase in rotative speed. The pump takes the water from the bottom of the radiator and forces it into the jackets at the lower end thereof, while from the top of the jackets the water returns to the top of the radiator. The connection to the top of the jackets is made by means of a copper manifold connecting to the brass plates on top of the jackets, and a short length of rubber hose is interposed between this brass manifold and the tank on top of the radiator.



AUTOCAR FOUR-CYLINDER ENGINE, EXHAUST VALVE SIDE.

The starting crank for the motor remains permanently in place, and is held in a leather sleeve or cover suspended on a coiled spring from one of the front spring horns—to keep the handle free from mud and to prevent its swinging when not in use.

The engine is provided with a 14½-inch flywheel, which is keyed to a tapered portion of the crank shaft, and secured in place by a lock nut in the usual manner.

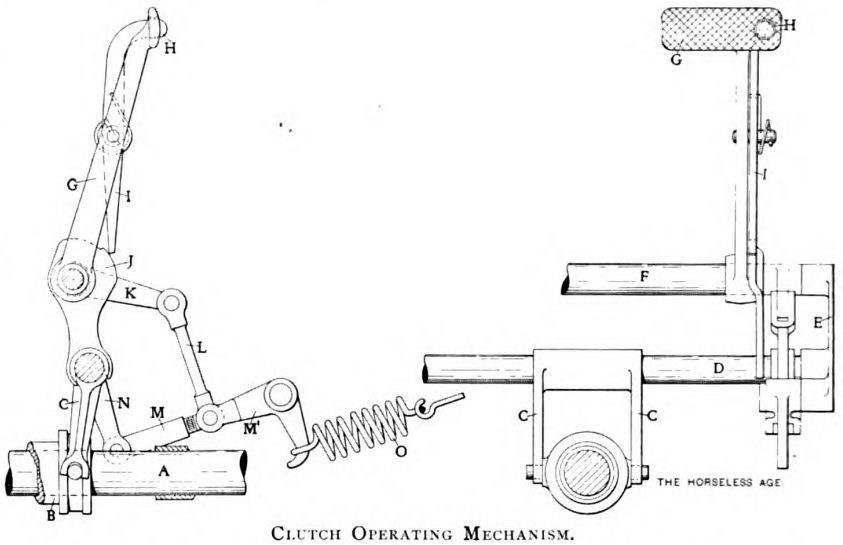
The clutch is of the disk or end-on type and is located inside the rim of the flywheel. The flywheel rim is drilled through radially at four equidistant points, to receive bolts with rectangular heads at the inner ends and slightly riveted over at the outer ends. The heads of these bolts form feather keys for a bronze ring of a little smaller diameter than the inside of the flywheel rim. On each side of this bronze ring is located a pressed steel ring of channel section, the forward ring being carried by a spider on the driven shaft, while the other ring is simply a floating piece. The two pressed steel disks can be clamped down on the bronze ring between them, by means of a set of three bell cranks and toggle links, and a sliding collar, as shown in the cut herewith. The bronze ring is provided with a number of cork inserts, to increase the friction. The bell cranks are pivoted on lugs extending backward from the spider carrying the forward pressed steel ring. The outwardly extending arm of the bell crank is provided with a setscrew which presses against the floating pressed steel ring, when the sliding collar is shifted to bring the toggle links into a position approximately at right angles to the driven shaft. A number of radial flat springs on the spider on the driven shaft hold the three friction rings out of contact when the clutch is disengaged. The clutch is adjusted by means of the setscrews, which, when the adjustment has been made, are secured by lock nuts. This clutch is said to have proven very effective in every respect—gripping gradually and then holding securely.

The clutch is operated by a pedal lever in the usual manner, but the clutch control mechanism is quite original. Referring to the sketch herewith, A is the clutch shaft on which slides the clutch sleeve B. The groove at the rear end of this sleeve contains a ring with radial pins on opposite sides which are engaged by the forked ends

of the double shifting lever C. The lever C is secured upon a shaft D which extends entirely across the frame of the car and is supported at its opposite ends in bearings in brass brackets secured to the frame side rails. One of these brackets, E, is shown in the drawing. A second shaft, F, extends parallel with shaft D across the frame, and is mounted in bearings in the same brass spiders; it carries the clutch pedal G and also the brake pedal (not shown.) A feature that is not found in any other car is that the clutch pedal can be locked in the "out" position, so that it is unnecessary to keep the foot constantly on the pedal when coasting a long hill; also, when the car is stopped with the gear in the second speed position, for instance, it is not necessary to bring the gear to the neutral position, as the car can be stopped by simply throwing out the clutch and locking it, and the car can be started on the second gear, by simply releasing the clutch lock.

The clutch pedal is of more than the usual width, and through a drill hole on the right-hand side extends what is termed a "hold-out" button—a knob H at the end of a pawl lever I pivoted at the middle of the pedal lever arm. The point at the lower end of the pawl lever I moves over a sector J with a single notch. If the driver has his foot on the "hold-out" button when he throws out the clutch, the point of the pawl will entirely clear the sector; but if he holds his foot on that part of the pedal to the left of the button, the pawl will engage in the notch on the sector, and lock the clutch in the "out" position when the foot pressure on the pedal is released.

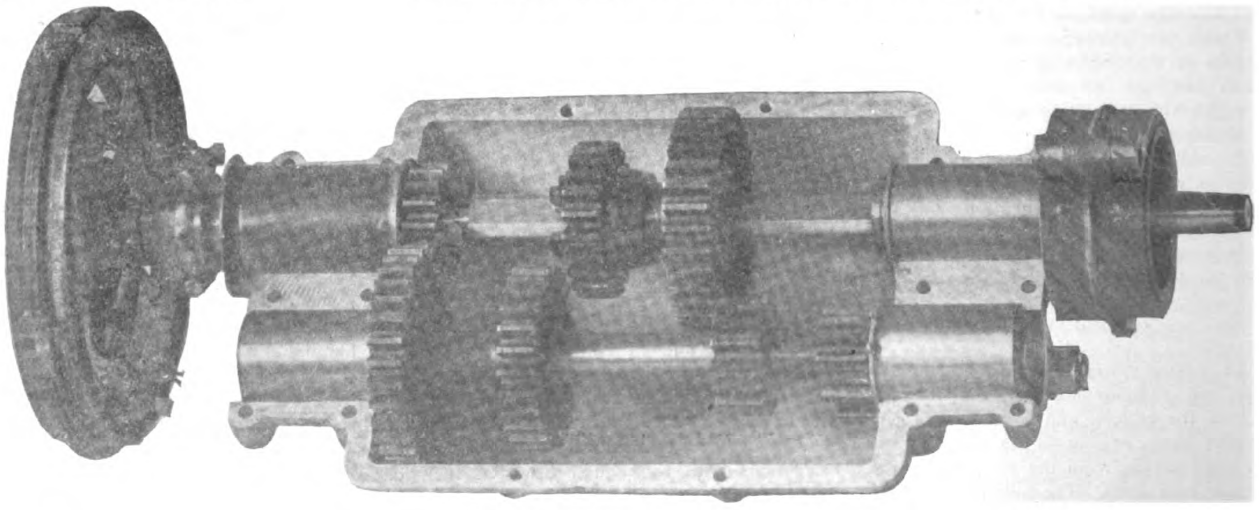
Fastened to the same shaft as the clutch pedal G is a rearwardly extending lever arm K which connects by a link L to a toggle mechanism MM. The toggle link M connects to a lever arm N on the shaft D to which the cluth fork C C is also secured, and the toggle link M^1 is shaped in the form of a bell crank, the clutch spring O being fastened to its free arm.



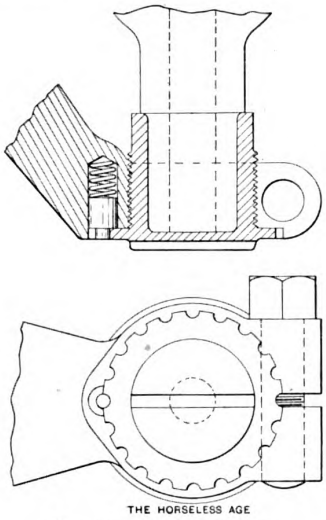
CLUTCH OPERATING MECHANISM.

The clutch operating mechanism here described has a number of advantages. Owing to the toggle arrangement, a very strong pressure between the clutch surfaces is obtained and at the same time considerable clearance when the clutch is disengaged. The clutch spring does not surround the clutch shaft, and if it should accidentally be broken it can readily be removed and replaced. Finally, the end thrust in the clutch is absolutely self-contained.

The change speed gear is of the sliding pinion type, giving three forward speeds and one reverse, with direct drive on the high gear. The ratio of reduction for the intermediate gear is 1.7; for the low gear, 4, and for the reverse, 5.3. All the bearings in the gear box are Hyatt roller bearings, those on the main shaft being 4 inches long, and those on the countershaft 3½ inches. The countershaft bearings are closed by plates at the outer ends, to make it impossible for oil to work out through them. The bearings on the main shaft are provided with dust-excluding washers. The change speed gears are of steel and hardened, and are cut with six pitch teeth. The ends of the teeth are slightly beveled, this operation being effected mechanically. The gears are all of very liberal width of face for the power they have to transmit. The sliding set of two pinions is controlled by a fork secured to a shifting rod which has bearings in the wall of the gear case. The shifting rod is cut with a number of V notches, one corresponding to each position of the sliding set. Into these V notches engages the V point of a spring-pressed pin which is guided in a short tube secured into the wall of the gear case. It will be easily seen that when the sliding gears are brought into approximately their proper position by means of the gear-shifting lever, the pressure of the spring acting on the V point pin will cause them to automatically move into the exact position, and hold them there. The gear box is made of aluminum, in two halves, being divided in a horizontal plane through the center line



CLUTCH. SLIDING CHANGE GEAR. TRANSMISSION BRAKE.



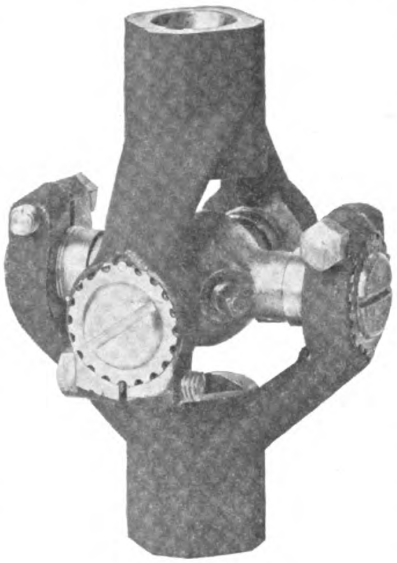
AUTOCAR SPRING LOCK.

of the shafts. The upper half is provided with a large inspection door, and the lower half with a large central oil well, so that all lubricating oil can be readily withdrawn from the box by removing a plug in the bottom of this well.

The transmission to the rear axle is, as already stated, by a propeller shaft and bevel gears. The propeller shaft is of square section over its entire length, and is arranged so as to slide freely in the hub of the forward universal joint. The engine and gear box are arranged at such a level that when the car is fully loaded, the propeller shaft is approximately horizontal, or in line with the engine shaft and the rear axle. The universal joints are of the company's own patented design, and embody one or two improvements over those used on last year's types. Those familiar with "Autocar" construction will remember that the cross of the universal joint is mounted in four bearings in the shape of caps or thimbles—that is, closed at the outer ends—which are screwed into the ends of the yokes forming part of the joint; and the cross is made hollow and filled with grease which is driven into the bearings by centrifugal force, yet prevented from escaping through them because the bearings are closed at the outer end. In the universal joint as now used the cross is made with a spherical grease chamber at the center, to hold a larger supply of lubricant; and the ends of the yokes are split and clamped together over the brass bearings, to prevent the possibility of any shake in the bearings owing to a loose thread. Another improvement is the spring latch pin, which has already been referred to, and which may now be described in detail. Referring to the illustration of one arm of the universal joint yoke herewith, the outer end of the bearing cap or thimble is provided with an external flange into which slots are cut at equal distances. Into the metal of the yoke arm, and in line with the slots in the flange on the bearing cap, is drilled a fairly deep hole of a diameter considerably larger than the width of the slots. Into the bottom of this drill hole is introduced a short coiled spring, and against this spring is pressed a steel pin just fitting the hole, with a reduced outer end just fitting the slot. The spring presses the shoulder on the pin strongly against the flange on the bearing cap, and positively prevents the latter from unscrewing.

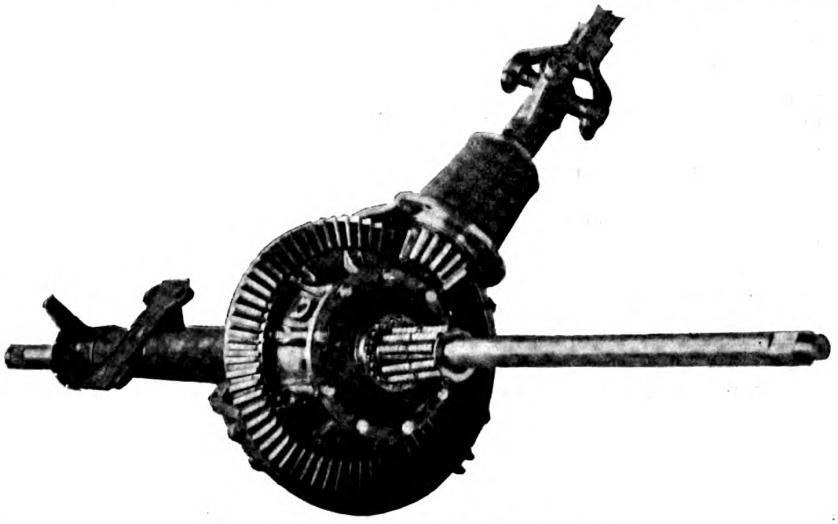
The bevel gears on the rear axle give a reduction of 60 to 14. The bevel pinion is provided with the ordinary cup and cone ball bearings, which take up all end thrust on it, and ball end thrust bearings are also mounted on both sides of the differential gear, that back of the driving gear being comparatively large in diameter. The differential gear is of the bevel pinion type. The casing over the driving gear is in three parts, a top part being made readily removable to give access to the gears for inspection, etc.

The main frame consists of heavy wood sills or side rails which are united in front by a downwardly-curved channel iron cross member, and in the rear by a wood cross member. The side rails are reinforced on the inside with pressed steel liners of channel section, which taper away toward both ends. The rear wood cross-bar is securely fastened to the side rails by bolted angle plates. The engine and transmission case are supported on a sub-frame or engine cradle consisting of two pressed steel members supported at both ends on cross members of the main frame. The engine cradle members are also of channel section at the middle portion of their length, but the lower flange and part of the web is cut away at both ends, to produce a supporting member of section substantially proportional to the load at every point. The frame is supported by semi-elliptic springs in front, 34 inches long by 2 inches wide and with four leaves; and by a platform spring in the rear, the side members of which are 35 inches long and two inches wide, and the cross member (at the rear end) 34 inches long and 2 inches wide. Side and cross members both have five leaves each. In the construction of the springs, provisions are made to increase the ability to withstand the strains of rebound, by uniting the outer end of the second leaf to the main leaf by means of a rivet, the rivet head passing through an oblong slot in the second leaf, so as to allow free motion of the leaves lengthwise upon one another, but no separation of the leaves. The springs have their ends secured to malleable iron spring horns and brackets, and the side members of the rear spring are swung outside the frame, by which arrangement three distinct advantages are secured, as follows: (1) The maximum strain on the rear axle is reduced; (2) the stability of the car as a whole is increased; (3) the center of gravity of the car is lowered.



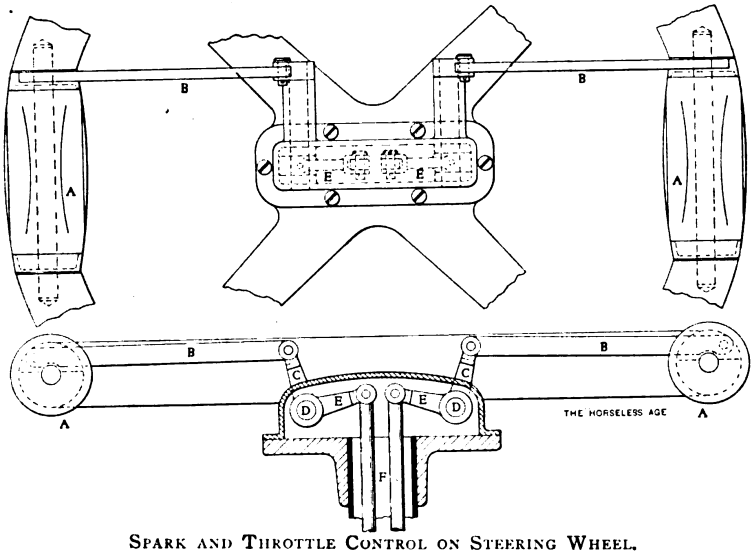
UNIVERSAL JOINT.

The front axle consists of a 2¼-inch seamless steel tube forming an inverted



REAR AXLE AND DRIVE GEAR CONSTRUCTION.

arch. Over the ends of this tube are slipped the hubs of the steering heads, pinned in place and brazed. The steering heads are drop forgings of the forked type. The two arms of the fork are widely separated, giving a very long bearing for the pivot pin. A small oil cup for lubricating the pivot is located on top of the pin. The steering knuckles are also drop forgings, the axle stub and the vertical head being in one piece. The center line of the axle stub is laid slightly to the rear of the pivot, to produce a self-straightening effect (the steering gear not being back-locking). The arms for the connecting rods are pinned and brazed to the knuckles. The two arms by which the knuckles on opposite sides are joined together extend forwardly, and are connected by a tubular rod with forked joints which are notable for their substantial wearing surfaces. The arm for connection to the steering column is secured to the right-hand knuckle directly underneath the upper arm of the steering head



Spark and Throttle Control on Steering Wheel.

fork, and is so bent as to bring the connecting rod to the lower end of the steering column comparatively high and outside the frame. This connecting rod is also tubular and provided with adjustable ball and socket joints at both ends. In order to adjust the joint at the forward end, it is necessary to first loosen the other joint and then turn the whole rod; while to adjust the rear joint, all that is necessary is to give a slight turn to a screw plug at this end and secure it again by means of a split pin.

The rear axle is a bevel-gear-driven live axle of the usual construction, with outside axle tubes for supporting the weight, and internal shafts for transmitting the driving power to the wheels. The rear axle tubes are of 2⅝ inches outside diameter and of high carbon steel; they are pinned and brazed into ribbed plates of malleable iron which are bolted to the sides of the driving gear case, and at the outer ends have combined spring blocks and brake supports secured to them by pinning and brazing. The structural strength of the rear axle construction is increased by brace rods running from the outer axle fittings to the lower part of the driving gear case. The driving shafts consist of 1⅜ inch cold rolled stock without a shoulder from end to end. The outer ends are squared off to form a driving connection with the wheel hubs. The rear axle is mounted on Hyatt roller bearings—two 3-inch bearings at each outer end of the axle, and similar bearings at each side of the differential gear. The front wheels are also mounted on Hyatt roller bearings, one a 3½-inch cage and one a 2-inch cage. The front axle stubs are drilled out from the outer end, and also radially, so that by simply removing the wheel caps, grease can be introduced to the wheel bearings by means of a grease gun.

The wheels are of the Midgely steep tube type, 30 inches in diameter and fitted with 3½-inch Fisk mechanically attached tires. The car has a wheel base of 96 inches and a tread of 54 inches (center to center of wheels).

The car is fitted with the regular hub brakes which are operated by a pedal, and with an emergency brake on the transmission shaft directly back of the gear box, which is operated by a side lever. The hub brakes are 10 inches in diameter, and are of the double acting steel band type, the bands being lined with leather. The bands are in two halves, each half having one end fixed to a bracket extending downward from the outer end of the axle sleeve, while the free ends can be drawn together by means of a lever arrangement. When not in use, the brake band is held off the drum by means of two short coiled springs, one on either side of a central pedestal. The drum for the emergency brake is much smaller in diameter; otherwise this brake is of similar construction to the hub brakes, except that instead of steel bands, heavy bronze segments are used, and instead of the leather lining, a red fiber lining. The emergency brake is interlocked with the clutch-operating mechanism, so the first motion of the emergency brake lever disengages the clutch and a continued motion applies the brake.

The car is steered by means of a 15-inch wood-rim hand wheel, mounted at the upper end of a 1⅜-inch seamless steel tube forming the steering column. This tube is supported at its lower end in a bearing secured by brackets to the dashboard and to the right-hand side rail of the frame. At the lower end the steering tube carries a bevel pinion meshing with a bevel gear sector. The shaft of this sector extends through a bearing in the wall of the case enclosing the pinion and sector, and at its outer end has securely pinned and brazed to it a downwardly extending arm which is connected to the right-hand steering knuckle by means of a short connecting rod with ball and socket joints, as already explained. The case enclosing the bevel pinion and sector is of brass and in three parts. The shaft of the sector can be adjusted in an axial direction to bring the sector into proper mesh with the pinion. It takes 1½ turns of the steering hand wheel to bring the steering wheels from hard over one way to hard over the other way. It may be noted that contrary to the former practice of the company, all the control devices are mounted on the right hand side of the car.

The spark and throttle control are arranged in the steering wheel and column, in an interesting and novel manner. In the rim of the wheel, at opposite sides, are two hand grips, A A, which are adapted to be turned about metal pins passing through them. The grip or handle on the left-hand side controls the spark timer, and the one on the right the throttle valve. These handles have pivoted eccentrically to their ends, short, flat links B B, the opposite ends of which are pivoted to upwardly extending lever arms C C on shafts D D which have a bearing in the wall of a small casing screwed to the top of the steering wheel spider at the center. Each of the two shafts at the end inside the casing carries another lever arm E, extending radially toward the center of the steering post, its outer forked end being situated in line with the tubular column. From each of these two arms a rod F extends down inside the steering tube. One of the rods extends entirely through the tube and connects by a suitable linkage with the carburetor throttle, while the other is connected at its lower end to a short tube fitting loosely inside the steering tube and connecting by pins passing through lengthwise slots in the wall of the steering tube, to a sleeve on the outside of the steering tube at about the middle of its length. This sleeve is suitably connected to the commutator, located in proximity to it. By turning the handles A A around their pins, the spark and throttle can therefore be controlled by the driver at will

without taking his hands off the steering wheel.

The car is to be fitted with a wood body of the side entrance tonneau type. The front seat is divided, and accommodates two passengers, while the rear seat has room for three. Laminated wood mud guards are fitted over the wheels, and are joined by a continuous step. The equipment consists of a pair of oil lamps, a tail oil lamp, horn, tire outfit, tools and a storm apron. Irons are fitted to the body for attaching a canopy top.

The Mason-Kipp Valveless Oil Pump.

The Mason-Kipp Manufacturing Co., of Madison, Wis., who have been making mechanical lubricators for stationary and traction engines for some years, have lately brought out a type specially designed for use on automobiles. In it, as in their older models, they make use of a valveless pump, the method of operation of which is shown by the part-sectional views herewith.

The block W, shown complete in the view to the right in Fig. 1, is attached to

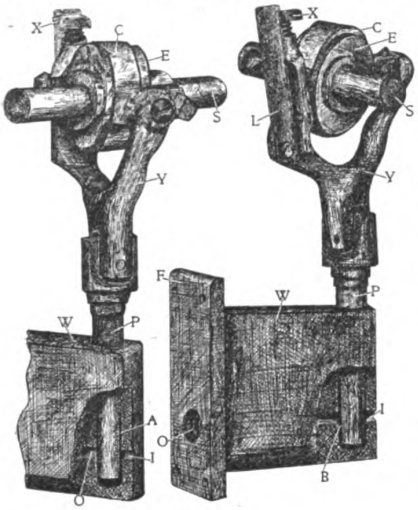


FIG. 1.

the side wall of the oiler by means of the flange plate F, which is screwed to the outer surface of the case (shown in Fig. 3), with the block extending inside the case. A horizontal passage extends through the block from O to I, and a hole of large diameter which passes nearly through the block is drilled vertically at its inner end, and serves as the barrel of a pump into which the plunger P fits. The shaft S runs across the top of the oiler in bearings supported by the case, and carries an angular eccentric directly over each pump. A collar C fits into a groove which runs about this eccentric, and is connected through lugs and screws to the upper ends of a yoke Y, which at its lower end is connected pivotally to the top of the plunger P. As the shaft revolves it gives to the plunger a combined up-and-down and a

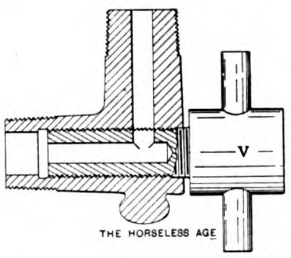


FIG. 2.

twisting motion about its longitudinal center line.

Beginning at the lower end of the plunger, and extending upward for a distance, are two grooves, A and B, which run lengthwise of the plunger and are located at something less than 180 degrees apart. A is shown in the view to the left, and B in the one to the right, in Fig. 1. The eccentric E is so shaped that when the plunger moves on the upward stroke, the groove A comes in line with the hole I, and the groove B is covered by the inner wall of the pump barrel. The oil, which entirely surrounds the block W, is then drawn in through the inlet hole I and passes down the groove A into the space beneath the plunger. At the end of the up stroke the plunger is twisted about until the groove B comes in line with the outlet O and the groove A is in turn covered by the walls of the pump barrel. As the plunger moves down, the oil is forced up through the groove B and out of the hole O from which it runs through an attached pipe to one of the bearings.

It can be seen that an oiler with any desired number of feeds can be built up by enclosing a sufficient number of the units herein described within a case which also acts as an oil reservoir.

The shaft S is driven by any positive means—chain, gears or ratchet—from the half-time shaft of the motor. The amount of oil fed to any of the bearings may be varied by means of the square-headed screw X shown in Fig. 1. By turning this one way or the other, one lug on the collar which surrounds the eccentric is raised or lowered, and the stroke of the plunger increased or decreased accordingly. The flat spring L fits against the head of the screw

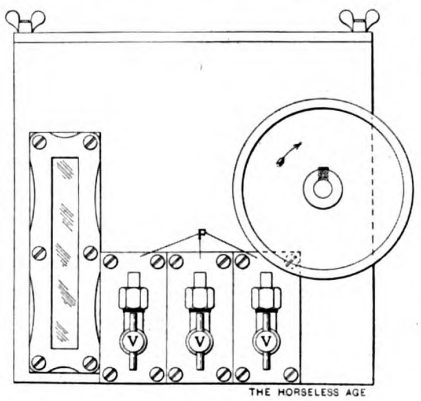
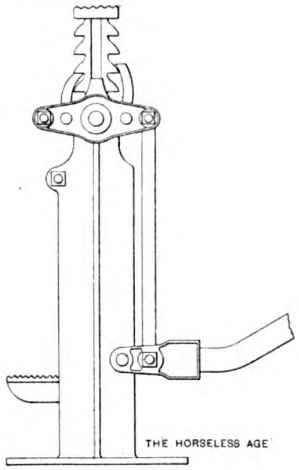


FIG. 3.

X and locks it in position. Instead of a sight feed attachment, the makers supply the device shown in Fig. 2. This consists of a small plug valve which screws into an elbow through which the oil passes on its way to the bearing. When it is desired to determine the manner in which the lubrication is operating, or to regulate the amount of oil delivered in a given time, this plug V is removed, and the oil will then appear at the plug opening. It is claimed by the makers that as the pump is of generous size and without check valves, its action is sufficiently positive to make a continuous sight feed unnecessary.

Any unit can be cut off altogether while the others are feeding oil, by adjusting the screw X (Fig. 1) so that the plunger P has no upward or downward movement, but merely turns about its longitudinal center line under the action of the eccentric E. The containing case, as has been pointed out, serves also as the reservoir for the oil; and as a glass plate is provided in one wall, the amount of oil in the tank can be seen at any time.



The New Peerless Jack.

The Oliver Manufacturing Co., of 203 South Desplaines Street, Chicago, Ill., are making the lifting jack shown in the accompanying sketch. The ram is fitted with a low bracket which can be used instead of the rest at the top of the ram in case the standard is too high to fit beneath the part to be lifted. To raise the ram, the handle, which in the model shown is hinged at the lower part of the standard and is connected by a metal strap to a walking beam above, is moved up and down in the quadrant below the horizontal position. The two pawls which are pivoted to the walking beam then engage with and pass over the teeth on the racks formed on the ram, in such a manner that the desired result is obtained. To lower the ram the handle is moved in a similar way in the quadrant above the horizontal position. The action of the pawls is thereby reversed. The company also make a smaller jack, in which the physical effort is applied directly to the walking beam by means of a detachable

wooden handle which fits into a socket formed on it. This jack is intended for use with vehicles weighing less than 2,500 pounds, while the one shown may be used for heavier work.

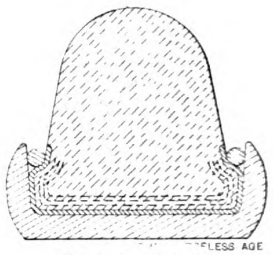
The Veeder Dashboard Odometer.

The cut herewith shows the Veeder Form D dashboard odometer made by the Veeder Manufacturing Co., of Hartford, Conn. As its name implies, it is attached to the dashboard of the car and is driven through a flexible shaft from a pair of gears, one of which is attached to the shaft and the other to a road wheel. It is provided with two registers, one for trip readings the other for recording the total accumulated mileage. Both indicate in tenths of miles, the fractions being shown in red figures at the right. All the gearing of the odometer proper is contained within the number rings in the manner common to the practice of this company, and the numbers are located close together so that they are easily read.

Two styles are offered—the straight drive and the bevel drive, so called. In the former the shaft runs horizontally directly into the side of the odometer, while with the latter the shaft may be brought up straight through the floor of the car or through the dash, and the movement conveyed to the odometer through bevel bears. Ordinarily the device is furnished nickel plated unless some other finish is specified. Special attaching fixtures are provided for each of the standard makes of cars.

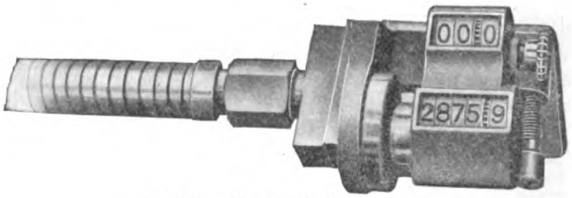
New Side Wire Tire.

The Republic Rubber Co., of Youngstown, Ohio, have recently brought out the side wire solid tire shown in the sketch herewith. The feature of its construction is that at equal intervals about its inner surface, or that which bears against the rim, are a number of flat metal plates, which are imbedded in the rubber and fabric so that their outer surface is flush with the inner surface of the tire, and are so shaped at their upwardly turned ends that space is provided between them and the inner edges of the rim for the side retaining wires. These plates receive the pressure of the side wires, therefore, in much the same way as do the cross wires which are more commonly used in tires of this description. The tire is held to the rim by the edges, which fit under the shoulders formed at the ends of the plates as they are bent away from the rim to make room for the side wires.



REPUBLIC TIRE.

The advantages claimed for the tire are that the rubber and fabric do not need to be perforated as is the case when cross wires are used, and that an equal distribution of the pressure of the side wires upon the cross members is more readily obtained than with the other construction.



VEEDER FORM D ODOMETER.

The Reo Car.

The first of the Reo cars, made by the Reo Car Co., of Lansing, Mich., is shown in the photograph accompanying. It is designed along French lines, so called, is propelled by a two-cylinder horizontal opposed motor of 16 H. P., and has a radiator of special design in which it is said the water may freeze without doing injury to it. The cars weigh about 1,400 pounds.

THE REO CAR.

Trade Literature Received.

The Hartford Rubber Works Co., Hartford, Conn.—"The Proof of the Pudding," being a pamphlet containing testimonial letters from users of their new Dunlop tires.

Knox Automobile Co., Springfield, Mass.—Illustrated folder and price list of Knox commercial vehicles.

Joseph Dixon Crucible Co., Jersey City, N. J.—"Graphite Lubricants," a booklet setting forth the advantages of graphite lubrication.

Carl E. L. Lipman, Beloit, Wis.—Price list of Lipman rotary circulating pumps.

The Adams Co., Dubuque, Iowa.—Catalogue of the Adams-Farwell cars.

The Chas. H. Moore Oil Co., Logansport, Ind.—Pamphlet containing testimonials from users of and directions for the use of their "Anti-Freezing Lion Cooling Oil."

The G & J Tire Co., Indianapolis, Ind.—Illustrated leaflets setting forth the achievements of their tires in the field of racing.

The Western Motor Co., Logansport, Ind.—Folder, illustrating and describing the Rutenber gasoline motors and accessories.

COMMUNICATIONS

The Tire Bugbear.

Editor HORSELESS AGE:

Your editorial on "The Tire Bugbear," in the HORSELESS AGE of October 19, was eminently fair and I am constrained to give my testimony. I touched on the subject at the close of "Trip to Detroit," in the issue of October 12.

Only four years ago I saw a belt-driven Benz machine, with its high drivers and small front wheels, slowly but surely climbing Durham Hill, England. The solid rubber tires were not a source of mental anguish to the operator. The belt drive has been abandoned for better mechanical devices and their details have been much improved from year to year. Materials have been adapted to the kind of stress to which the part is subjected. Shapes and proportions have been improved until delays from defective design or manufacture of metal parts are extremely rare.

The improvement in wearing qualities of tires has not kept pace with the more severe requirements of heavier and faster vehicles; furthermore there is nothing to indicate that tires for lighter and slower cars have materially improved.

A false impression may be easily gained from the reports of the St. Louis tour, where, according to the newspapers, hundreds of miles were made without repairs. The manufacturers had fitted their cars with new tires and the tire makers had probably taken special pains with their product. One can judge better by the experiences of fifteen or twenty club friends than by "ads." My own observation extends over two seasons' use of single tubes under a 1,200-pound light road wagon. From April to December the four new tires were not punctured and they were not blown up from August 26 to January 1. They were carefully used and frequently examined, tacks and sharp stones were extracted and the holes were filled with jiffy.

In 1904 these tires began to fail—one does not epect them to last forever. One gave out, was sent to the factory to be revulcanized and was replaced by a new one from the same firm. This new one blistered badly after about one month and 300 miles of use. It was also leaky at many points, but a dose of soapstone and water made it hold air two weeks without repumping. The auto agency through which the tire was purchased advised returning and sent the tire back before it was much worn. The factory advised that they found nothing wrong in the construction and would repair it for $5. I told the agent to wire them to return tire unrepaired, as their advice was unsatisfactory. They replied that they had cut it in making examination and would repair it free of charge, which they did after three weeks' delay. On being thus trapped one would have expected a good job, but the revulcanized air tube would not hold up two hours. In fact, the makers had completed the destruction of what was a defective tire in the beginning.

Contrast with this the prompt action of the auto company in sending me new cups, cones and steering knuckle, without charge, when a ball broke, and in shipping a dust protector, without charge, which was not in my contract. The auto maker wants to sell cars, but the tire maker don't care. This attitude does not improve goods and is dealing the whole auto business an "undercut." One friend is trying a semi-solid tire; another is using a filler; solid tires are used some and talked a good deal. Everyone is, of course, reluctant to abandon the pneumatic, but the present situation cannot be satisfactory to motor maker, seller or user. The results would be more encouraging if the tire makers gave more effort to producing tubes for the common herd rather than relying on mile-a-minute records as recommendations.

I had expected to change my rims and use double tubes, but the reports of others do not offer much relief to the user of a light wagon. S.

Editor HORSELESS AGE:

Let your editorial entitled "The Tire Bugbear" be the tocsin for the uprising of the purchasing public against that most exasperating nuisance—the pneumatic tire. How much longer will motor car users patiently suffer this nuisance to continue, when by acting together as a unit the purchasing public can insist on manufacturers getting busy to rid the motor car to it. It is time for the revolt alluded to in your editorial to come right now. It should come before drop forged axles and running gear parts are standardized and the expensive machinery for their manufacture is installed. After that the change that must come in tires would be costly and long deferred. Eventually we are bound to come down to a less resilient, but serviceable tire; to good spring suspension, and a running gear which will stand the changed conditions. The sooner the change is made in tires, wheels, axles, knuckles and springs the better it will be for users, the manufacturers, and the general automobile movement all 'round. The change must be made. Why stagnate any longer where we are. It is up to the user right now to make known what he wants and insist on it.

I do not speak for the owners of racing cars, who tear along the highways at a record-smashing pace; or for the owners who are so happily fixed in the world that wasted time and cash in bursts and punctures count for nothing. Let the manufacturers use up their pneumatics on such as want them; but for the rest of us, let us have tires that are serviceable and always reliable. Cars properly designed for the latter tires can be fitted with the former, except in cars for racing—and they are in a class by themselves.

I have in mind a tire I saw four years ago, an indurated fabric tire. That tire had been used for seven thousand miles, so the makers claimed, and from what I saw I believed it. That tire never gave out from burst or puncture, for the simple reason that it was solid. It never tore from the rim and wrecked its driver, for the good reason that it was bolted on. It never flaked or gouged out great chunks on flint or car tracks, for the reason it was laminated with tough layers of fabric vulcanized in on edge. That tire gave seven thousand miles of faithful service, and was worn out; but worn out as the sole of a man's shoe wears out—by gradual, even wear all over the tread.

This tire was not highly resilient, but more resilient than an iron tire, and more so than a wooden tire. It had some resilience; also gave good traction; was hard to skid on stone or asphalt; was noiseless, and, above all, was always reliable and wore well.

Let our coming cars for touring and every-day pleasure and business use be designed with wheels and axles to bear a less resilient tire. Let our springs be nearly straight and long—platform or semi-platform if need be. Let the main leaves be Norway iron; or, if of steel, then only oil-tempered Swedish steel. Let the leaves be broad, thin and numerous. Then give us a tire on the order of the example we have seen above. WALTER S. VOLKMAR.

Why the Engine Wouldn't Start.

Editor HORSELESS AGE:

Perhaps you may be interested to know the causes for my engine not starting promptly as per my inquiry two weeks since. After satisfying myself there was no other cause for the trouble than the new cam, I put on the old one for trial, and the engine started on the first turn, proving the point of trouble. Upon comparison of the two cams, I noted that the relief lift was exactly opposite the exhaust lift on the new cam, while on the old cam it was about ¼ inch earlier. The New York people did not think this the cause for not starting, but as they could find nothing else they concluded to move the relief lift as an experiment. The engine started on the first turn. They could not say why this one engine should require the relief cam placed differently from all others. Can you?

FRED LOCKWOOD.

(We cannot.—Ed.)

We forgot in our last issue to say one of those automodevils passed through here. It was a fine one, but when she struck Knowlton's plastering sand she stopped all right.—Berling (Wis.) Courant.

List of New York Show Exhibitors.

Announcement has been made of the spaces allotted to those who will exhibit in the Fifth Annual Automobile Show in Madison Square Garden, New York, January 14 to 21, and it will be seen that a far greater number of exhibitors have been cared for than ever before. In all, there are about 250 exhibitors, each of whom has received a diagram, showing the space he is to occupy. Diagrams are issued for the main floor, the elevated platform, the balcony, the exhibition hall, the restaurant and the concert hall, which includes every available inch of space in the big amphitheater.

In making the allotment the committee in charge, which consisted of James C. Young, manager of the show; S. A. Miles, National Association of Automobile Manufacturers, and S. M. Butler, Automobile Club of America, provided for every application received prior to October 27, arranging it so that every manufacturer could exhibit at least one of each of his models. Something like a dozen applications have been received which cannot be accommodated. Following is a complete list of those who will exhibit:

MAIN FLOOR.

J. Stevens Arms & Tool Co.
White Sewing Machine Co.
Elmore Mfg. Co.
Olds Motor Works.
Buckmobile Co.
Baker Motor Vehicle Co.
Worthington Auto Co.
Waltham Mfg. Co.
Matheson Motor Car Co.
Peerless Motor Car Co.
Corbin Motor Vehicle Corp.
F. B. Stearns Co.
Pope Mfg. Co.
Standard Motor Con. Co.
Locomobile Co. of America.
Mitchell Motor Car Co.
Kirk Mfg. Co.
Haynes-Apperson Co.
Geo. N. Pierce Co.
Cadillac Automobile Co.
Ford Motor Co.
Upton Motor Co.
Grout Bros. Auto Co.
Electric Vehicle Co.
Autocar Co.
Phelps Motor Vehicle Co.
Winton Motor Carriage Co.
Knox Automobile Co.
E. R. Thomas Motor Co.
Royal Motor Car Co.
Fischer Motor Vehicle Co.
Vehicle Equipment Co.
Covert Motor Vehicle Co.
National Motor Vehicle Co.
Smith & Mabley Mfg. Co.
H. H. Franklin Mfg. Co.
Thos. E. Jeffery & Co.
Northern Mfg. Co.
Duryea Power Co.
Apperson Bros. Auto Co.
Automotor Co.
Crest Mfg. Co.
Reliance Auto Mfg. Co.
American Motor Co.
Daimler Mfg. Co.
Lane Motor Vehicle Co.
Packard Motor Car Co.
Studebaker Bros. Mfg. Co.
Prescott Auto Mfg. Co.

ELEVATED PLATFORM.

Hartford Rubber Works Co.
Rose Mfg. Co.
Fisk Rubber Co.
Dayton Electrical Mfg. Co.
Standard Welding Co.
Dow Portable Electric Co.
Timken Roller Bearing Axle Co.
Warner Gear Co.
Herz & Co.
Pope Mfg. Co.
Jos. W. Jones.
Morgan & Wright.
India Rubber Co.
R. E. Hardy Co.
N. Y. & N. J. Lubricant Co.
National Carbon Co.
Firestone Tire & Rubber Co.
Gleason-Peters Air Pump Co.
Shelby Steel Tube Co.
Badger Brass Mfg. Co.
American Ball Bearing Co.
20th Century Mfg. Co.
Pittsfield Spark Coil Co.
Light Mfg. & Foundry Co.
American Coil Co.
Brennan Motor Co.
Phineas Jones & Co.
Broscoe Mfg. Co.
Columbia Lubricants Co.
Springfield Metal Body Co.
Parish & Bingham Co.
Weston-Mott Co.
Baldwin Chain & Mfg. Co.
American Roller Bearing Co.
Whitney Mfg. Co.
The Veeder Mfg. Co.
G. & J. Tire Co.
Goodyear Tire & Rubber Co.
Diamond Rubber Co.
Brown-Lipe Gear Co.
Midgely Mfg. Co.
Gray & Davis.
C. F. Splitdorf.
R. E. Dietz Co.

UPPER BALCONY.

Post & Lester.
Green-Tweed & Co.
Chas. E. Miller.
Wm. H. Brown.
Standard Oil Co.
Edison Storage Battery Co.
Demmerle & Co.
Motor Car Equipment Co.
Chas. H. Metz.
Breeze Motor Mfg. Co.
United Elec. Mfg. Co.
The Lunkenheimer Co.
Rushmore Dynamo Works.
Dr. T. J. Cooper.
Auto Supply Co.
A. H. Funke.
Electric Contract Co.
Leon Rubay.
De Laski & Throop Tire Co.
English & Mersick Co.
D. McRa Livingston.
Continental Caoutchouc Co.
Hendee Mfg. Co.
Reliance Motor Cycle Co.
Trebert Auto & Marine Motor Co.
Columbia Nut & Bolt Co.
Pneumatic Tire Protector Co.
Scandinavian Fur & Leather Co.
Scoville & Peck Co.

BALCONY EXTENSION.

W. J. Duane & Co.
Wm. Roche.
Wm. Cramp & Sons Ship & Eng. Co.
America Co., Inc.

EXHIBITION HALL.

Mack Bros. Co.
Chicago Automobile Mfg. Co.
Pierce Engine Co.
Central Automobile Exchange.
Marble-Swift Auto Co.
Lionel Norman.
Springer Motor Vehicle.
Michigan Automobile Co.
Jackson Automobile Co.
Austin Automobile Co.
Oscar Lear Automobile Co.
Warwick Cycle & Auto Co.
Coldwell Lawn Mower Co.
Reid Mfg. Co.
Marion Motor Car Co.
The Lozier Motor Co.
Sturtevant Mill Co.
United Motor & Vehicle Co.
Buick Motor Car Co.
Upton Machine Co.
Pungs-Finch Auto & Gas Eng. Co.
Morse Motor Vehicle Co.
Eisenhuth Horseless Vehicle Co.
Columbus Motor Vehicle Co.
Howard Motor Car Co.
Bartholomew Co.
J. G. Parsons.
Standard Wheel Co.
Welch Motor Car Co.
J. L. Dolson & Sons.
Torbenson Gear, Inc.
The Union Automobile Co.
Toquet Motor Car & Const. Co.
Berkshire Automobile Co.
Model Gas Engine Works.
Regas Automobile Co.
Acme Motor Car Co.
James Brown Machine Co.
Warren Automobile Co.

RESTAURANT.

Premier Motor Mfg. Co.
Wayne Automobile Co.
H. H. Buffum Co.
Reo Car Co.
Pope-Robinson Co.
Panhard & Levassor.
De Dietrich & Co.
Worthington Auto Co.
Maxwell-Briscoe Co.
C. H. Blomstrom Motor Co.
Commercial Motor Co.
Norris N. Mason, F. I. A. T.

Palais de l'Automobile.

FIRST TIER BOXES.

New York Edison Co.
Sprague Umbrella Co.
Whitlock Coil Pipe Co.
Concentrated Acetylene Co.
Hussey Drop Forge & Mfg. Co.
Hine-Watt Co.

CENTRAL BOXES.

Hyatt Roller Bearing Co.
Chas. E. Miller.
B. F. Goodrich Co.
E. J. Willis Co.

CONCERT HALL.

Byrne-Kingston & Co.
Swinehart Clincher Tire & Rubber Co.
Cleveland Car Specialty Co.
The Tokheim Mfg. Co.
Motsinger Device Co.
Carlyle-Johnson Machine Co.
Warner Instrument Co.
Wray Pump & Register Co.
Autocoil Co.
Hess-Bright Mfg. Co.
Detroit Steel Products Co.
Manufacturers' Foundry Co.
Imperial Wheel Co.
Federal Mfg. Co.
National Car Wheel Co.
C. A. Mezger.
Oliver Mfg. Co.
Aurora Automatic Machine Co.
Pennsylvania Rubber Co.
Brown & Sharpe Mfg. Co.
S. F. Bowser & Co., Inc.
The A. O. Smith Co.
McGiehan Odometer & Mfg. Co.
The Webb Co.
Steel Ball Co.
The Jersey Brake Co.

List of Allotments for Chicago Show

There will be about 170 exhibitors at the Chicago show, of whom 80 will exhibit cars and 90 parts and accessories. The space in the gallery was allotted by a committee representing the Motor and Accessory Manufacturers. All of it was taken by members, so that it was necessary to abandon the restaurant, which has heretofore been on the second floor of the annex, for the benefit of non-members. Of the automobile exhibitors, an even score have never before shown at Chicago. There are applications on the waiting list for five exhibits of complete cars and twice as many for accessories.

The complete list follows:

AUTOMOBILE MANUFACTURERS.

Acme Motor Car Co.
Apperson Bros. Auto Co.
Auburn Automobile Co.
Austin Automobile Co.
Autocar Co.
A. C. Banker Co.
The Bartholomew Co.
C. H. Blomstrom Motor Co.
Buick Motor Car Co.
Burtt Mfg. Co.
Cadillac Automobile Co.
Chicago Auto & Mfg. Co.
Chicago Motorcycle Co.
Coldwell Lawn Mower Co.
The Columbus Motor Vehicle Co.
Covert Motor Vehicle Co.
Crest Mfg. Co.
John L. Dolson & Sons.
Duryea Power Co.
Electric Vehicle Co.
Elmore Mfg. Co.
Ford Motor Co.
H. H. Franklin Mfg. Co.
Hagmann & Hammerly.
Haynes-Apperson Co.
Holsman Auto Co.
Jackson Auto Co.
Thomas B. Jeffrey & Co.
Kirk Mfg. Co.
Knox Auto Co.
Locomobile Co. of America.
The Marble-Swift Auto Co.
The Marion Motor Car Co.
Maxwell-Briscoe Motor Co.
Mead Cycle Co.
Michigan Auto Co.
Mitchell Motor Car Co.
Model Gas Engine Works.
National Motor Vehicle Co.
Northern Mfg. Co.
Olds Motor Works.
Packard Motor Car Co.
Peerless Motor Car Co.
The George N. Pierce Co.
Pierce Engine Co.
Pope Motor Car Co.
Premier Motor Mfg. Co.
Pungs-Finch Auto & Gas Eng. Co.
Regas Auto Co.
The Reid Mfg. Co.
Reliance Motor Car Co.
Reo Car Co.
Royal Auto Co.
Royal Motor Car Co.
Simplicities Auto Co.
The Sommer Motor Co.
Standard Wheel Co.
The F. B. Stearns Co.
J. Stevens Arm & Tool Co.
St. Louis Motor Carriage Co.
Stoddard Mfg. Co.
Studebaker Bros. Mfg. Co.
E. R. Thomas Motor Co.
Tincher Motor Co.
The Union Auto Co.
Vehicle Equipment Co.
Waltham Mfg. Co.
Welch Motor Car Co.
White Sewing Machine Co.
Winton Motor Carriage Co.
Woods Motor Vehicle Co.
Worthington Auto Co.

PARTS AND ACCESSORY MANUFACTURERS.

American Roller Bearing Co.
Aurora Automatic Machinery Co.
Autocar Equipment Co.
The Autocoil Co.
Badger Brass Mfg. Co.
Baldwin Chain & Mfg. Co.
The Beckley-Ralston Co.
S. F. Bowser & Co., Inc.
Brennan Mfg. Co.
Briscoe Mfg. Co.
W. H. Brown.
Brown-Lipe Gear Co.
Byrne, Kingston & Co.
Chicago Battery Co.
Chicago Rawhide Mfg. Co.
Chicago Storage Battery Co.
Continental Caoutchouc Co.
Cullman Wheel Co.
Dayton Electrical Mfg. Co.
Detroit Steel Products Co.
The Diamond Rubber Co.
R. E. Dietz Co.
Jos. Dixon Crucible Co.
Dow Portable Electric Co.
A. L. Dyke Auto Supply Co.
Electric Contract Co.
Excelsior Supply Co.
Fawkes Rubber Co.
Federal Mfg. Co.
Firestone Tire & Rubber Co.
The Fisk Rubber Co.
G & J Tire Co.
The B. F. Goodrich Co.
Goodyear Tire & Rubber Co.
Gray & Davis.
Greene, Tweed & Co.
The R. E. Hardy Co.
The Hartford Rubber Works Co.
Hendee Mfg. Co.
Herz & Co.
Hine-Watt Mfg. Co.
William Hjorth & Co.
Hyatt Roller Bearing Co.
Imperial Wheel Co.
India Rubber Co.
Chas. Kaestner Mfg. Co.
G. B. Kimball & Co.
McGiehan Odometer & Mfg. Co.
The Miller-Knoblock Electric Mfg. Co.
Morgan & Wright.
The Motor Car Supply Co.
Motsinger Device Mfg. Co.
National Carbon Co.
Oliver Mfg. Co.
The Pantasote Co.
Pennsylvania Rubber Co.
Pope Mfg. Co.
Pneumatic Tire Protector Co.
Remy Electric Co.
William Roche.
Rose Mfg. Co.
Shelby Steel Tube Co.
G. F. Splitdorf.
The Sprague Umbrella Co.
Standard Carriage Lamp Co.
Standard Oil Co.
The Standard Welding Co.
The Steel Ball Co.
Swinehart Clincher Tire & Rubber Co.
Timken Roller Bearing Axle Co.
The Tokheim Mfg. Co.
Twentieth Century Mfg. Co.
The Veeder Mfg. Co.
Vesta Accumulator Co.
Warner Gear Co.
Warner Instrument Co.
The Webb Co.
Wheeler Mfg. Co.
Whiteley Steel Co.
The Whitney Mfg. Co.
E. J. Willis & Co.
Wray Pump & Register Co.

LEGISLATIVE AND LEGAL.

RYE, N. Y.—A crusade against automobile scorching was started on Saturday, November 19, when twenty special deputies were sworn in for the purpose. By the end of the day twenty-two automobilists had been stopped and $315 collected in fines. The victims were mostly New Yorkers en route to New Haven for the Yale-Harvard football game.

NEW YORK, N. Y.—Papers have been filed in the suit of Clarence E. Sherin vs. Police Commissioner McAdoo. The case arises from the new traffic regulations recently put in force by the police. The plaintiff alleges that Mr. McAdoo has exceeded his authority in closing certain streets, notably Thirty-fifth street, to traffic during certain hours of the day. He was arrested for driving on it in his car in spite of a warning from a police officer.

SPRINGFIELD, OHIO.—Mrs. Virginia Wilkins, of Urbana, has sued the Clark County Commissioners for $20,000 for injuries alleged to have been received when an automobile in which she was riding was wrecked because of a defective road.

WAUKESHA, WIS.—Mrs. William Keppen has begun suit against George H. and Fred D. Clark, of Evansville. She and her husband were riding in a wagon on August 27, when, it is claimed, an automobile driven by the Clarks frightened the horse and the plaintiff was injured.

KANSAS CITY, MO.—Only two licenses have been taken out in the two months during which the new ordinance has been in force. The examining board has asked the Mayor to devise a means of bringing the automobilists into compliance with the law.

BUFFALO, N. Y.—The fire commissioners have prepared a communication to the board of aldermen asking them to pass a new ordinance regulating the sale and handling of gasoline. The present measure is made obsolete by the new order of things.

PHILADELPHIA, PA.—In a speech at the annual meeting of the Camden County Board of Agriculture Henry S. Scovel, father of the New Jersey automobile law, stated that at the next meeting of the legislature he would propose the following amendments to the law: "First, for every violation of the act, arrest without a warrant. Second, reduce the speed limit to whatever may be deemed proper. The speed limit of twenty miles an hour that is in force now is excessive. Third, that automobiles while in this State, shall display only the number of the State on the back."

KANSAS CITY, MO.—Automobilists are preparing to test the validity of the recently passed ordinance which provides for examining and licensing of operators.

PITTSBURG, PA.—George Munson, chauffeur, has been fined $35 and is the first to be convicted under the automobile act of 1903. In passing sentence Judge Evans took occasion to warn automobilists that the act provides for either a fine or imprisonment, and that future offenders would not be dealt with so leniently.

WILKESBARRE, PA.—The directors of the Elmhurst Boulevard Co. have notified the motorists of the vicinity that speeding on the boulevard will not be permitted, and that if after a warning an operator persists in the practice, he will be barred from the road altogether.

WATERVILLE, ME.—A verdict for the plaintiff has been returned in the Supreme Judicial Court in the case of A. O. and Mary Lombard vs. A. S. Burke, damages being assessed at $400. The suit resulted from a collision between the plaintiff's car and a dog owned by the defendant, as a result of which the plaintiffs were injured and the car damaged.

FAIRBURY, ILL.—An automobile ordinance has recently become operative. It provides for a speed limit of eight miles an hour between, and six miles an hour at crossings. The minimum penalty is $5, and the maximum $200 fine for each offense.

LOUISVILLE, KY.—At a hearing before the railroad and revision committee of the city council at which a number of automobilists were present, Alderman Harris agreed to drop his proposed ordinance. At the present time there is an ordinance in force which is satisfactory to all concerned. Mr. Harris' measure provided for the examination of operators.

TAUNTON, MASS.—At a recent meeting of the committee on streets and bridges of the city council an ordinance was presented which provides that "no person having the care or control of an automobile or self-propelled vehicle" shall drive said vehicle at a greater speed than eight miles an hour when within one and one-half miles of the city hall. The maximum penalty is $20 fine. The bill will be printed and then referred to the council for action.

Since printing the item regarding how to get small pieces of metal out that have accidentally dropped into a cylinder, a number of other methods have been suggested for accomplishing the same purpose. A correspondent in a French contemporary suggests to besmear the end of a screw driver or other tool with heavy grease and insert it into the cylinder to the point where the piece to be removed may be lodged, when the piece will most likely adhere to the tool. One of our readers suggests that a wire be wrapped around the screw driver a number of times and connected to the sparking battery; if the screw driver is then inserted into the cylinder any small free iron pieces in the cylinder will be attracted and held by it, and may thus be removed.

Commercial Vehicle Notes.

Plans are on foot to establish a system of automobile busses on the streets of Sioux Falls, S. D.

The American Express Co. expects to equip their Manchester, N. H., branch with motor propelled delivery wagons in the near future.

The Los Angeles, Cal., City Council has appropriated $2,300 for the purchase of an electric patrol wagon for the police department.

A gasoline motor track car has been put in operation lately on the Sioux City, Homer & Southern Railway in Nebraska. The line connects the Winnebago Indian reservation and Sioux City, Ia., and is twenty-four miles long.

A company has been organized to operate an automobile stage line between Trenton and Yardville, N. J., to compete with the street railway company, who have lately reduced the number of cars running between these points. Morris & Co., the Union Oilcloth Co., and a number of individuals are said to be interested in the venture.

A public hearing was given in Boston on November 15 by the aldermanic committee on licenses on the petition of J. J. Busch for a license for an automobile route with a stand in front of the Granary burying grounds. The various officers of the Cab Drivers' Union and the Boston Cab Co. were present as remonstrants. The point of their argument was that the automobile operators are not under the same police restrictions as are the cab drivers and can therefore regulate rates and routes to suit themselves and use methods of soliciting business which are denied them by law. The committee took the matter under advisement.

New Incorporations.

The Peerless Motor Car Co., New York, N. Y. Capital, $50,000. Directors. C. G. Wridgway, C. T. Anderson, L. H. Kittredge.

The Motor Car Equipment Co., New York City. Capital $25,000. Directors: Emil Grossman, Carl Kaufman, E. J. Kestenbaum.

Mobile Motor Car Co., Mobile, Ala. Capital, $15,000. Incorporators: Robert Morris, A. J. Spencer, M. Van Veuvel, Joseph Stone.

All-Around Philadelphia Automobile Co., Washington, D. C. Capital, $50,000. Incorporators: Frank C. Berens, S. Burkhart, Emmert, C. Bernard Werle.

Bennett-Bird Co., Chicago to manufacture automobiles. Capital, $10,000. Incorporators: A. G. Bennett, G. H. Bird, Mark Breeden, Jr.

The Wayne Automobile Co., Detroit, Mich. Capital, $300,000.

Club Notes

A. C. A.

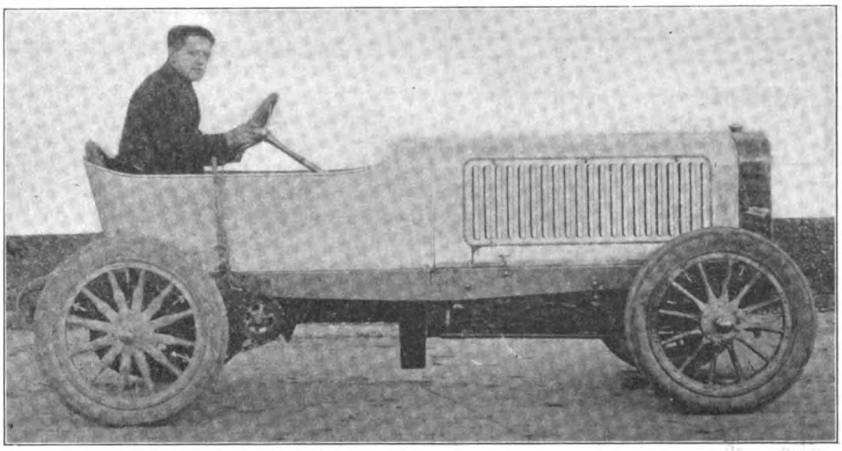
The annual meeting was held on Monday, November 21. Reports were presented by the various officers and committees, and the retiring president, W. E. Scarritt, made a lengthy address. The regular ticket named by the nominating committee was elected by acclamation. The new officers are, therefore: President, Dave Hennen Morris; first vice-president, Colgate Hoyt; second vice-president, William K. Vanderbilt, Jr.; third vice-president, Clarence Gray Dinsmore; treasurer, Samuel H. Valentine. Governors, to serve three years, James L. Breese, Melville D. Chapman and Harlan W. Whipple.

N. Y. STATE A. OF C.

The board of directors met in Syracuse on November 19. Considerable routine business was transacted. The legislative committee was instructed to prepare a bill to be presented at next session of the legislature making it a misdemeanor for a chauffeur to drive a car without the owner's permission. With such a bill in force it is believed a large percentage of automobile casualties can be avoided. A banquet was held in the evening.

SPRINGFIELD (MASS.) A. C.

Nearly fifty members and guests sat down to the annual club banquet at the Highland House on November 16. Good roads and favorable legislation were the chief subjects discussed by the speakers. Judge Kellogg, of the Westfield Court, said that in his opinion the speed limit should be twenty-five miles per hour in sparcely settled districts. He pointed out the weakness of laws which make divisions of the fines with those securing convictions. Among the speakers were: Harlan W. Whipple, C. H. Gillette, E. C. Lee, Asa Goddard, and President L. J. Powers.



POPE-TOLEDO 90 HORSE-POWER RACER

A. C. OF GERMANTOWN, PA.

Cards are out announcing the opening of the new club house at Carpenter and Elmer Streets, on the evening of November 23.

NEW BRITAIN (CONN.) A. C.

In an effort to increase its membership the club has sent out invitations to motorists in Berlin, East Berlin, Kensington, Plainville, Forestville and Bristol, to enlist on the club rolls.

PITTSBURG A. C.

The proposed endurance run to Mercer has been abandoned on account of the unfavorable condition of the roads. Plans are on foot for a series of smokers for the winter months at which vaudeville and musical programs will be offered.

N. Y. MOTOR CLUB.

At a meeting held on November 18 it was decided to incorporate the club. For that purpose a temporary board of directors was appointed, composed of C. H. Hyde, Frank J. Griffen, S. A. Miles, A. L. McMurtry, W. J. P. Moore, Sidney B. Bowman, Isaac B. Potter, H. A. Lozier and W. J. Morgan. It was voted to foster and promote motoring in the air. A constitution and by-laws were adopted.

LOUISVILLE (KY.) A. C.

About twenty-five members appeared before the committee on railroads and revision of the board of aldermen at their public hearing last week on the automobile ordinance proposed by Alderman Harris. As a result of their efforts the ordinance will be dropped.

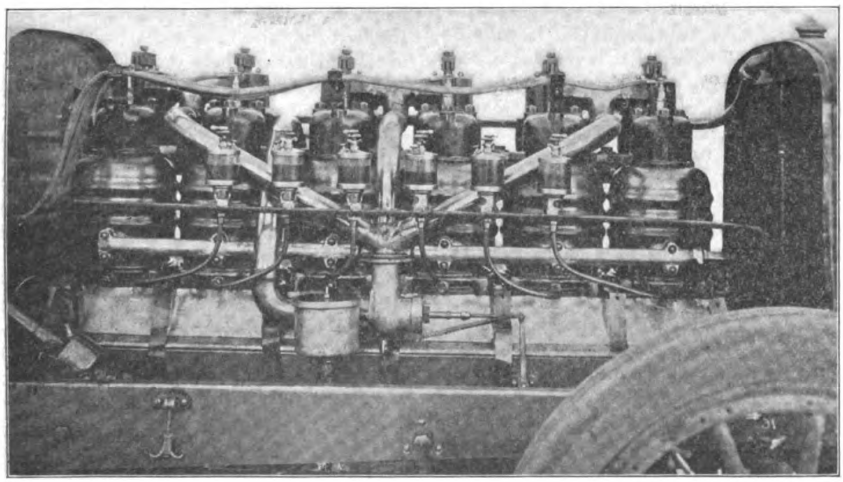
90 H. P. Pope-Toledo.

We show herewith photographs of the new Pope-Toledo racing car which has been entered by the Pope Motor Car Co. for the Ormond-Daytona record trials and also of its 90 H. P., six-cylinder motor. The latter has a bore and stroke of six inches and is designed along lines similar to those of the company's smaller cars. The drive is by bevel gear to a countershaft and by side chains to the rear wheels. It is said that on the high speed the crank and driving wheels are geared one to one.

Amendments to Gordon Bennett Cup Race Entry Conditions.

The racing committee of the Automobile Club of America announced last week certain changes in the conditions which govern the entries of cars of American manufacture for the Gordon Bennett Cup race. The date at which cars must be placed at the disposal of the committee has been changed from April 15, to May 1, and at that time each entrant must file with the secretary of the club an affidavit to the effect that his car has been entirely completed for a period of over two weeks. Entries will close on December 15.

In the article on sliding pinion change gear design in our issue of November 9th, the width of the low-speed pinions of the Pierce gear, which is 1 inch, was erroneously given as 7/8 inch. The bore of cylinder was also at one place given as $3\ ^{5}/_{16}$ inch, instead of $3\ ^{15}/_{16}$ inch, but this was merely a typographical error and the true bore was used in the calculations



POPE-TOLEDO RACER—VIEW OF ENGINE.

MINOR MENTION

The New Kensington (Pa.) Automobile Co. are erecting a new factory.

The C. H. Blomstrom Motor Co., Detroit, Mich., are making extensive additions to their plant.

The Rhodes Manufacturing Co., Grand Rapids, Mich., are putting out a new clincher tire remover.

The Adwear Auto Tire Sleeve Co., North Attleboro, Mass., have recently organized to make tire sleeves.

The Wolverine Motor Car Co., of Detroit, Mich., purpose to move to Fort Wayne soon.

T. J. Blake & Son, Hartford, Conn., have recently put upon the market a special alloy for automobile use, called Hercules Bronze.

The capital of the Hanson Automobile Works of Chicago has been increased from $1,500 to $2,500.

The capital stock of the Welch Automobile Co., of Pontiac, Mich., has been increased from $50,000 to $100,000.

The Electric Supply Co. of Savannah, Ga., will soon occupy a one-story brick garage which is building on Liberty Lane.

The Denver (Col.) agency for the Reo car has been taken by the Barclay Automobile Co. of that city.

The first automobile races to be held in South Carolina will be run off at Charleston on Thanksgiving Day.

Joseph Heller, who is to import Pipe cars, made in Belgium, has taken quarters at 1722 Broadway, New York City.

There is a movement on foot to make entries for the Ormond-Daytona record trials open to all instead of by invitation, as is now the case.

The Butler, Ind., Arc Light Co. are moving into a new factory and will manufacture the Burke Automobile Climber—an "anti-skid" device of their own design.

The Electric Vehicle Co. has commenced suit against Henry and Albert C. Neubauer, managers of the Palais de l'Automobile, the New York branch of Panhard & Levasser, for infringement of the Selden patent.

The L. H. Fawkes Co., with J. S. Spargo, as manager, opened an automobile sales room last week at 93 East Fifth Street, St. Paul, Minn., and have taken the agency for the Rambler cars.

The Harrison Wagon Works of Grand Rapids, Mich., are reported to be building a number of experimental cars with a view to entering the automobile manufacturing business.

In a report, submitted at their request to the Nassau County (L. I.) Board of Supervisors, Alfred Reeves states that the cost of the Vanderbilt Cup race to the A. A. A., contestants and others, aggregated $550,000.

The Fisk Rubber Co., of Chicopee Falls, Mass., have taken out a license to manufacture tires with the Bailey "Won't Slip" tread. They have also arranged to furnish the Samson leather cover on their tires.

The Standard Roller Bearing Co., of Philadelphia, have recently purchased a quantity of land in the neighborhood of their plant and will erect a steel casting foundry and an addition to their steel bolt factory.

Automobilists of Brunswick, Me., are planning to form a club and it is proposed to invite those in Bath to join with them in the organization of an inter-city association.

The Republic Rubber Tire & Shoe Co., of 138 West 52d Street, New York City, have brought out a "nonskid" leather cover which, it is said, can be attached to any make of tire.

The Royal Automobile Co., Cleveland, O., have filed an amendment to their charter, which provides for an increase in their capital stock to $250,000, $100,000 of which is to be preferred.

On the 10th the Autocar Co., Ardmore, Pa., celebrated the opening of their new shop by a lunch participated in by their 400 employees and the workmen engaged on the new building.

The Springfield (Mass.) Hat and Cap Co., are putting out a portable rubber basin which is provided with compartments for soap and towels and can be folded to fit in the tool box of a car.

The N. A. A. M. has declined to sanction the automobile show which had been planned for St. Louis in January. It is likely that the date will be changed to May or June.

Miss Anna Buddick, of Stockton, Cal., was killed on November 13. She was riding on the rear part of an automobile with her feet hanging over, when her skirts caught in the chains and she was thrown to the pavement and dragged for some distance.

The firm of Whitten & Clark, Springfield, Mass., have reorganized, Mr. Whitten having resigned, and are now known as the E. R. Clark Automobile Station. They have taken the E. R. Thomas Motor Co. agency for 1905.

The Hiland Automobile Co., recently organized in Pittsburg, Pa., is erecting a salesshouse at Baum and Beatty Streets. The officers of the company are: Dr. John A. Hawkins, president; Dr. George A. Urling, treasurer; F. W. Anderson, secretary.

The Corbin Motor Vehicle Co., of New Britain, Conn., will soon move into the old plant of the New Britain Knitting Co. The company expect to make a small car of medium price as well as their touring car, during 1905.

The James Brown Machine Co., of Pawtucket, R. I., have succeeded the United Motor Corporation and will manufacture the Cameron cars. For 1905 they expect to market a car with a two-cylinder air cooled motor, and a larger one with a three-cylinder motor.

Miss Helen Walker, of St. Louis, has filed an attachment suit against the Grout Bros. Automobile Co., of Orange, Mass., for $700. She alleges that the automobile which she purchased from the defendant company was not, as represented, easy to manage, and did not give satisfaction.

The Mobile Motor Car Co. was organized at Mobile, Ala., on November 10, with a capital stock of $15,000. The officers of the company are Robert Morris, president; A. J. Spencer, first vice-president; M. Van Veuvel, second vice-president; Joseph Stone, secretary.

It is probable that the Essex County (N. J.) Board of Freeholders will soon widen and improve the plank road between Jersey City and Newark. This road is the most direct route from New York to Newark and vicinity and would be much used by motorists if in better condition.

Smith & Mabley, of New York City, are said to have made an arrangement with Allen, Halle & Co., whereby the former concern secures the selling rights for the Mercedes cars in America. Smith & Mabley, being members of the A. L. A. M., Mercedes cars will henceforth be sold under Seldon licenses in this country.

James Bradley and G. Feltman, machinists and bicycle dealers, have purchased a building at 22 Plain street, Albany, N. Y. The building has a main floor, 100x40 feet, which will be used for storage purposes, and three other floors on which a machine shop will be installed. The firm intends to engage also in the agency business.

The New Jersey A. C. held a race meet for amateur drivers in stock cars on November 19. The winners were: I. M. Upperau (Cadillac), A. E. Reid (Orient), R. T. Newton (Autocar), E. Strasser (Locomobile), A. W. Stockbridge (Locomobile), M. Roberts (Thomas). B. M. Shanley, Jr., in a 90-h.p. Mercedes, drove in an exhibition trial, making 4½ miles in 5:56 1-5.

While rounding a sharp curve in their car in a narrow gorge near Santa Barbara, on November 12, G. E. Bailey and wife, of San Francisco, Cal., came suddenly upon a herd of steers, who stampeded through fright at the car and in endeavoring to rush by forced the car over the edge of a cliff, badly wrecking it. The occupants escaped without injury.

On the morning of November 18 John Clemons, a farmer, was found pinned in a blanket lying by the side of the Pelham, N. Y., Parkway, suffering from a fractured skull. His wagon was found badly smashed and his horse tethered to a tree a short distance away. Upon recovering consciousness, he stated that while driving over the road in the night a large touring car, running at high speed, struck his wagon and threw him out. The occupants of the car, upon learning his condition left him as he was found, promising to send aid, but failed to do so. George Mack, a chauffeur, has been arrested in connection with the case.