MINOR MENTION

The B-L-M Motor Car Company, of Brooklyn, have opened temporary offices in the Spalding Building, New York.

The Oldsmobile Motor Works, of Lansing, state that they will build the buggy type of runabout during the coming year.

The Holmes-Schmidt Company, of Chicago, report that they will build a car of their own for 1907, but will continue to handle the Welch line of vehicles.

Chas. J. Glidden has returned to Boston from his automobile tour through Mexico. This tour carried him into thirty-six different countries, and his total mileage on this trip is 39,768.

The Cartercar Company will soon complete their branch salesroom on Jefferson avenue in Detroit. The company will occupy the entire four stories of the building, which is to be 35x125 feet.

We are informed by the Gabriel Horn Manufacturing Company, of Cleveland, Ohio, that they have recently doubled the manufacturing capacity of their factory, and now have 13,000 feet of floor space.

The Packard Motor Car Company, of Detroit, claim to be the first company to test out their 1908 cars on the road. It is said that before the executive staff of the company left Detroit for the Madison Square Garden Show the four cylinder 1908 Packard was in commission.

The G & J Tire Agency, at 711 North Broad street, Philadelphia, maintain a powerful free pump for all motor enthusiasts who desire to inflate their tires. The managers of the agency have received many expressions of approval from Philadelphia autoists for their thoughtfulness and generosity.

At the annual meeting of the Brennan Motor Manufacturing Company the following officers and directors were elected: President, A. C. Brennan; secretary, Ernest R. Deming; treasurer and manager, P. H. Brennan; directors, A. C. Brennan, Ernest R. Deming, P. H. Brennan and Arthur Perkins.

The Detroit Spring Wheel Company, which has recently been incorporated to manufacture the spring automobile wheel designed by B. S. Seaton, alleged to be the inventor of the third rail system for electric railways, will occupy offices in the Penobscot Building, Detroit, until a suitable factory can be leased or built.

The Buick Motor Car Company, by reason of the extensions and additions to their group of plants at Flint and Jackson, Mich., have inaugurated a foreign department, with John L. Poole as manager. They believe that there is a growing demand for American medium priced cars in foreign countries. Mr. Poole's headquarters will be in Paris, France, care American Express Company.

The Hartford Suspension Company have recently established the following agencies: Springfield Automobile Company, Springfield, Mass.; the Dominion Automobile Company, Ltd., Toronto, Winnipeg and Montreal, for Canada, and the Chancellor & Lyon Motor Supply Company of Los Angeles and San Francisco, for California.

A proposition to admit chauffeurs to the Protestant Coachmen's Benevolent Association disclosed the fact that many well known professional drivers have become successful chauffeurs. One reason for their success is that they know how to care for a fine equipage, the same care being necessary in the case of the modern luxurious machine.

The Autocar Company, of Ardmore, Pa., claim the distinction of originating the idea of the floating ring clutch, an improved form of which they are still using in their models. They claim also to have built the first shaft driven automobile in this country and the first car to have a two cylinder opposed engine located in the front under the hood.

At the annual election of officers of the Washington A. C., held on Saturday evening, January 12, at the clubhouse, R. B. Caverly was elected president to succeed W. S. Duvall. The remaining officers were re-elected as follows: Vice president, Col. C. E. Wood; secretary, LeRoy Mark; treasurer, O. J. DeMoll; captain, F. H. Edmonds, and lieutenant, C. Royce Hough.

The Brush Motor Car Company, of Detroit, are planning to make 2,500 cars for the season of 1907, 5,000 during 1908 and 10,000 yearly thereafter. They plan to sell this car at $500. For 1907 the cars will be assembled in the plant of the Briscoe Manufacturing Company. This is the first time a car fitted with solid rubber tires and a special spring suspension has been put on the market in large quantities.

New Incorporations.

Pittsfield Motor Carriage Company, Pittsfield, Mass.—To manufacture six cylinder cars.

Portland and Rockland Automobile Company, Rockland, Me.—Agency and garage. Capital stock, $10,000.

Detroit Automobile Syndicate, Detroit, Mich.—To build touring cars. Incorporators, Ralph Dyar, John Dyar, B. S. Warren and W. T. McGraw.

The Chicago Vulcanizing Company, Chicago, Ill.—Capital, $20,000. Incorporators, H. W. Teniere, J. W. Benton, J. G. Boos, D. E. Teniere and H. E. Teniere.

Detroit Spring Wheel Company, Detroit, Mich. —Capital, $100,000; to manufacture automobile spring wheels. Incorporators, W. T. McGraw, of Detroit, and Walter B. Parker, of St. Louis.

Newton Garage and Automobile Company, Portland, Me.—To manufacture and deal in automobile supplies. Capital stock, $10,000. Offices, President, Nathan Clifford; treasurer, Elgin C. Verrill.

The Hawley Automobile Company, Ltd., Constantine, Mich.—Capital, $1,000,000. Officers, W. L. White, president; James Welch, vice president; R. B. Hawley, secretary, and E. P. Partlow, treasurer.

Coppock Motor Car Company, Marion, Ind.—Capital, $100,000. Officers, M. Earle Brackett, president; M. W. Myers, vice president; H. F. Reynolds, secretary; Harry Ward, treasurer, and L. W. Coppock, general superintendent.

The Capital Auto Company, Lansing, Mich.—Capital, $10,000; to control the Reo agencies in fourteen counties. Officers, T. E. Peake, president; B. Stanchfield, vice president, and T. A. Wall, secretary and treasurer.

Trade Personals.

Frederick Seitz has been appointed assistant sales manager of the Olds Motor Works of Lansing.

P. A. Williams, Jr., has been appointed sales agent for the Knox Motor Truck Company, of Springfield, Mass.

Joseph Tracy has accepted the position of consulting engineer to Craig-Toledo Motor Car Company, of Toledo, Ohio.

Richard Bacon, Jr., will manage the new branch for the Cleveland Motor Car Company at 1470 Michigan avenue, Chicago.

Frederick Boron has succeeded H. F. Siegrist as treasurer of the Swinehart Clincher Tire and Rubber Company, Akron, Ohio.

H. N. Harding takes the place of the late Ernest Keeler as driver of racing cars for the Olds Motor Works of Lansing.

J. A. Swinehart, of the Swinehart Clincher Tire and Rubber Company, Akron, Ohio, has just returned from his recent European trip.

At a recent meeting of the board of directors, Nicolas G. Roosevelt was elected treasurer of the Dragon Automobile Company, Philadelphia, Pa.

Marcus Allen, formerly of the Water Paint Company, of America, has been appointed manager of the Automobile Equipment Company of Detroit.

Owing to press of other business, O. E. Seager has retired as vice president of the Jackson Auto Company, of Kansas City, Mo., but will retain his stock.

Pierce Smith, of the J. D. Smith Foundry and Supply Company, Cleveland, is now associated with the Allyne Brass Foundry Company, of Cleveland and Detroit.

New Agencies.

Mobile, Ala.—Flock & McBee, Buick.

Camden, N. J.—C. C. Albertson, Autocar.

West Chester, Pa.—Morris B. Slack, Ford.

Mobile, Ala.—Guthrope & McKean, Maxwell.

Boston, Mass.—F. R. Parker & Co., Elmore.

Marblehead, Mass.—Gardner R. Hathaway, Ford.

Utica, N. Y.—New York Auto Company, Cartercar.

New Haven, Conn.—N. B. Whetfield, Oldsmobile.

Lakewood, N. J.—Jos. B. Hoff, American Mercedes.

St. Louis, Mo.—Colonial Auto Company, White steamer.

St. Louis, Mo.—The Macnish Auto Company, Rambler.

Los Angeles, Cal.—H. C. Harrison Company, Oldsmobile.

Milwaukee, Wis.—Hibbard Auto Company, Oldsmobile.

Pacific Commercial Car Company, Tacoma, Wash.—Cartercar.

Cleveland Motor Car Company, 1470 Michigan Avenue, Chicago.—Cleveland.

Minneapolis, Minn.—F. H. Winston, Jr., 709 Hennepin avenue, Oldsmobile.

Reo Automobile Company, Detroit, will soon open their new agency on Jefferson avenue.

Chicago.—Maxwell-Briscoe-Chase Company, 1407 Michigan avenue, Columbus electric vehicles.

The Forest Auto Company of St. Louis, Mo., formerly the Union Auto Company.—Oldsmobiles.

Philadelphia.—Fraser & Reynolds, proprietors of the Rittenhouse Garage, South Twenty-third street, Wayne.

The Oldsmobile Company, of Cleveland, will open a new agency at 1010 Prospect street. They are to succeed the Auto Shop Company, of 731 Vincent street.

A Technical Review of the Show.

By C. F. Smith.

A trip to the Show at the Garden last week amply repaid anyone interested in automobiles, and the display of automobiles was a most interesting and pleasing sight for the curious who went for sightseeing only. The Garden was never so lavishly and tastefully decorated and the exhibits were never so well arranged. There was an ever varying stream of humanity, which presented many interesting types, from the "wise" fellow, who was trying to tangle up the general information men, to the small boy, who was just prying into the mysteries of the automobile. The interest in the Show was clearly demonstrated by the large attendance during the very disagreeable weather which characterized Show Week, and on "dollar days," when the price of admission was doubled. Possibly each one thought "the other fellow" would stay away on these days and give him a better chance to see things.

Very few radical changes were noted, which would seem to indicate that the general design of automobiles has nearly reached finality. A refinement of details and general use of the best material obtainable characterized the exhibits throughout. The accessories exhibits presented very few new appliances, but a great many new makes of standard attachments were shown. There were only two or three "hands off" exhibits, most manufacturers realizing that most people are prejudiced against such an exhibit, and leave with the idea that it is "Pretty, but——"

The line along which most improvement, changes and arrangements have been made seems to be that of ignition, apparatus for which appears in almost every conceivable form. The double ignition system is rapidly replacing the single equipment, with only battery and coil or magneto, as the case may be. One car gives the option of jump spark or make and break; both magneto and battery are furnished in either case.

Most cars having the double system are equipped with two sets of spark plugs, but there was shown one having a single set of plugs with a high tension switch on the dashboard. One prominent foreign car was equipped with an Eisemann tilting magneto, the spark being advanced by rotating the entire magneto about the driving shaft. There was also shown a jump spark equipment and magneto in which the magneto was low tension and replaced the battery, in connection with a single coil and separate distributer. Some cars were provided with a waterproof magneto case, which would seem to prevent some of the trouble with ignition circuits.

An emergency cut-out was shown which short circuited the make and break bus bar by means of a button inserted in the dashboard, which pressed a plunger against the end of the bar, thereby grounding it through the metal dash. A spark retarding device for starting was shown which was partially automatic, the distributer and timer being rotated by connection with the relief cock operating rod. Some cars had the spark governing lever placed on the dash instead of on the wheel, as has been the general custom.

The method of supporting the lead wires and their position seem to have received considerable notice. Many of the cars provided cable carrying standards, which consist of a metal upright attached to the cylinders, which supports a fibre block having holes for carrying the cables. A car which had conduit tubes for carrying the cables from the distributer to the spark plugs had a unique scheme for tracing the circuits without testing by spark. The cables were of different colored insulating material, by which they were easily distinguished at their ends.

There seems to be a diversity of opinions as to the proper place for the spark plug in the cylinder. Some plugs are arranged vertically, some horizontally, some inclined, and placed anywhere from one side of the cylinder to the other. One manufacturer carried on extensive experiments to determine the most advantageous position for the plugs. His car is equipped with two sets of plugs for battery and magneto, and has inlet and exhaust valves on opposite sides of the cylinder. The battery spark is used simply for starting when desired, and, in an emergency, the magneto supplying the service system. The plugs are placed in a vertical position directly over the valves, the magneto plugs being over the exhaust valves and the battery plugs over the inlet valves.

During the experiments to determine the proper location for the plugs an engine was used in which the cylinders were tapped in various places and the plugs tried in all positions and locations. It was found that when the plugs were in a horizontal position a pocket was formed which caught cylinder oil and impurities, which fouled the points, thereby weakening the spark and sometimes rendering the plug entirely useless. When this occurred the plug was taken out and perhaps a couple of drops of oil would run out of the end, and upon the plug being replaced it would work all right until another accumulation had formed.

The plugs were then tried over either valve, with the result that no difference was noticeable when placing them over the inlet or exhaust valve. They were found to keep cleaner over the exhaust valve, but were more liable to become damaged by the heat cracking the insulation. These experiments show that there are slight advantages and disadvantages in either position, and the principal reason for placing them as they are placed on this particular car is to simplify the wiring and connections.

A great variety of inlet pipe connections was shown, and much ingenuity was displayed in attempts to solve the problem of equal distribution of gas to all the cylinders. One foreign six cylinder car connects the inlets of the pairs of cylinders by two tubes, which form two U shaped connections between the cylinders, into which connect the upper ends of a Y pipe from the carburetor. Another foreign four cylinder car connects directly from four inlet openings and one carburetor pipe into a single manifold of extra large tubing, which is said to give equal distribution on account of the excessive size of the passages. A connection which would seem to fulfill the requirements has a separate pipe leading from the carburetor outlet to each cylinder.

A few cars showed offset cylinders and cam shafts, but manufacturers in general do not seem to have come to a realization of the advantages offered by this construction.

The multiple disc clutch in many modified forms is gaining in popularity, as it has only a small moment of inertia, making gear changing easier and allowing of larger blades in the flywheel when that part is used as the fan. Two or three cars provide an interlock for the clutch and gear change mechanism, but most designers deem this unnecessary. Several machines showed the mechanical oiler attached to the engine base, some with sight feeds on the dash and some without. A ratchet operated oiler was shown operating from an eccentric stud on the rear end of the cam shaft.

One manufacturer of six cylinder cars realizes the gradually decreasing cooling effect of the air from front to rear, and therefore increases the cooling flanges toward the rear until the fifth cylinder has the most, the number of flanges on the sixth being the same as the fourth, as this cylinder is next the fan flywheel and receives the benefit of side draughts of air.

To facilitate ease in starting there was shown a starting crank geared by a spur gear reduction to the crank shaft.

A progressive change gear was shown with a self finding lever and index guide, which is designed to operate with the least attention and exertion.

A unique idea was embodied in the flexible connection between the clutch and the transmission case on one car. Instead of the usual two universal joints there was inserted one joint consisting of a slot in the ends of the abutting shafts, between which was inserted a cross tongue block, the whole of which constituted a Hooke's coupling.

On the other hand in a certain foreign machine the universal joints are dispensed with, the clutch surface being suspended on the flywheel by means of rubber collared studs, which are designed to allow of considerable disalignment. One type of joint quite extensively used was what might be called a "wrench" type of joint, the forks being very heavy and closing about a square block, cross pins being used simply to keep the parts in place.

BRAKES.

A study of the various brake connections was interesting. Most cars are provided with equalizers, of which there were many types shown. The most common type was a short bar engaging the ends of levers on adjacent ends of the interrupted rocker shaft, the operating rod being connected to the centre of this bar. One type of equalizer does away with the rocker shaft, the bar being extended outside the frame and having the rear brake rods attached directly to its ends. A very neat arrangement was shown on a prominent foreign car, in which the ends of a cable were attached to the levers on the interrupted shaft, the cable running over a pulley on the end of a lever on the forward rocker shaft.

An "ease-in" brake connection was shown where the power was transmitted through a stiff compression spring on the brake rod which passed through an eye in the end of the brake lever, the spring being placed between the lever and a head on the end of the rod. Most cars are now provided with a ratchet sprag, and one side chain driven car has the pawls engage in the teeth of the rear sprockets. Very few machines retain the "push" motion to the brake hand levers, the natural tendency being to pull, as on those cars not having an interlock the clutch pedal is simultaneously operated.

The simplest method of placing a double set of brakes on the rear wheels is to have external and internal brakes operating outside and inside the same drum, but a direct drive car was noted with two sets of internal expanding brakes, using a double drum, the whole being encased and presenting a very neat appearance.

Of radius and torsion rods there were many types, some cars having a single heavy rod, others having a lighter rod on each side, a few having both, and a triangle effect in design was also shown. One car had a torsion rod which was markedly different from all others. This rod was an I shaped beam secured in the top of the rear axle housing and standing vertically. Attached to the frame was a heavy crossbar having two rollers at the centre, between which the torsion bar projected. The torsion was resisted by the rollers, which lessened the wear and noise due to the motion of the bar on jouncing. The objection to this scheme would seem to be the room it takes up at the rear, which is usually utilized for carrying purposes, as tool box, etc.

The commercial car exhibit was as interesting as ever. Several new types of wagons were shown, but there were no radical changes in design, the most noticeable features being the increased size and capacity.

The electric exhibit shows a decided tendency toward a chassis type light car. This design permits of various bodies being attached at will, and also facilitates testing at the factory without harm to the bodies.

A feature of the Show was a "combination" gasoline and electric car, the power being generated by a gasoline engine and transmitted by means of an electrical plant, which takes the place of the usual cumbersome power consuming gears. This electric plant acts as an electro-magnetic clutch, the power which is generated by slippage at the generator being used to assist the turning effort of the shaft at the motor. The action of this car is very simple, and there can be no jerk from sharp clutch engagement nor stripping of gears; also, the engine is always running at its most advantageous speed, and the speed of the car is always the maximum possible and is self adjusting to grades.

There were several types of starting devices shown, all of which are claimed to "do the business."

The accessories exhibits were very interesting and instructive. Before looking over these exhibits one has no idea how many things there are which are applicable to an automobile, and each and every one of which he ought to have—according to the demonstrators. There are all kinds of tires and tire treads for all purposes, most of them anti-skid life savers, and a few cushion trouble savers. The shock absorbers were quite interesting, and some of the exhibits were very novel, one exhibitor demonstrating the anti-jolt qualities of his device by means of a pair of springs upon which was mounted a chair, with a huge Teddy bear seated therein, alternating to enjoy (?) the jounce of the springs under absorber and non-absorber conditions. to the intense delight of the juvenile audience.

Speed indicators seem to be the proper thing to manufacture nowadays, if the number shown counts for anything. There were magnetic, electric, centrifugal, liquid, and, in fact, every type of speed indicator imaginable. A power tire inflator has lately come out which is designed to make the engine do the work, or it can be operated independently by the starting crank.

In lamps there seems to be a tendency toward refinement and high grade finish rather than mechanical innovation, although a new searchlight was exhibited which does double duty, a double burner and mirrors projecting a powerful beam of light far ahead of the car, and a diffused light directly in front to show the road directly ahead.

Few new features seemed to have developed in carburetor design, but we may expect quite a change in the construction of this very important part should a new fuel present itself.

Summed up as a whole, the general design of the motor car seems to have about reached finality, the design in minor details being varied to suit each individual designer, and no radical change may be looked for until some new method of propulsion is invented.

For the race for the Emperor's Cup, which is to be held on the Taunus Circuit next summer, no less than 92 entries have been received. Of these 32 are German, 21 French, 19 Italian, 10 Belgian, 4 English, 3 Austrian and 3 Swiss. The event will therefore be a truly international one.

Some Novelties of the Show.

J. Grant Cramer.

I well remember the first automobile show in Madison Square Garden in November, 1900. How we used to wonder what the improvements for the coming year would be, and how great they were in a comparatively short period of time! But now it is different; until some very radical change is made in the construction of explosion engines, most of the changes will be along the line of refinements; changes for the better will be made in the matter of the metals used in construction. Perhaps some day before long we shall have an explosion turbine, just as we now have steam turbines; but up to date there is no metal that can stand the intense heat that would be generated in such an engine; the valves would warp in no time.

The Mechanical Branch of the Association of Licensed Automobile Manufacturers has done good work toward the task of standardizing design, and I think we may safely say that one of the most important steps taken in the automobile industry was the establishing of the Licensed Association Laboratory at Hartford, under the direction of Henry Souther, a metallurgist of note. This laboratory is fully equipped with the latest machines. Experiments in all parts not fully developed, necessary in the make-up of an automobile, are constantly going on. The experiments in metals have been particularly valuable.

A close observer at the Show will have seen that there are really very few novelties, and practically no startlingly new devices. This may seem to some like a strong statement, but the dissenters may accept it more readily if I put it differently, and say that there are many good cars made and that in most cases their makers attain the same result, using somewhat different methods in so doing.

The Fiat pneumatic self starter is ingenious and appears to be efficient; however, it, together with two other tolerably well known self starting devices—the one American, the other French,—may appeal to persons who like new things for their novelty, and perhaps also because they are tempted into forgetting the stern fact that if you would get energy out of anything, you must first put energy into it. It is a question, however, whether the compression relief used on some cars, the Pierce, for instance, does not make starting so easy as to render undesirable the extra complication, weight and expense of a self starter.

Sprags are useful and are found on a number of cars. I know of at least one case, however, where the sprag not only held the car from going backward on a steep clay road, but prevented it from advancing for a time; the sprag ran deep into the soft soil and refused to come out. The Pierce sprag has a disc of fair diameter, about 3 or 4 inches from the end.

The Darracq has the ignition lever low down on the dash, the designer evidently believing that the average driver is prone to play with the advance and retard too much, and I am not sure but that he is right.

The Isotta Fraschini has very much less wire than is usually found on a car having jump spark ignition, as the wires run

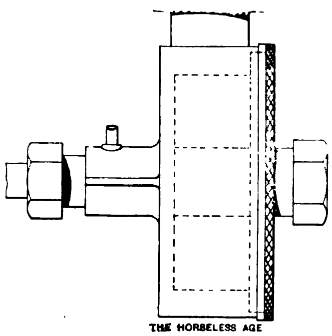


FIG. 1.

directly from the Bosch high tension magneto to the plugs. There is no coil.

The Rochet-Schneider has a new type of carburetor this year. Instead of heating the mixture by hot water from the circulation system, the 1907 type is heated by hot air from the exhaust. As the engine speeds up a diaphragm opens and admits cold air in order to keep the temperature constant.

The C. G. & V. has a very efficient chain cover made entirely of sheet metal. A grease cup is provided to force lubricant upon the chain without opening the cover. Spring catches allow easy removal of part of the cover for the purpose of inspecting the chain.

The Lozier has double ignition (jump spark), by magneto and by storage battery. There is neither a distributer nor a coil on the dash for the magneto, whose distributer is self contained. There is an automatic brake on the clutch shaft to slow it down and to obviate clashing of the gears when shifting them. In the water cooled brake on this car the water actually drops on the metal surface instead of circulating about the brake, as in European practice. The Lozier also has an excellent

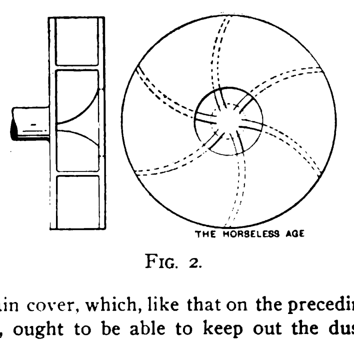


FIG. 2.

chain cover, which, like that on the preceding car, ought to be able to keep out the dust, mud and water most effectually. Instead of being made entirely of sheet metal, a part of the upper and lower portions is made of leather. It can readily be opened to admit of inspecting the chain or to replace a link. There is a spring covered oil hole in the chain case.

A chain cover that thoroughly protects is undoubtedly a very valuable and important addition to a car. On my long European bicycle trip I had a Frost chain cover, which I also used on many other journeys, and found that it protected the chain perfectly. I traveled over 4,000 miles with the same wheel and only had to oil and graphite the chain twice during that time. Of course, at various times I rode through much dust, and one day I rode for hours in a driving rain storm in the Thuringian Forest in Germany in water over the rims, yet not a drop got to the chain. The makers of the Sunbeam—an English car—fit it with a chain cover which is so constructed that the chain runs in an oil bath.

In the Peerless steering gear a whole gear is used instead of only a segment, as is the general custom. This can be turned around in case of wear. There are no movable wires on the commutator and there is only one brush. The makers claim that there is only one-fourth the usual amount of wear. The main bearings are in removable cages.

The Knox has an automatic brake which

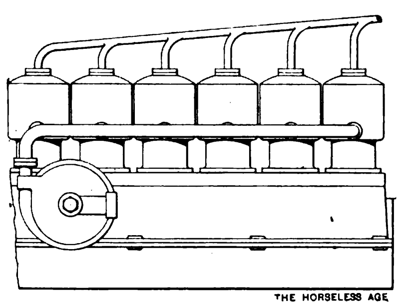


FIG. 3.

slows down the shaft to prevent clashing of the gears when shifting.

It may be interesting to note that two very successful air cooled cars—the Knox and the Marmon—have very similar systems of lubrication. They are combinations of the principal features of two excellent French cars—the De Dion and the Delaunay-Belleville. I gave the salient points of these systems in an article in THE HORSELESS AGE of December 12.

The Apperson has a double frame which is intended to prevent sagging or twisting.

J. B. Herreshoff Visited the Palace A. C. A. Show.

J. B. Herreshoff, the noted boat designer, visited the recent Palace Show in New York, and although blind seemed much interested in the exhibits, through the marvelously developed sense of touch of his fingers being enabled to appreciate changes in design of of the 1907 models. While standing on a low platform beside one of the cars he remarked that the tires were 36 inches, after feeling their height, but as he stepped off the platform he said, "Oh, no! they are only 34 inches, because your platform is 2 inches high." He was accompanied by Mrs. Herreshoff and Harold, who acted as his guide.

Water Cooling System.

BY DAVID LANDAU.

Radical improvements in the cooling system are not to be expected, as this system is so near perfection that troubles seldom arise from it. Yet, so long as radiators, pumps, piping and water jackets are called

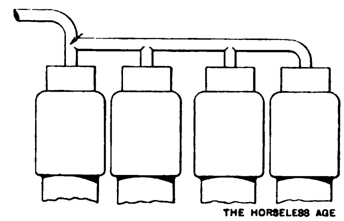
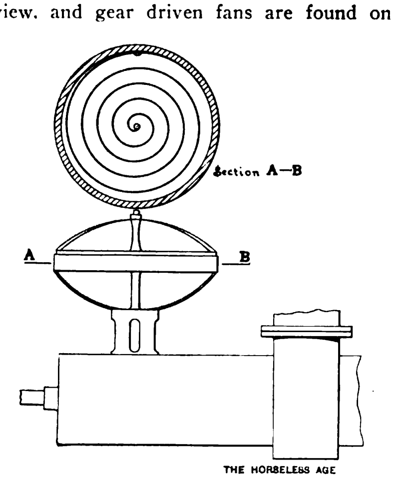


FIG. 4.

for, they must be designed to do their work with a minimum of expense. Radiators have attained a remarkable degree of perfection, and in some cases the weight of these devices is so low that the amount of heat they absorb and dissipate in a few minutes would be sufficient to melt their own substance. The water jackets on the engines are deeper, to allow of free and rapid circulation of the cooling liquid, and better jacketing of the valves, valve seats and cylinder walls is provided. We have it on the authority of Mr. Lake that the casting of the jackets are even better attended to here than abroad. The centrifugal pump has its large number of adherents, and the gear pump as well, but the thermo-siphon system was not represented at all in this show.

The fan, which is so important an adjunct in the cooling system, has received some attention from a mechanical point of view, and gear driven fans are found on



(See Carburetor Art, Page 124.)

some cars, notably the Winton and Thomas. The Thomas also shows a friction coupling in the fan to prevent undue strains on the train of driving gears when starting and accelerating the motor. The fan itself has not received the attention that it might, and we observe that the diameter, number of blades and shape, as well as the speed, do not follow any rational laws. Even the air coolers have not studied this problem in its entirety, if we can judge by appearances. The pump, of whatever type, is more judiciously designed, and some even show radical changes from common practice. An example of this is seen in the Lozier centrifugal shown in Figs. 1 and 2.

The casing containing the impeller is parted, and the disc is threaded and screws into the pump shell. This construction of the impeller is used in sand dredging pumps, and its use here is apparently intended to prevent wear on the casing by the impeller blades striking against it, no thrust bearing being provided. This pump has no volute, and its efficiency must, therefore, be low, in spite of its other good mechanical features. The pump, like the fan, has not received the attention it deserves. The centrifugal pump on the Stevens-Duryea six cylinder is of very large diameter—in fact, the largest seen on any automobile—and the piping from the pump to the cylinders and from the cylinders to the radiator is convergent and divergent, as it should be. In fact, of the several cooling systems observed this conforms nearest to correct hydraulic principles. I was not able to learn how the axial thrust of the runner was provided for (see Fig. 3).

On one car the return pipe, Fig. 4, ran into a T in the first cylinder, producing the most unmechanical job imaginable, and I trust that my criticism of this detail will not pass the chief engineer's notice. In one or two cars iron and steel piping was observed, while the rest had either brass or copper. In the Winton not a single piece of hose is used in the water cooling system, and this practice is very commendable, for several reasons. The piping in the Columbia car is also clean cut, and represents a very carefully laid out system, especially with regard to the attachment to the cylinders. In a few well known cars the piping was small and the pump was apparently geared up to compensate for this, but this seems to be poor economy.

Improved details such as those just enumerated go a long way toward perfection, and, on the whole, improvements will come more rapidly in these parts as designers spend less time on the other parts, which are also reaching perfection.

A law has recently been adopted by the British Parliament intended to prevent the giving of secret commissions. It is thought that the law is particularly aimed at "grafting" chauffeurs. The maximum punishment for either giving or receiving of commissions of this sort is a fine of £500, or two years' imprisonment; so it was evidently the intention of the Legislature to strike as hard a blow as possible at these practices.

Carburetors at the Show.

By David Landau.

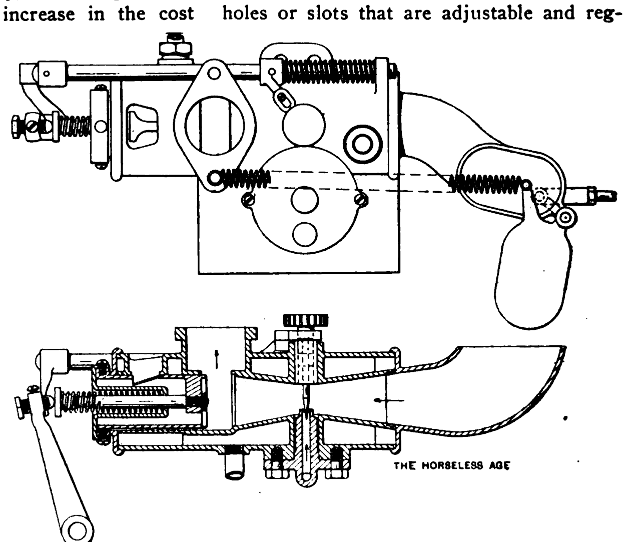
A very talented engineer remarked to the writer a few days ago that "We have reached commercial perfection in auto building to the extent that any automobile, regardless of its price or power, can be depended upon to leave New York and complete a journey of several hundred miles, and be expected to return within a predetermined time." This is a very gratifying statement when we consider that only six or seven years ago this could not be said of even the very best machines then made. The gentleman referred to also remarked: "Now we have reached that stage of building when the successful manufacturer is engaged in the refinement of minute detail." In auto building, while we have not yet come down to the minute economics where eventually the profits of any legitimate business enterprise are to be sought, still we are working in that direction. To practice economy we should start at the very beginning, and hence we have to deal with the fuel problem or carburation.

As was intimated, radical changes are not to be found, but detail changes there are, and broadly we may assert that the "warm air pipe" is not used as much as formerly on carburetors, with the result that this pipe is saved, a denser charge of gas is introduced, and greater power developed. If the abolition of this pipe means that the mixture brought to the engine is, say, 5 to 10° F. lower in temperature than it would otherwise be, and we can secure between, say, 1 and 3 per cent. more power without increase in the cost of the engine, this must be clearly a gain. Practical men are likely to sneer at these small figures, yet these same individuals would not place an order with a firm whose price on raw material was 1 or 2 per cent. more than a competitor's.

Perfection in carburation means less gear changing, and ultra perfect carburation means practical abolition of gears. But the problem of perfect carburation involves many serious difficulties, and to one who has never investigated the problem it may appear as a very simple one, like the problem of determining the flow of water in a pipe, which seems simple enough, yet we are informed that a perfect water meter has not yet been invented.

No radical changes in carburetors are found, but the perfection of minute detail tending toward economy is clearly in evidence. Carburation is practically automatic in the usual sense of the word; mixtures are gasified in the carburetor, not in long and winding manifolds; warm air pipes are on the decline; water jackets around the mixing chambers are to be found on the better class of vehicles, with means to shut off the water circulation on warm days; compensating air devices show considerable thought and ingenuity of design, particularly with respect to the preventing of fluctuation of the auxiliary openings. Carburetors are more accessible, though this is not absolutely necessary in a perfect device. Passages are designed with a view to free gas movements, and gas speeds, judging from external size of manifolds, are lower, seldom exceeding 60 feet per second average speed. The single spray nozzle predominates, but a few are using the multiple nozzle, notably the Matheson, the Columbia and the Stevens-Duryea six cylinder. The Matheson car carries the idea to the extreme by using three nozzles, and each one is opened in succession by the hand throttle. No float is used to maintain a constant level in these nozzles, but a pump, continually operated from the engine, brings fuel into a small tank, which in turn is connected to a standpipe that maintains a constant height of fuel by causing the excess to overflow.

The Columbia two jet carburetor is used on their Model 40 car. The small nozzle is arranged in a contracted orifice, a sort of connoidal chamber, the end of the cone having an annular ring attached to it, around the periphery of which are drilled holes or slots that are adjustable and reg-



Royal Carburetor With Air Inlet Throttle to Facilitate Starting.

ister with similar slots in an annular part that slips over this. In addition there are several holes drilled in the bottom of the carburetor base, so to speak. A small pipe extends from the top portion, into which is fixed a plain butterfly throttle valve regulated from the steering wheel. In other words, this is a complete carburetor and handles the car at low engine speeds, up to 25 miles per hour on the level. To increase the speed the foot accelerator is depressed, which opens a butterfly valve in the large mixing pipe or manifold, and this brings the second or larger nozzle into action. Owing to the large volume of gas now formed, undue refrigerating effects might result, so the designer inserts a "pigtail" pipe in the mixing pipe, which carries or shunts part of the exhaust gases through the mixing chamber, assisting the vaporization. If the engine speed still keeps increasing, an auxiliary air valve in the form of a piston uncovering ports in a cylindrical tube, is brought into action by the suction caused by the increased piston speed, and this compensates the richness of the mixture. The piston is made of compressed graphite, and is, therefore, self lubricating and prevents sticking. A spring returns the piston when the engine speed slows down as the load increases or the large throttle is closed. It should be mentioned that the small carburetor butterfly valve is also controlled by a governor. This device seems to have been carefully worked out, and though it possesses a multiplicity of parts this complication is probably easily compensated for by the flexibility obtained at the motor and the gain in fuel economy.

The Stevens-Duryea carburetor is similar in principle, differing only in the detail arrangement of the component parts. In the S. & M. Simplex, automaticity of carburetor action is sought by using one nozzle and regulating the auxiliary air by means of a conical piston, whose period of opening and closing a tapered or conical port is determined by having its one end

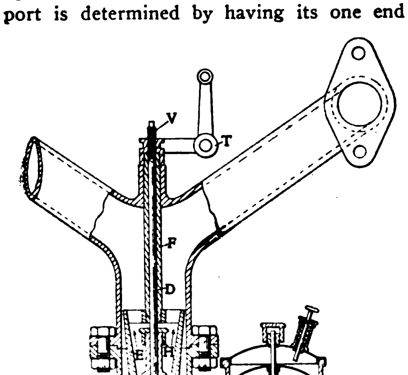


FIG. 5.—HOTCHKISS CARBURETOR.

terminate in a circular metallic disc moving in a cylindrical chamber filled with some viscous liquid, as oil, and its degree of freedom of operation is determined by making the disc just a little smaller than the cylinder into which it is fitted, thus causing a damper action obtained by moving a solid in a viscous fluid. Temperature changes will probably influence the action of this device.

While in the writer's opinion devices based on this principle are to be preferred to the auxiliary air valve as originally suggested by Bradley and Pidgeon, in England, we find the automatic or suction operated supplementary valve still used on such cars as the Pierce, Peerless, Packard and Locomobile. The difficulty experienced with such valves is that owing to the short helical springs used their opening or lift is not proportional to the depression, and the Locomobile designer, while adhering to this principle, has adopted a special spring —an archimedean spiral of very large diameter, to the centre of which is attached the valve, and so obtains larger lift and does away with the snorting action so common with the other valves. The degree of automatic action of any of these devices is an uncertain element, as in general carburetor design is not based on broad scientific data. This is attested by the fact that "catalogue horse power" very often grows by 5 or 10 in a salesman's conversation with a prospective customer, "owing to our automatic carburetor," and there is no rational proof to the contrary.

In order to facilitate starting motors when they are very cold, and especially small motors, it is essential that some means be provided for obtaining a sufficiently rich mixture when cranking slowly. The Royal Tourist provides such a device in the form of an air damper valve to which is secured a rod ending in a ring in front of the radiator. By withdrawing this rod one closes the air inlet to the carburetor, only a slight leak being allowed that permits of easy starting. The other features of this carburetor are not new, as the auxiliary air valve is arranged to act in conjunction with the opening of the throttle—an old Mercedes practice, but still used on many foreign cars, and American as well. These may be called semi-automatic carburetors, but they have much in their favor, particularly simplicity.

There is still a third class of carburetors shown, of which the Hotchkiss is a typical example, namely, the type in which both the fuel and air are operated on by the control lever. A cross section of this device is shown. The needle valve D of the spray nozzle K is tapered. The needle in the spray is adjustable by the nut Y to give the best results when throttled down. By means of the operating lever T the plunger D and sleeve E are both moved upward simultaneously. The air passage P, which passage contains a tuyere (not shown), is thereby increased to admit large volumes of air and at the same time the needle valve is opened, permitting more fuel to enter in proportion to the increase in the air admitted. The air and gas mix at $C\ C_2$, and pass through to F, where they enter the cylinders. The sleeve E, as is shown, serves the purpose of throttle and auxiliary air piston. Close study of this type will reveal that its automatic action is in nowise much better than when the auxiliary air passages alone are controlled. It is worthy of note, however, that a Chenard-Walker carburetor constructed on this principle made the best showing in a fuel economy test some two years ago in France. The air and gas were not controlled by hand, as here shown, but solely by the vacuum or suction.

While the devices noted all attempt to supply a nearly constant ratio of fuel to air passing into the engine and cylinders, it may be safely asserted that this end is not fully attained under all conditions, and some carburetors perform better than others. On the whole the results are very gratifying, and next year still greater detail improvements may be expected. The inlet manifold has received some thought this year, indeed more than ever, and we find that gas distribution is perfectly balanced, even in six cylinder engines, with their numerous branches. Especially is this true of the sixes when the cylinders are of the individual type. Gas distribution from a single carburetor to eight cylinders is shown by the Hewitt Company on their limousine, where the cylinders are placed V form, four on each side.

It is hoped that tests of fuel consumption will receive some consideration in the near future, and the determination of speed-torque characteristics of motors as well. These tests can be well conducted under the auspices of the A. C. A. in their proposed laboratory and this will stimulate further research work in the carburetor line tending toward improvements throughout gasoline and other internal combustion motors.

Some Ideas About Body Design.

By J. Grant Cramer.

The writer has often wondered why the constructors of automobiles which are supposed to be built and are certainly sold as "touring" cars do not pay more attention to certain details which make for economy of space, increased baggage carrying capacity and comfort. Just as some able and learned men are obscure in their writings, so not a few otherwise good body builders evolve complicated methods of fastening the body to the frame, let the body overhang the rear axle excessively, do not utilize to its fullest extent the space at their disposal, allow the transmission gear to be difficult of access beneath the floor, and in various other ways show a tendency to disregard their own experience and that of others.

In a recent article in The Horseless Age I mentioned a certain French car which has its capacious gasoline tank immediately behind the dash. This car has the body attached to the chassis in such a manner that without breaking a single connection or even loosening a wire, but merely by loosening four nuts, the whole body can be removed. This form of construction is not patented and is very strong, simple and efficient.

While in Paris last year I saw one of these cars fitted with a double phaeton touring body which had been designed by Dr. W. McMurtry, an American motorist who has had much experience in European touring, and Kellner & Sons, of Paris, who built the body, think very highly of it. Under the rear seat is a large vacant space capable of accommodating a good sized trunk; furthermore, there is built from the rear of the car a compartment in which can be placed another trunk immediately behind the first mentioned one. This compartment has a door and is provided with a lock, so that the two trunks are protected from the weather and theft. Under the front seat is another long, vacant space, into which, through a little side door, may be put a trunk or other luggage.

For cars to be used on good European roads a long box under each running board will be found very convenient for the tools, spare parts, tubes, tire repair outfit and reserve cans of gasoline and oil. For American road conditions, where a greater clearance is absolutely necessary, it would be better to have two boxes or one longer box with a strong partition in the middle on each running board. In one compartment the tools, jack, pump, etc., can be carried, and in the other the spare tubes and tire repair outfit. On the other side, in one box or compartment, can be placed a very complete line of spare parts (if on an extended tour), and in the other the reserve gallon cans of oil and gasoline, respectively, together with waste, etc. There seems to be no reason why such a body could not be fitted regularly to cars costing from $3,500 upward. Of course the car described above had a Cape top and side curtains.

Some makers are prone to put a number of drawers under the front and back seats; at first glance they look attractive, but when one thinks the matter over one will realize that on a motor trip one cannot very well distribute one's personal effects in those nice little drawers as one can place them in a bureau in the privacy of one's room, only to have to empty out the aforesaid little drawers on arriving at a hotel in the evening.

The arm separating the two front seats may be made hollow, and when provided with a lid makes a convenient receptacle for maps, route cards, gloves, etc.

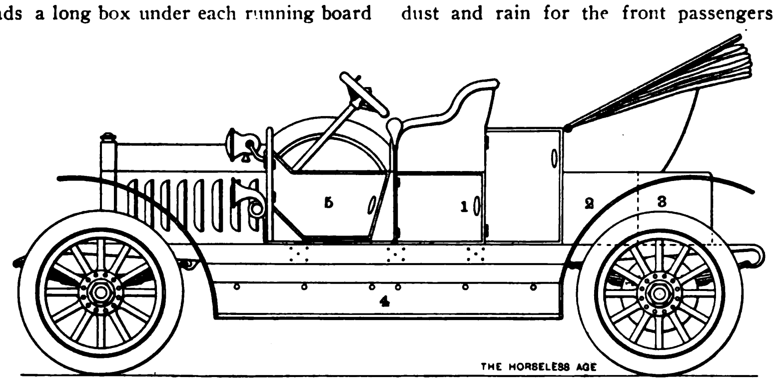
The doors admitting to the rear seats should be quite high enough to protect the knees of the passengers from draughts. There is no reason why the car should not be fitted with low doors in front to protect the feet of the occupants of the front seats. A little wrinkle worth trying and which does not increase the cost of the body is to build the rear side doors with their hinges near the front seat; then, if the door should happen to be left partly open or if the catch were defective, it would not fly wide open and thus be liable to break off, as it would be were the hinges near the rear of the car.

Probably the best protection from wind, dust and rain for the front passengers is the latest model of the "Parebrise Huilier," which can be used in three different ways.

Unless the travelers are very delicate, an open double phaeton as above described with Cape top and side curtains is to be recommended for touring.

In the body just described it will be observed that all the weight is carried very low. If all the trunks are piled up on an overhanging baggage rack or platform behind (as is so often the case), the rear tires will be racked severely and the car will not ride so easily. If one has a limousine or a fixed canopy top and puts the baggage on the roof, there will be excessive swaying and a constant and unnatural strain upon the springs and tires. There will also be a much greater tendency to skid than when the car is well balanced.

A common carelessness is to put a heavy body, such as a landaulet or a limousine, upon a chassis provided only with springs originally intended for an open body, which is, of course, much lighter than the closed coach work. The inevitable result will be that the springs will flatten out under a weight greater than they were designed to carry, the frame will be sprung or bent, the engine bearings will bind and wear unduly, and in the case of a shaft driven car the bevel gears will not mesh properly, causing great loss of power.



SUGGESTIONS FOR A TOURING CAR BODY.

1. Door admitting to space under front seats.
2 and 3. Spaces under rear seats, and compartment for two trunks.
4. Long box under running board.
5. Low door admitting to front seats.

Speaking in a general way, a 24-35 horse power motor is quite powerful enough for touring, unless one has a heavy closed body. A large engine consumes much gasoline or "petrol," which is an item to be considered in Europe, where fuel often costs 40 cents or more a gallon. Moreover, a large motor is less pleasant to drive than one of moderate power.

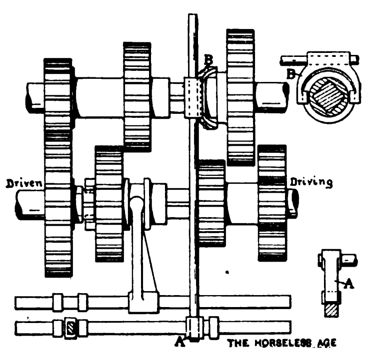
The whole motor, even the radiator, should be placed behind the front axle, never projecting beyond it. In the latter case the front wheels are overburdened, the steering gear is under a constant strain and the balance of the whole vehicle rendered defective. The body proper should not hang out beyond the rear axle, as that throws the car out of balance and is hard on the rear tires, which certainly have enough to contend with even in the best designed car.

Use tires of ample size, not less than 34x4½ all around, and, better yet, 36x4½ or even 5 inches. There is a tendency to use too small tires in this country; in the long run this policy is not at all economical. The French on their fine roads use large tires. I have often seen 880x120 mm. tires on the rear wheels of 15 horse power French cars. The flat tread tires are much superior for touring to the ordinary type.

For traveling in the mountainous districts of Europe, water cooled foot brakes are advisable, as descents of from 1 to 25 miles may be met in the course of the trip. The Simplon Pass, for example, has a steady ascent of 16 miles on the Swiss side from Brieg to the summit; thence to Domodossola at the foot on the Italian side is a little over 25 miles.

Automobile Body Contours.

In the beginning the motor car body was little better than a box, or perhaps we should say a collection of boxes. All sorts of attempts were made to render it elegant, such as the introduction of skeleton backs to the seats, which were supported by a few light vertical rails; a sort of light fence such as one still sees on horse carriages, and which may be appropriate enough for them but quite unsuitable for the more rapidly moving motor car. Things have developed since those days, and now motor bodies are not only, in the best examples, extremely elegant, but they are very much more suitable for their work, and consequently much more comfortable for their occupants. Without referring to covered cars at the moment, it will not be without interest to point out that bodies have now settled down into three more or less distinct forms. We may take an ordinary side entrance car, and deal only in the sketches with the outline of the back portion, as that is sufficient to show the three prevalent contours, which are (1) straight, (2) Roi des Belges, and (3) rotund. We illustrate the three to make our meaning plain. The straight form is the cheapest and least elegant, though it can be made to look very well. The Roi des Belges, with its inward curve at the bottom of the seat and its outward curve or lip at the top, is by many considered the most elegant form of body, and there is no doubt that it lends itself to really artistic modeling. The difference between a thoroughly well designed Roi des Belges body and one which merely has what may be called the general characteristics of a Roi des Belges is very great. For an open car it is difficult to beat the easy and richly flowing lines of the Roi des Belges, but the comparatively recently introduced rotund is now in point of smartness running it very close. This may be roughly described as the Roi des Belges without the outward curve at the top; it is really more than this, and is a most difficult pattern to design well. There is a suggestion of restraint about it which is not evident in the more flamboyant design of the Roi des Belges, and it has a certain individuality and appearance of fitness for its purpose



Corbin Change Gear.

which is all its own. If the Roi des Belges becomes vulgarized, as it seems likely it may, the rotund will be more used in the future than in the past. In its most advanced form the rotund body is not merely rounded as shown in the outline; the rotund idea is carried out to the full, and there are no square or boxlike corners about it anywhere. Although it is unquestionably an opinion of personal taste as to whether the Roi or the rotund is the handsomer outline for an open car, there is no question that the rotund looks better when a covered top of any sort is used, because a vertical line does not spring well from the outward lip of the Roi des Belges, but looks in keeping on the top of the rotund. One possibility is evident in the tendency for the upper lines to take an inward curve or "tumble home"; just the opposite curve to that which characterizes the upper part of the Roi des Belges. There are, in fact, even more chances for the talented designer, who can harmonize his curves, to exercise his art in the rotund than are afforded by the Roi des Belges. Last, but not least, the two forms might conceivably be blended with very pleasing results.—*Autocar.*

Gearing and Transmission Systems at the Madison Square Garden.

By Dempster M. Smith.

The exhibition at Madison Square Garden, together with the December Show at the Grand Central Palace, furnished a fairly complete exposition of the world's automobile industry. The writer visited every booth at the Garden Show and has made a very careful tabulation of the most important features of gearing and transmission systems. This tabulation is believed to be as thorough and correct as any data compiled in the midst of the crowd and hurry of a national automobile show can be. With this information and that obtained at the December Show at hand, the present conditions and tendencies of these important features of automobile design may be determined.

In tabulating features of the various cars, wherever one manufacturer makes two or more models which differ considerably in respect to gearing or transmission features, these models have been treated as independent machines and listed accordingly. Therefore, in the following comments a larger number of American cars will be referred to than the total of domestic manufacturers exhibiting.

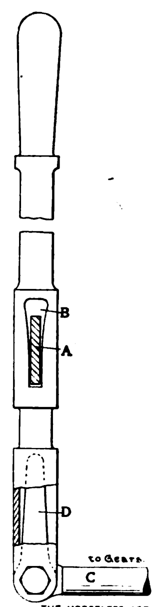
The Shows Compared.

Speaking generally there were a good many more innovations and a greater variety of gearing construction displayed at the Palace than at the Garden. However, while the Garden Show revealed less of novelty it was in many respects fully as interesting to the investigator because of the fair representation of alternative constructions which have come to be regarded as standard and the many examples of really fine workmanship observed. There is no part of the automobile in which careful, compact design or excellent material shows up so prominently as in the gearing, and after seeing the work of the foreign and American manufacturers side by side, the writer is convinced that the best of the American producers have nothing to learn from those abroad as regards either of these features.

American gear boxes are decidedly more compact than the foreign. This is in some measure due to the use of smaller gears, which brings the gear shafts closer together and permits a smaller enclosing case, at the expense of higher tooth pressures and somewhat greater liability to wear and breakage if any but the best materials are employed. It has long been a characteristic of machine design in this country, however, to lighten construction by keeping the parts within the smallest practicable compass and cutting out superfluous elements and material wherever possible, and excellence of design and material has been relied upon to insure the strength and durability which are often obtained by designers of other nationalities by the use of heavier and larger parts. In view of past experience it is safe to predict that the adherence of domestic designers to this old principle, now that the necessity for the use of proper material in all parts is realized, will enable them to maintain and increase their supremacy over European manufacturers in the automobile industry.

Systems of Gearing.

At the Palace Show it was found that an overwhelming majority of cars embodied gearing of the sliding type. The preponderance of this form was even more marked at the Garden. Taking the two shows together the percentage of other types is almost negligible. At the last Show, of seven foreign cars which were not commented on in connection with the other all employ this system. Out of a total of thirty-eight distinct American models thirty-two show sliding gears and six other forms. Probably it is safe to say that taking the domestic art as a whole about 10 per cent. of the models used gearing other than the sliding type.



Elmore Lever.

The writer observed that in two cars—the Orient and Winton—means are provided for throwing out the main countershaft gear when on the direct drive, so that the countershaft is stationary, avoiding the running of any gears in mesh on the high speed and making the car substantially "gearless" under these conditions. Other cars may have this feature, but it is exceptional, and a great majority of sliding gears have a countershaft continually impelled while the motor is running.

There are two widely used methods of arranging the gear box, one with the direct drive connection at the forward end, the other with this connection at the rear. In the first instance the smaller of the two gears connecting the countershaft with the main driving line is in alignment with the main shaft; in the second, the smaller gear is on the countershaft. The result of this is that in the first arrangement when the gearing is in direct drive position the countershaft is impelled at a low speed, involving little friction and noise. In the second case, however, under the same conditions, the countershaft is impelled at a much higher rate of speed than that of the motor, with consequent increase of noise and power loss and wear of gear teeth. The principal reason for using the second arrangement seems to be that the sleeve carrying the driven gear is customarily supported by two ball bearings set a considerable distance apart in order to provide a proper support for the rear end of the main shaft, which has its only support at the rear end within this sleeve. Advantage can be taken of the rigid mounting of this sleeve for applying to it a transmission brake drum without the necessity for adding other bearings to support it.

Where the positive clutch connection is made at the forward end of the gear box this double bearing is usually put on the sleeve which carries the small pinion driving the countershaft, and it is, of course, impossible to apply the transmission brake at this end of the box. It seems as if it would be worth while in gearing having the direct drive clutch at the rear end of the box to provide means for disconnecting the countershaft when on the higher speed, so as to do away with the disadvantageous running conditions pointed out.

Almost all sliding gears provide a direct drive on the high speed, but two examples of the Panhard type were observed. These were in the C. G. V and the large Fiat, both of which use double chain drive.

SPEEDS.

The seven foreign cars tabulated at the Garden all provide four gear speeds. It was found at the Palace that twelve out of fourteen foreign manufacturers provide this number of speeds, so that it may be concluded that the three speed gear is practically dead in Europe. The writer found at the Palace that eleven of thirteen American manufacturers consider three speeds sufficient. At the Garden, out of thirty-one manufacturers, twenty provide three speeds and eleven four, while an additional maker (Knox) has one car with three and one with four speeds.

After reviewing the Palace Show it was predicted that manufacturers operating under the Selden license would follow the foreign practice in many respects more closely than the independent concerns. This is shown to be true in regard to the number of speeds.

CONTROL.

While at the Palace the foreign cars shown were about evenly divided between selective and progressive methods of gear control, at the Garden the entire seven used the selective system. This changes materially the impression given at the Palace, where it was found that progressive systems exceeded the selective by the proportion of nine to eight, and throws the balance decidedly in favor of the selective system.

The "licensed" American makers at the Garden also used this system in the proportion of twenty to twelve employing the progressive method, and adding these figures to those obtained in the December exhibition it is found that twenty-nine American cars have selective control as against eighteen using the progressive method, and this in spite of the fact that the typical American car has only three gear speeds.

The shifting rods of most of these selective systems are retained in the positions in which they are placed by the selective lever simply by pawls, balls or other spring pressed devices engaging notches in the shifters. When this is the only fastening used breakage of a spring might permit the corresponding shifter, if disengaged from the controlling lever, to move under influence of the jarring of the car and bring its set of gears into contact with others and cause considerable damage before the clutch could be disengaged. In a few cars, probably only about 10 per cent. of the total, the original selective system, comprising a slotted bolt movable transversely of the gear shifting rods, and serving to positively lock in place the shifters not in engagement with the lever, is employed. Some makers employ spring catches engaging notches in the shifters in addition to the positive bolt lock, probably simply for the purpose of checking movement of the sliding member at the proper point.

Only two four speed cars were found at the Garden in which the direct drive is on the third speed, and the fourth speed faster than the direct. These are the Pope-Toledo and the Winton sliding gear model. To the list of independent manufacturers using this system as recorded in the issue of December 12, 1906, should be added the De Luxe. The Rolls-Royce, the English car which uses this system, was exhibited at both shows.

TRANSMISSION SYSTEMS.

Five of the foreign makers at the Garden exhibition use double chain drive and two the bevel gear system. In distinct contrast out of thirty-two domestic cars twenty-three have the bevel gear drive, with live rear axle, and only nine the double chain. The double chain system is therefore greatly in the minority. There are thousands of cars in daily use which justify the bevel gear drive, and if it is still considered that there is any possibility of binding or breaking in the rear axle, due to this construction, the difficulty may be met by some form of reinforcement. The De Luxe car provides for this possibility by combining with the bevel gear housing and axle tubes an I section axle which is sufficiently rigid to prevent the possibility of disalignment.

The chains of the C. G. V. are enclosed in metal cases, which are constructed so that apparently they will effectually exclude dirt. This equipment should be more general on chain driven cars.

OTHER GEAR SYSTEMS—PLANETARY.

Besides the sliding gear there were four other gear systems represented at the Garden—planetary, individual clutch, friction and a combined electric and mechanical transmission. The planetary system is found in all the Hewitt cars, including a very heavy truck, two light delivery wagons, with double reduction between the motor and the wheels; a physician's runabout and an eight cylinder touring car of about 50 horse power. The same type of planetary gear—two speeds and reverse, all external gears—is provided in all cases.

The Cadillac Company retain their three speed planetary gear in one of their four cylinder models, and in their well known single cylinder runabout they continue to use their two speed planetary. For the first time this year the company also produce a sliding gear model, which has been included in the tabulation of that type.

The planetary gear is also shown in the well known Buick model, with two cylinder horizontal engine, and in a new model produced this year by the Buick Company having a four cylinder, vertical motor. The gearing is enclosed in a unitary structure with the motor, and there is a main clutch interposed between the motor and gearing, controlled by a pedal, in addition to the high speed clutch of the gearing itself. The three clutches of the gearing are controlled in rather a peculiar manner by a single lever moving in a H slot and acting on the clutches in a manner practically the same as the controlling lever of a selective sliding gear. The system is practically the same as that employed in the large Cadillac model, except for the method of controlling the speed changes. In the Cadillac, to continue the comparison with the sliding gear, the control system would be called progressive, since forward and reverse movement of a single lever serves to set and release all the clutches successively. The selective system has probably been adopted by the Buick designer because it is a more popular system at the present time, and because there is less danger of suddenly changing from the high to the low speed when the car is running at a rapid rate. In both of these cars an additional main clutch held normally in engagement by a spring enables the driver at any time to disconnect the motor without touching the gear shifting lever. This also may result in greater safety when the car is in the hands of an inexperienced operator, but if the controlling lever is carefully manipulated the car may be properly driven by this means alone, and the complication of an additional main clutch could be avoided. The main clutch is a characteristic of the sliding gear and is essential in that system, but it seems as if its use in a planetary system is principally a concession to the popular familiarity with the sliding gear.

The only friction drive system found was in the Orient buckboard. This mechanism is quite ingeniously arranged in a small space, but is open to the same criticism which was made by the writer of the cars exhibited at the Palace—that it provides no direct drive with friction elements eliminated.

THE INDIVIDUAL CLUTCH SYSTEM.

The Winton Company carry forward their model of last year with few changes (in addition to their new sliding gear model), and this car is the only one in which an individual clutch transmission of the double shaft type was found. One reason why gears of this system have failed in the past has undoubtedly been that the clutches, and especially the high speed clutch, were not large enough for the duty. In the

Winton one of the members of the high speed clutch is by their peculiar method of construction placed outside the gear box, and therefore can be and is made of considerably larger diameter than it could be if it were within the box.

ELECTRIC CARS.

Transmission systems employed in electric vehicles are seldom commented on. In the Baker electric, however, is found a combined reduction and transmission gearing which deserves notice. A sketch of this arrangement was published in the issue of January 16. It is in no sense a change speed gear, but simply a planetary reduction gear, the planet pinions of which are carried by a spider on the driving shaft and engage an internal gear ring carried in the motor casing and a driving pinion on the armature shaft. The idea has been prevalent that planetary gearing is inefficient as compared with other types, but the fact that a well known concern like this sees fit to employ this reduction in place of the spur or chain gears generally used in electrics argues well for the former system.

CORBIN GEARING.

The Corbin Motor Vehicle Corporation has produced a selective type of sliding gear which is very compact and deserves special notice. As will be seen in the sketch, a portion of each of the shafts is squared and carries a sliding member. The sliding member on the main shaft is engaged directly by one of the shifting rods and the other sliding member is moved by a yoke carried on a cross shaft mounted above the main gear shafts. The cross shaft has an arm engaging a socket in the other shifting rod. The shifters are moved by the selective arm of an ordinary controlling lever which engages the two notches shown in the sketch. This arrangement enables the gear box to be shortened up considerably and adds practically no complication.

ELMORE SELECTIVE LEVER.

The Elmore selective gear operating lever (see sketch) is of the pivoted instead of the sliding type. It is pivotally connected to the end of the rod which leads to the gear box and operates the sliding members in the ordinary manner. The lower end of the lever is formed into a socket, and the end of the shifting rod is turned up and shaped into a tongue fitting this socket so as to give a longer bearing surface for rotating the rod than would be afforded by the pivot joint. The lever is slotted to embrace the guide sector, which fits loosely in the slot. To effect the endwise movement of the rod the lever is moved laterally on the sector as a fulcrum. The weight of the lever rests entirely on the rod.

SUMMARY.

There is a satisfactory scarcity of cheap looking gear boxes, in accordance with the general tendency toward increased prices and improved construction throughout the vehicle. The typical foreign car has a four speed, selective sliding gear, with either shaft or chain drive. The American car has a three speed selective gear of the sliding type, with bevel gear drive.

There are still in this country, however, a very respectable number of planetary gears. It is a remarkable fact that very few high powered cars are provided with this gearing. The great object of increasing the dimensions and number of cylinders is increased flexibility, and most manufacturers of large multi-cylinder cars claim that they will run on the direct drive at speeds varying from something like 4 miles an hour to the maximum. And yet in these same cars three or four gear speeds are almost invariably provided. Hewitt seems to be about the only designer with the courage of his convictions. He uses a two speed planetary gear in connection with his eight cylinder, V type motor. Surely if such a motor is as flexible and powerful as it should be it should be able to move the car on the direct drive a great part of the time, and a single low speed gear for exceptionally severe conditions should be sufficient.

There should be some limit to weight and complications, and with a motor with six or more cylinders it would seem to be the reasonable thing to reduce the gear equipment to a minimum. There should be a larger field for the planetary gear, which is simple, cheap, and exceptionally efficient on the direct drive, in cars of this class.

Control.

By Harry E. Dey.

A thorough examination of all the cars at the Show proved that the control mechanism has now become nearly standardized. There is one feature, however, in regard to which the cars are nearly equally divided, and that is the operation of the emergency brake. There were twenty-seven cars at the Show in which the side lever is *pulled* to put on the brakes, and thirteen in which the lever is *pushed* to accomplish the same object. These methods being directly opposed, a person accustomed to one finds it awkward for a while to use the other. Besides, as the name implies, it is an emergency brake, and one does not usually have time to think what motion he is to perform, for which reason the operation should become second nature. If a person simply got a new machine and used that only he would soon become accustomed to the change, but he may be alternately using one and the other. Personally I do not see much choice between the two systems. One maker will claim that the pulling action is better, because you have your foot braced against the foot brake pedal, while another will say that it does not require as much time to grasp the push handle, as it is normally close to the seat. I think, however, that either one style or the other should become the standard.

The progressive style of change gear seems to be rapidly disappearing, as is also the planetary gear. There were exhibited twenty-six makes of cars with the selective type of gearing and twelve with the progressive type, while only two makes of cars with planetary gears were observed by the writer. The side lever is almost universal for handling the gears. One prominent car still retains the shifting lever in the horizontal form under the wheel. This style was very popular a few years ago, and I do not know why it has been discarded. The lever certainly was in a more convenient location than at present, and the system might have been worked out so as to adapt it to the selective type of gear.

Two gasoline cars only use a separate lever for reverse. One of these uses one side lever for reversing, a second one for the forward speeds and a third lever for the emergency brake. The other car, which has an air clutch and air brakes, uses horizontal levers under the wheel for shifting the gears, while the reverse is thrown in by pressing with the foot on a short projecting arm located upon the lower part of the steering post. The clutch is operated by twisting the gear shifting lever, this controlling the air supply. One car employs one side lever for the reverse and the brake, while a second lever operates the second and third speeds.

Practically all the cars have two foot pedals, one for the clutch and the other for the brakes. The majority of the pedals are slightly crowning; some have a rib or flange on one side to prevent the foot slipping off, others have a flange on each side, while one car is provided with removable rubber pads. The latter appears to be a good idea, both for appearance and practicability. The majority of the pedals, however, have no provision for holding the foot in position except a pyramidal roughened surface.

Thirty-two cars have their spark and throttle levers placed above the steering wheel. There are several ways of arranging these levers. On some cars one lever works on an internal ratchet, while the other is on an external ratchet of the same arc. Others have a ratchet above and below the segment, while on still others the levers are placed diametrically opposite one another. Still others are provided with a rocking lever for the spark. There were only three cars that have these control levers located below the wheel.

One car uses thumb wheels, inside and near the rim of the steering wheel, while another has that portion of the rim that is gripped by the hands arranged so that a twisting movement controls the spark and throttle. Several cars using low tension magneto have no provision for spark advance, while one car has automatic advance by means of a governor.

Those cars that have governed engines usually have a foot controlled accelerator, and few are provided with muffler cutouts, the latter usually being operated by a heel push button. A few cars have a handle arranged upon the dash to regulate the mixture while running the car. This should be a generally adopted feature, for a carburetor can certainly be adjusted to better advantage when running at full load. It is also good for emergency work, as an engine will give the most power when the mixture is a little too rich for smokeless and economical running. It is a good plan to have this adjusting device limited by stops so that it cannot be turned far enough in either direction to stop the engine. This arrangement was noticed on one car.

Quite a number of the cars were equipped with the ratchet sprag. This is another item that ought to become universal. A few have arrangements on the dash or in front for flushing the carburetor, but a large majority of cars are designed on the assumption that the carburetor will not require flushing or that the bonnet may be lifted and the "tickler" reached direct. The latter, of course, is inconvenient.

The inside of the rim of the steering wheel of one car was corrugated to afford a better grip for the fingers.

Practically all of the starting cranks are now held in a horizontal position by a looped strap when not in use. In an article in the recent Engineering Number of The Horseless Age, I called attention to the possibility of starting automobile engines with compressed air, as is done on some motor boats, and stated that with such an engine and a shifting cam shaft for reversing, there was no apparent reason why we should not have a gearless car. I found at the Show that a promising step in this direction had been taken by one maker, whose car is equipped to start with compressed air, obtained from a tank which is kept constantly filled by an air pump operated from the engine. I think this air pump and tank idea will be largely adopted in the near future. It has many good talking points. It can be made to start the engine, operate the clutch and brake, fill the tires and blow the horn, and be used to blow the dirt from crevices when cleaning, and possibly for many other purposes.

There is one feature of the present car that I have always been opposed to, and that is the holding in of the clutch at all times, except when forcibly kept out. If a person stops and neglects to disengage the gears, there is likely to be an accident when one attempts to start, as the car is liable to start ahead when the spark circuit is closed, or when cranking. In the latter case one is liable to be run over. I believe, there have been several accidents of this kind, but how serious they have been I do not know. However, the danger is there and there ought to be some provision made for overcoming it. I do not doubt but that some interlocking system can be provided that will make it impossible to start the engine when the clutch or change gear is in engagement.

An interesting car, from the control point of view, is the Columbia gasoline with electric transmission. This transmission, as Mr. Ents, its inventor, explains, is a combination of the two well known electric transmission systems, giving the high efficiency that the one lacks and avoiding the storage battery of the other. It consists essentially of two electric motors, both series wound, one having both its members, armature and field, rotatable, the other the armature only. The former has its field mounted upon the engine shaft and serving as a flywheel. The armature is direct connected to the propeller shaft just back of the jaw clutch and is connected in series with the first motor, with the proper resistance and switches in circuit.

When the car is at rest the circuit is open and consequently there is no pull between any of the electrical elements, but as soon as the circuit is closed the revolving field motor acts as a dynamo to generate a current, and, according to well established electrical laws, there is a constant pull between the armature and field

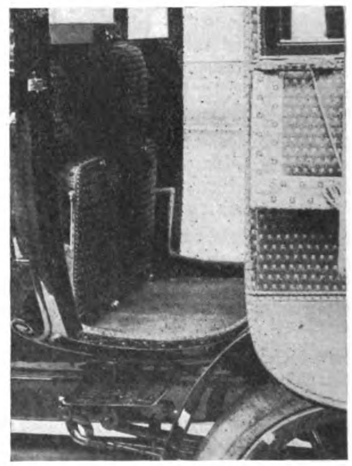


Fig. 2.—Special Seats in the Stevens-Duryea, Closed Position.

in direct proportion to the current generated. The latter will be governed by the internal resistance of the circuit and the induced voltage, which depends upon the velocity of the wires past the field, with an average slip between them of 5 per cent. The current generated passes through the second motor and causes that to develop a torque which it impresses upon the shaft. The heavier the load the more the slip, and as this is equivalent to a higher dynamo speed a greater current is generated. This in turn furnishes more power to the second motor, so that as slower speeds are reached the torque increases, thus avoiding the use of change gears. To reverse, the jaw coupling is disengaged, so that the two motors are disconnected from each other. The field of the second motor is then reversed, and then the switch is thrown in, causing the second motor to start in the reverse direction and supplying all the necessary backing power.

I availed myself of an opportunity to take a ride in one of these cars, and the smoothness of starting and of speed control, etc., was very noticeable; besides, the car is very quiet running, there being absolutely no gears, except the bevels in the rear axle casing. The changes of speed are governed by a controller similar to those used on electric carriages. There are five speeds forward and two reverse.

Among the electric vehicles wheel steering appears to be becoming popular, it being about equally common as the horizontal side lever. One large car has the electric control operated by a radial lever under the

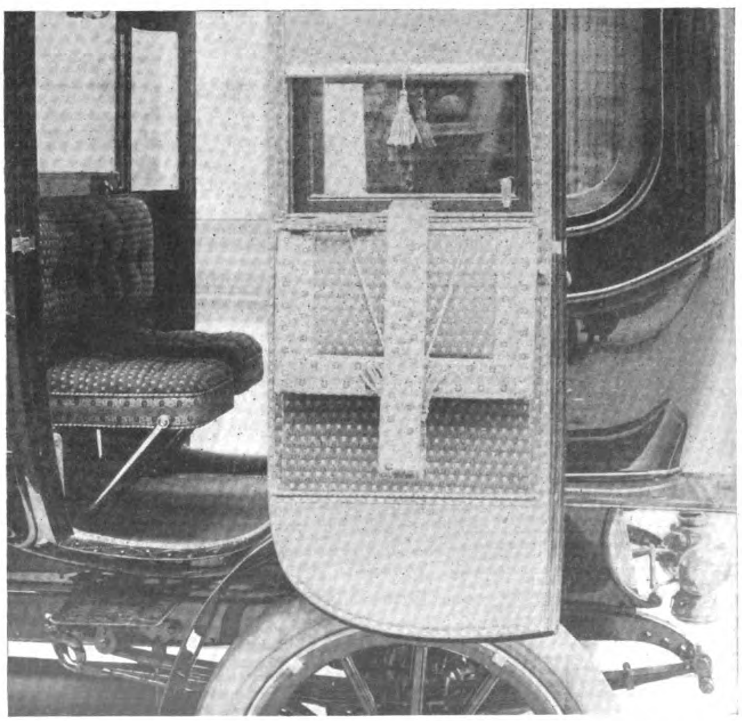


Fig. 1.—Special Seats in the Stevens-Duryea Limousine, Open.

steering wheel. All others use the old standard side handle. One combines the brake with this lever. By pulling the lever to the extreme back position, it sets a band brake upon the motor shaft. As a rule, a separate lever is provided for reversing, this being operated in some cases by foot and in others by hand.

Some Folding Auto Seats at the Show.

One of the most notable points in connection with the Garden Show, in fact in all the recent automobile shows, is the tendency toward extreme luxury in

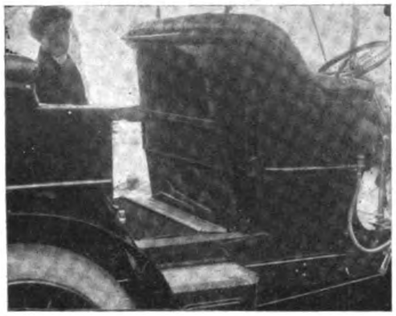


Fig. 4.—Special Seats of Locomobile Stowed Under Front Seat.

body design and equipment. Almost every convenience that can be desired is found in the modern limousine touring car. In the accompanying photo, Fig. 1, is shown a new type of seat as used in the limousine body equipment of the Stevens-Duryea "Little Six." This body is sensibly upholstered in dark gray material which will not show the effects of wear or dust, but is, nevertheless, very rich in appearance. These seats, as shown, are arranged on the back of the front seats and are supported by nickeled rods. They can be quickly folded downward against the front seat by lifting the back end slightly to disengage it from its support, and then swinging this rear edge downward and the front edge upward, when the seats will take the position shown in Fig. 2. This makes a very compact and handy arrangement. Many of the large machines are fitted with extra seats in the tonneau, some of these being large, permanent fixtures with backs and upholstered in the same style as the rest of the vehicle, while others are auxiliary seats to be used only occasionally. The Locomobile Company of America show such seats in their 35 horse power car, as illustrated in Fig. 3; these are of the revolving type with upholstered bottoms and backs. These seats are peculiar in that all parts, even the irons holding them in place, may be quickly removed and stored in a special compartment designed for this purpose. In Fig. 4 the method of stowing away the seats in the compartment under the front seat is shown. The metal parts are so arranged that it is but the work of a minute to set up the seats or stow them away, thus making a very convenient arrangement.

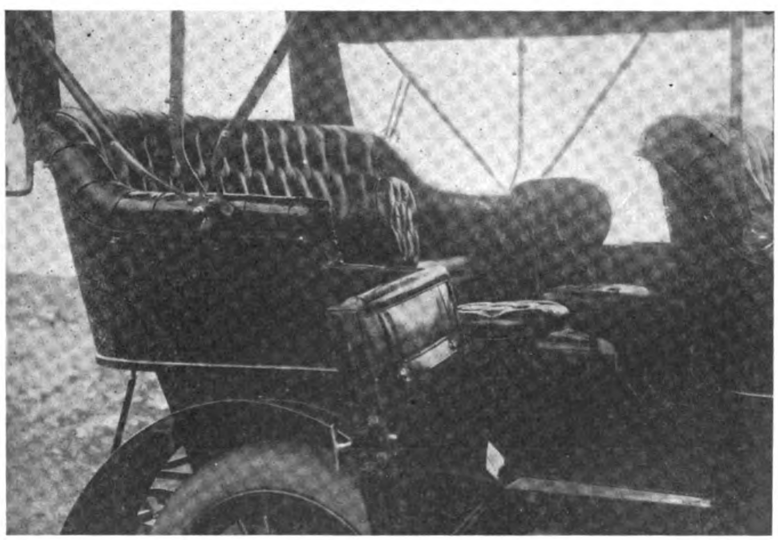


Fig. 3.—Special Folding Seats of the Locomobile.

Brakes and Car Weight.

By P. S. Tice.

The data in this article showing the relations existing between the brake surface and the car weight in modern motor cars was collected at the recent A. L. A. M. Show. The cars there exhibited may be taken as typical of both American and European practice.

The brakes designated as "service" brakes are so named because they are pedal operated, and are the ones used under all ordinary circumstances. Those designated "lever" brakes are the lever operated and so called emergency brakes.

In average car design the service brakes are placed upon one of the power transmitting members having a higher rotative speed than the wheel hubs, upon which the lever brakes are always placed. In some few cars, more particularly European cars, two service brakes are placed upon transmitting elements forward of the hubs, and of late several cars have been shown having the service and lever brakes both acting upon the hub drums. While in some respects this latter arrangement is the best, when considered from the point of view of brake power for given dimensions it is very inferior, since the brake power depends directly upon the rotative speed of the drum to be retarded.

The general tendency is to make those brake surfaces which are capable of enclosure or protection from foreign matter of metal, and to operate them with lubrication. The metal to metal braking surfaces must be lubricated to get the best results. The elements of brake life depend largely, though not wholly, upon the lubrication of the surfaces. Where it is impossible to retain lubricant upon the surfaces because of exposure, as in bands on the hub drum, a facing of some material requiring no lubrication (and to which lubrication would be a disadvantage) is used.

Averages computed from data obtained from forty-eight cars, including all the makes shown, give the following results:

TABLE I.

Averages from Totals.

	Service.	Lever.	Total.
Brake area in square inches	103.2	170.2	273.4
Pounds car weight per square inch surface	26.9	16.3	10.1

These figures do not take account of the location of the brakes and are simply the average car weights and the areas of the two brakes, regardless of location.

Table II shows the average areas and the car weights per unit area where the service brakes are placed upon the wheel hubs and upon the higher speed transmission members, respectively.

TABLE II.

Service Brakes Upon Wheel Hubs.

	Service.	Lever.	Total.
Brake area in square inches	129.7	151.1	280.8
Pounds car weight per square inch surface	21.5	18.4	9.9

Service Brakes Upon Transmitting Members.

	Service.	Lever.	Total.
Brake area in square inches	92.3	178.1	270.4
Pounds car weight per square inch surface	30	15.5	10.2

Given two service brakes of equal dimensions, one upon the hubs, the other on a jack shaft or propeller shaft, the average ratio of gearing being about two to one, it is readily seen that the pressures at the surfaces necessary to secure equal braking effects are approximately twice as great for the hub brakes as for the transmission brakes; and as the heating and wear increase more rapidly with increase in pressure than with increase in speed, it is readily seen that the transmission service brake, dimensions being equal, will in general much outlast the hub service brake.

In Table II is shown the difference in area as found in practice. The difference is great in both service and lever brakes, one most noticeable fact being that in cars with transmission service brakes a great increase in lever brake area is found over that in cars having hub service brakes. It can be stated that in actual practice, as observed in handling and operating cars, the service and lever brakes in the average car are approximately equal in power, and if such a car were driven by a man accustomed to using both brakes about equally they would wear equally well.

Brake replacements are not infrequent occurrences, and while they are mostly necessitated by lack of care in adjustment and lubrication, another by no means negligible factor is inadequate brake surfaces. While all cars have brakes that will stop them, and do it promptly, the difference in surface pressure required is enormous. For instance, the writer has in mind two cars of about the same power, both of which are universally considered of the highest grade. Each has a single transmission service brake and a pair of hub lever brakes. The table (III) gives the figures of weight and brake area.

It is not difficult to decide which of these cars has the more serviceable brake outfit. While the examples cited are extremes, they are a striking illustration of the point made, and that such a large number of cars are provided with inadequate braking surfaces is deplorable, especially when one considers the perfection of these cars in other directions.

It is the general opinion that foreign cars are much better equipped in this regard. Table IV gives the averages upon which a comparison may be based.

A comparison of actual areas shows demestic and foreign practice to be the same in service brakes, with a slight advantage for domestic cars on account of their lighter weight, but the fact that the foreign service brakes are more powerful than the domestic, owing to their location, must not be overlooked. All the foreign cars have their service brakes on the transmission shafts, which increases their power nearly twofold, while in the figures for the domestic cars there are included fourteen cars having service brakes on the wheel hubs, and, consequently, with larger area but of somewhat less power. So far popular opinion is borne out. In the lever brakes the foreign cars easily lead, as also in total brake area, although their advantage here is slight. Summing up, the foreign cars have somewhat larger brake area and also greater brake power, partly due to the more advantageous location of their service brake, but they are not nearly so superior as is usually taken for granted.

In quite a few cases brakes are of a most niggardly design, and frequently shoes or drums must be renewed before the end of a season's running. The recent Show indicated an almost general tendency toward increase in brake dimensions, but as yet it is only the beginning.

TABLE III.

Car Weight (Lbs.)	Service Area Sq. In.	Brakes Car Lbs. Sq. In.	Lever Area in Sq. In.	Brakes Car Lbs. Per Sq. In.	Total Brake Area in Sq. In.	Car Llbs. Per Sq. In.
3,500	61	56.3	122	28.6	133	19.1
2,900	150	19.3	285	10.1	435	6.6

TABLE IV.

AVERAGE BRAKE AREAS AND WEIGHTS IN FOREIGN CARS.

	Service.	Lever.	Total.	Car Weight.
Brake area in square inches	103.8	213.6	317.4	2,943
Car pounds per square inch of surface	28.1	13.7	9.2	....

AVERAGE BRAKE AREAS AND WEIGHTS IN DOMESTIC CARS.

	Service.	Lever.	Total.	Car Weight.
Brake area in square inches	103.1	161.6	264.7	2,745
Car pounds per square inch of surface	28.6	16.9	10.3	....

Present Clutch Practice as Indicated by the A. L. A. M. Show.

By P. S. Tice.

The clutches used in the cars exhibited were all of either the conical, cylindrical or plane surface type. While the majority of makers using the cone clutch content themselves with a plain leather facing, or supplement it with springs placed under the leather to insure easy engagement, there seems to be a tendency (one which can be felt rather than seen) to employ metallic cone surfaces, operated with lubrication.

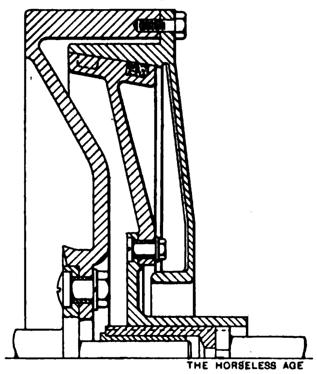


Fig. 1.—Knox Metal Clutch.

Probably the greatest departure from accepted lines in leather faced cones is the decrease of diameter and increase of face width in the smaller Columbia car, in which the male member has a face of great width and is fitted with four rather large spring pressed plates under the facing. In the larger Columbia the spring pressed plates are of bronze and take the form of shoes which project through the leather, so that the surfaces for early engagement are both metallic. The only other clutches shown with combination conical surfaces were those in which cork inserts are used in conjunction with a leather facing, the inserts being made a part of the facing, and the metal to metal cone clutches with cork inserts used in the Knox cars. These clutches (Fig. 1) are of large diameter and housed in the flywheel. The aluminum inverted cone is provided with large inserts staggered over the surface, and is brought directly into engagement with an iron ring bolted to the flywheel. The housing shown is provided for the retention of lubricant, a quantity of which is placed in the chamber formed, and is carried to the frictional surfaces by centrifugal force.

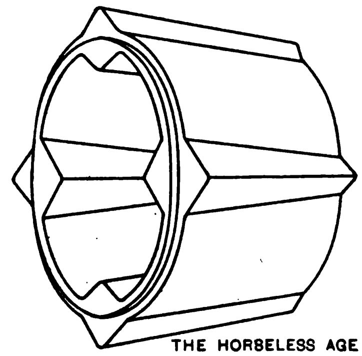


Fig. 2.—Smith & Mabley Conical Friction Members.

A cone clutch with both members of steel and small diameter, and with a corresponding increase in face width, was seen in the Smith & Mabley exhibit. When assembled on the car this device is similar in appearance to a very compact disc clutch. The novel feature is the engagement by distortion of the surfaces from the true conical. The friction members (Fig. 2) are very thin and held against turning on their respective shafts by the inclined feather keys shown. Running in an oil bath, engagement is brought about by a heavy spring forcing the male member toward the flywheel, and into the female, squeezing out the lubricant. As the oil is forced from the surfaces, the resistance to turning, which is communicated from one member to the other, is entirely supported on the inclined sides of the integral splines, causing the cones to distort under the wedging action set up, bringing about the intimate contact necessary for positive driving. The clutch shown seemed quite small when the surface, form and the work it is required to do are considered. A pair of engaging members said to have been run several thousand miles showed no great deterioration of the surfaces and evidences of only very slight heating.

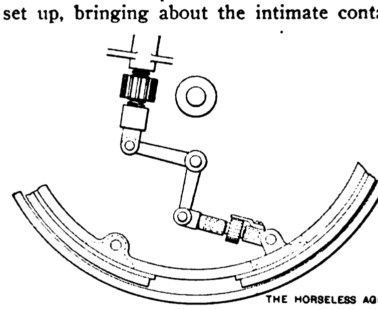


Fig. 3.—Packard Operating Device.

The cylindrical surface clutch had a comparatively large following. It is a type which is as old as the conical in car design, and while not nearly so largely used as the latter, was shown in some very refined forms. Both expanding and contracting, metal to metal, and leather faced clutches of this type were shown, nearly all on large, powerful cars.

In the metal to metal forms, the engaging surfaces were invariably bronze or cast iron or steel. Both the Apperson and Haynes cars were equipped with clutches in which a contracting steel band, wedge and lever operated, engages a bronze drum on the flywheel. In the former, the bronze drum is attached to a drum integral with the flywheel, and in the latter the drum is carried concentrically by the wheel, but is semi-spring driven by it through short helical springs and lugs.

Peculiarly enough, all but one of the cylindrical surface clutches shown had the expanding or contracting member in one piece. The expanding leather faced ring, carried on a light drum and operated by more or less simple mechanisms, was used on three high grade American cars of high power.

In Fig. 3 is shown the Packard, one of the simplest of those devices which employ screws with right and left threads. The bell crank is carried by a boss on the web of the drum, and connected by an adjustable link with the free end of the faced ring. The slight movement of the bell crank on its fulcrum for engagement or disengagement is made through the right and left threaded screw which carries the pinion shown, and which is rotated by a rack slidably mounted and spring controlled.

Fig. 4 shows the expanding device employed in the Peerless clutch. The right and left threaded screw acts directly upon the free end of the ring or band, through the rotative motion imparted to it by the arm *a*, which is connected by a link to the slidably mounted collar.

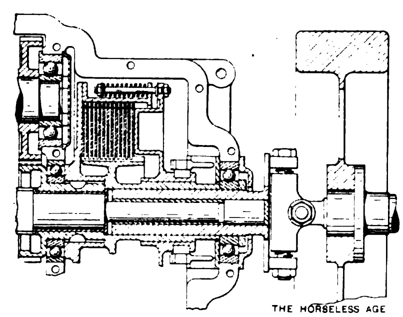


Fig. 6.—Pope-Toledo Multiple Disc Clutch in Gear Case.

One of the great advantages of clutches such as the foregoing is the perfect release and entire absence of drag, since in disengagement the band is drawn tightly upon its supporting drum and is then freed beyond possibility of contact with the driving drum.

Another ingenious expanding mechanism is used in the Stearns clutch (Fig. 5), which was the only two segment clutch exhibited. The faced shoes are carried by a double armed spider, the arms of which are tubular and have mounted within them a shaft carrying, in the hollow hub of the spider, a small pinion which is rotated by a sliding, spring controlled rack. On each

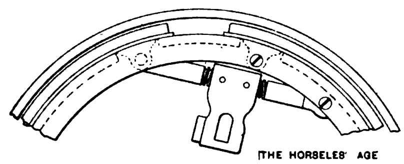


Fig. 4.—Peerless Operating Device.

end of the shaft (which is in reality two shafts keyed into the pinion boss) is formed a small eccentric. These eccentrics, through a suitable strap and ball joint, as shown, force the free ends of the faced segments into contact with the inner face of the fly-

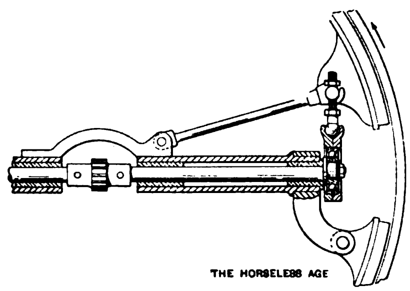


Fig. 5.—Stearns Operating Device.

wheel drum when the shaft is rotated under the influence of the spring. Adjustments are made through the threaded shanks of the ball ended links, and rods are provided to keep the segments in their proper plane and resist the distorting influence of centrifugal force.

Several of the cylindrical surface clutches noted are distinctive products, having been employed for years by their makers, who have retained and refined them in their present state.

The multiple plane surface or disc clutch is used by a great many car manufacturers, its rapid adoption being really wonderful when its large number of parts and attendant complications are considered. Its advantages, at one time peculiar to it alone, are shown to be possible of realization in either of the other types with greater simplicity and much reduced cost.

There is a notable tendency in American practice toward housing these clutches in a forward compartment of the transmission case, and the use of multiple springs. There are some advantages in so housing the clutch. It relieves the engine crank shaft of all thrusts in clutch operation and makes the clutch very much more accessible, the removal of a cover sufficing for what would in many cases require the removal of the entire gear case, if the old arrangement were employed. Then, also, lubrication can be better attended to, a stationary casing being not nearly so apt to leak as one which revolves and the discs constantly dip into the oil, instead of having it all carried away from them and to the outer wall by centrifugal force.

Bronze steel and steel-steel are both largely used combinations, with the users of steel-steel increasing in numbers. In Fig. 6 is shown a typical multiple disc clutch mounted in the forward end of the gear case.

Releasing of the plates, one from the other, is insured in several ways, viz., by small helical springs between the discs of the same member; by small buttons on the free peripheries of the discs, and by the discs having a portion of their free peripheries cut and sprung to make them self releasing.

Only two makers who exhibited use the three disc clutch with levers. In one case this style of clutch was shown in a car of great weight and power, necessitating a clutch of large diameter and powerful application.

The clutch shown in the Northern large car (Fig. 7) is a new disc construction; a steel driven disc is clamped between a fibre disc and a heavy leather diaphragm for driving engagement. The novelty in this clutch is the engaging means. This is simply air under pressure introduced behind the diaphragm, causing it to engage with and force into engagement the driven disc. The air is introduced through a passage in the crank shaft leading from a packed joint at the front end to the clutch air chamber.

The several clutch types appeared in the following numbers in a total of fifty-eight models exhibited by thirty-six manufacturers:

Type.	No. of Cars.	Per Cent.
Conical	26	45
Cylindrical	11	19
Disc	21	36

A summary of the exhibits at the A. C. A. and A. L. A. M. Shows clearly indi-

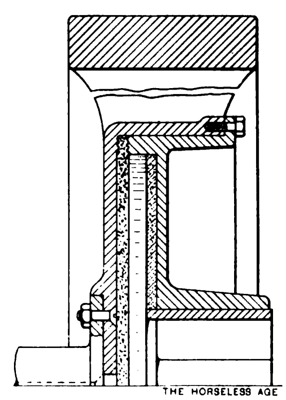


Fig. 7.—Northern Air Operated Disc Clutch.

cates the order of popularity of type in modern practice:

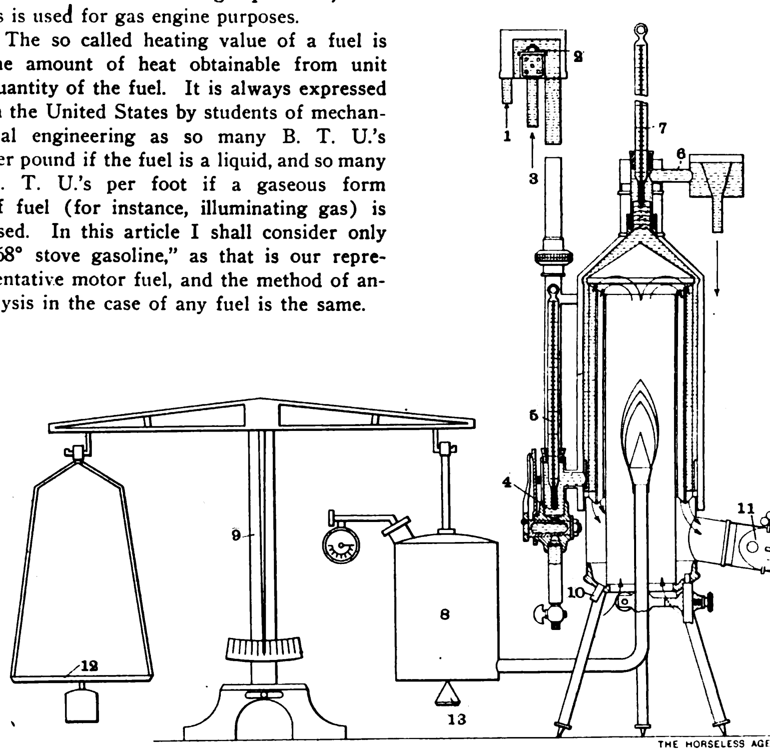
Type.	No. of Cars.	Per Cent.
Conical	71	46
Cylindrical	25	16
Disc	60	38

"High" or "Low" Heating Value in Thermal Efficiency Calculations?

By Harold S. Wheeler.

Those who are interested in the design and development of the modern gas engine seem to be of different opinions concerning the use of the "high" or the "low" heating value of the fuel, in calculating the thermal efficiency of the engine. Some of the engineers interested in this work use the high heating value, some use the low, and which is the correct value to use seems to be rather a confusing proposition. Before advancing my theories along this line it seems only right that I should explain what the "heating value" is, and how it is obtained when using liquid fuel, such as is used for gas engine purposes.

The so called heating value of a fuel is the amount of heat obtainable from unit quantity of the fuel. It is always expressed in the United States by students of mechanical engineering as so many B. T. U.'s per pound if the fuel is a liquid, and so many B. T. U.'s per foot if a gaseous form of fuel (for instance, illuminating gas) is used. In this article I shall consider only "68° stove gasoline," as that is our representative motor fuel, and the method of analysis in the case of any fuel is the same.



Apparatus for Determining the Heat Value of Liquid Fuels.

It may be well to state here that the B. T. U., the unit used in our calculations, is equivalent to the heat required to raise 1 pound of water 1° Fahr. at its maximum density, or about 39° Fahr.

The heating value of the fuel under consideration (68° stove gasoline) was found by means of a Junker's calorimeter. This instrument is manufactured in Dessau, Germany, and when carefully used with accurately calibrated thermometers it is considered accurate. The underlying principle is very simple. The heat generated by the burning of a fuel is applied to a constant stream of water, and the increase in the temperature of the water is measured thermometrically. This is accomplished by establishing a condition of permanency in the calorimeter, wherein the heat developed from a constant flame is transmitted to the constant flow of water, while a specified quantity of the fuel is burned. The calorimeter proper (see sketch) consists simply of a surface condenser operated without vacuum, the heated air being passed through thin copper tubes in an annular water space. To prevent heat loss to the outside atmosphere the outside of the calorimeter is heavily lagged with a non-conducting material.

The accompanying sketch shows the cooling water entering through a rubber tube at 1 into a "constant level" tank 2, the overflow being conducted away at 3. The water flows down through the long pipe to a regulating cock 4. At 5 is situated the thermometer cup for taking the temperature of the entering water. Obeying the law that "hot water rises," the overflow from the apparatus occurs at the top at 6, the temperature of the overflow being taken at 7. Calibrated thermometers, graduated to one-tenth of one Centigrade degree, are used, and permit of very accurate readings.

The fuel is contained in an ordinary blow torch 8, such as is used in soldering, to which are added a small scale pan and a gauge to indicate the pressure in the torch. This is supported on a beam balance 9. A predetermined weight of the fuel is burned, and the products of combustion are carried up through the interior of the calorimeter, down through the copper tubes in the annular space and out at the vent 11. The water vapor formed from the combination of the hydrogen (H) of the hydrocarbon fuel with the oxygen (O) of the atmosphere in which the fuel is burned, according to the formula H_2O, is condensed in the calorimeter and collected at the small drip 10, and great care should be taken to measure this water accurately, as it represents the amount of heat in the difference between the high and low heating values. The water outlet 6 is provided with a flexible tube discharge, which enables the observer to transfer the flow of water through the calorimeter to a measuring vessel while any predetermined weight of fuel is burned.

Now, taking up a determination of the high and low heating values of a sample of liquid fuel, we proceed as follows:

Arrange all of the apparatus according to sketch, providing a large graduate to measure the main flow of water and a small one to measure the drip. Start the blow torch, and place the flame inside the calorimeter, with the torch on the scale pan as shown. Start the water supply, taking care to supply enough so that the overflow of the "constant level tank" will be in action. When the temperatures of water entering and water leaving have become practically constant we are ready to make the first determination. Put weights into the scale pan 12 so that the scale is nearly in balance, the side carrying the torch being slightly heavier. As combustion is all the time going on, the scale will come slowly into balance. At this instant transfer the main flow 6 to the large graduate, and place the small one under the drip 10. Place a weight equal to the amount of fuel it is desired to burn (commonly 5 grams) upon pan 13. This overbalances the scale again. Now, at the instant the scale again comes into balance, the test is finished, and the two graduates should at once be removed and the amount of the contents noted. While the test is going on, it is necessary to note the temperatures shown by thermometers 5 and 7 at frequent intervals.

We have now obtained the weight of fuel burned, temperature of water entering, temperature of water leaving, amount of water flowing through the calorimeter and the amount of drip. The method of calculating the heating values from these quantities is as follows:

Weight of water flowing through the calorimeter multiplied by the Fahrenheit difference in temperature between the water entering and leaving, multiplied by 90.8 equals the number of B. T. U.'s per pound of fuel, high heating value. We multiply by $90.8 = \frac{1}{0.011}$ because this is the number of times our unit quantity of fuel (5 grams) is contained in 1 pound. Now, 966 (the latent heat required to vaporize steam at atmospheric pressure), multiplied by the number of cubic centimeters of drip, multiplied by 0.0022 (= the fraction of 1 pound represented by 1 gram), multiplied by 90.8, as above, equals the number of B. T. U.'s per pound of fuel that go into the drip. The high heating value minus the drip loss equals the low heating value.

The data sheet on page 135 shows the method of putting the work into shape and a specific calculation of heating values is thus made.

Having shown what the actual heating values of gasoline are, and how they are obtained in the laboratory, I now propose to give my idea of a method for the determination of the correct heating value to use for the thermal efficiency calculations in any specific case.

I fully realize that the following method of calculation is not exact, since pyrometric measurements give only the mean temperatures rather than an instantaneous temperature, and one must assume specific heats at constant pressure, which is not exactly the case. However, it is my opinion that in cases where it is inadvisable to go to the expense of purchasing and installing apparatus, with which to measure the air used by the engine and to analyze the exhaust gases, this method will prove satisfactory. In fact it seems to me that such a method will do very well for use in almost any gas engine experimental department, as in nine cases out of ten the manufacturers wish to know the thermal efficiency of their product as accurately as possible, and at the same time with very little expense.

Now, suppose we ran a test on an engine, used pyrometers in the exhaust and in the combustion space, and have obtained the high and low heating values of the fuel. The pressure due to compression (P_1), as well as the explosion pressure (P_b), can be easily determined by the use of a gas engine indicator, or in a proposed engine can be approximated by means of the formula $\frac{PV}{t} = \frac{P_1 V_1}{t_1}$. For approximate work a pressure gauge may be attached to the combustion space, the engine turned over quickly by hand (after having been run long enough to warm up), and the explosion pressure taken as four times the observed compression pressure.

Now, the total heat which must be supplied to the water formed by the combination of the hydrogen and oxygen to bring it up to the temperature of explosion will be the latent heat necessary to vaporize the water at the explosion pressure, plus the heat necessary to superheat the steam formed from the temperature corresponding to the explosion pressure to the maximum explosion temperature. The heat given back in useful work during the expansion stroke will be equal to the heat given off in expanding superheated steam from the explosion temperature to the temperature of the exhaust.

Let us denote the factors entering into the equations as follows:

H = high heating value of the fuel.
L = low heating value of the fuel.
T_b = temperature corresponding to the explosion pressure.
T_c = temperature of the explosion.
T_d = temperature of the exhaust at point of release.
P_1 = compression pressure.
P_b = explosion pressure.
h_1 = latent heat of steam at temperature T_b.
K_p = specific heat of water vapor at constant pressure.

Referring to tables of saturated steam, which are found in any steam engine handbook, we find the value of h_1 corresponding to T_b. Thermodynamics shows us that the heat required to superheat steam any required amount is equal to the specific heat of steam at constant pressure into the number of degrees the steam is superheated, or heat required to superheat $= K_p\ (T_c - T_b)$. Thus, the total heat supplied to the water vapor will become $H_1 = h_1 + K_p(T_c - T_b)$, and the heat given off during expansion will be equal to the work done in expanding the steam from the explosion temperature to the temperature of the exhaust; that is, H_2

$H_2 = (K_p) \times (T_c - T_d)$.

The heat given back in useful work, divided by the heat supplied, is equal to the efficiency of the cycle, or $E = \frac{H_2}{H_1}$. Substituting the values of H_2 and H_1 we have

$$E = \frac{(K_p) \times (T_c - T_d)}{(h_1) + K_p(T_c - T_b)} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Now the difference between the high and low heating values multiplied by the fraction E, added to the low heating value, will give the heating value to be used in the thermal efficiency calculations; that is, the correct heating value $= E\ (H - L) + L$.

Before proceeding to show how the above equations are used in an actual case we must take cognizance of a few facts concerning explosion and exhaust temperatures taken by means of the thermo-electric pyrometer and the specific heat of water vapor at constant pressure.

The pyrometer indications of temperature as taken are indicative only of the mean thermal conditions, and consequently both temperature readings by this means will be somewhat lower than the actual instantaneous temperatures at the instants of explosion and release. In the expansion stroke, where both T_c and T_d are taken by pyrometer, the temperature difference will be practically correct, since both pyrometers give the mean thermal condition instead of the maximum. In raising the water vapor from T_b to T_c, T_b may be obtained from the steam tables. As above stated, T_c is only a mean temperature, and we have no way of finding the exact instantaneous temperature. However, we know that the temperature as given by the pyrometer is low, so I propose to add a constant of 200 degrees to T_c to correct as nearly as possible for the error in the pyrometer. This is, of course, a strictly arbitrary constant, and whether the addition of 200 degrees is sufficient or not I do not know; however, it seems to me to be reasonable. The addition of this constant will make our formula for efficiency read:

$$E = \frac{(K_p) \times (T_c - T_d)}{(h^1) + K_p \left\{ (T_c + 200) - T_b \right\}} \quad \ldots\ldots 2))$$

and $E\ (H - L) + L =$ the correct heating value as before, except that the change in E, occasioned by the introduction of the correction factor, will be noticeable.

It is a well known fact that the specific heats are not constant, varying with the temperature, so for $K_p \times$ and (K_p) we must use coefficients which are proportional to the mean temperature; that is, for $K_p \times$ the coefficient should be that which is used for the temperature $\frac{T_c + T_d}{2}$, and for K_p the coefficient should be that which is used for the temperature $\frac{T_c + 200 + T_b}{2}$. The German authority, Hugo Güldner, on page 149 of his "Entwerfen und Berechnen der Verbrennungs Motoren," gives a table "Veränderlichkeit der Spezifischen Wärmen, nach Mallard und Le Chatelier." In this table, assuming a constant pressure, the specific heat for water vapor at any temperature is given as $0.323 + 0.000364 \times$ degrees centigrade above the absolute zero. So to find the correct K × we must proceed as follows:

$\left(\frac{T_c + T_d}{2}\right)$ is given in degrees Fahrenheit. Now the temperature in centigrade degrees is $\frac{5}{9}$ (Fahrenheit temperature —

HEATING VALUES OF 68° STOVE GASOLINE.

Test Number.	Weight of Fuel Burned. Grams.	Temp. H_2O Entering. Degrees Fahr.	Temp. H_2O Leaving. Degrees Fahr.	Temp. Difference. Degrees Fahr.	Wt. H_2O Through Calorimeter. Lbs.	Drip. C. C.	B. T. U. Per Lb. High Value.	B. T. U. Per Lb. in Drip.	B. T. U. Per Lb. Low Value.	
1	5	55.8	102.6	46.8	5.00	7.5	18,600	1,448	17,152	NOTE.—Temperatures of water entering and
2	5	56.0	98.86	42.86	5.00	7.5	19,470	1,446	18,024	leaving are the mean of five actual
3	5	56.0	98.0	42.00	4.85	7.0	18,530	1,352	17,178	readings for each test.
						Average	18,867	and	17,451	B. T. U. per pound high and low values.

Method of calculation for test (3): 1 gram = 0.0022 pound, 5 grams = 0.011 pound $\frac{1}{0.011} = 90.8$ = number of times 5 grams is contained in 1 pound. 966 B. T. U. = latent heat of steam.

Now, $4.85 \times 42 \times 90.8 = 18{,}530$ B. T. U. per pound high heating value; $966 \times 7.0 \times 0.0022 \times 90.8 = 1{,}352$ B. T. U. per pound lost in drip; and $18{,}530 - 1{,}352 = 17{,}178$ B. T. U. per pound low heating value.

32°), or in the centigrade scale $\left(\frac{T_c + T_d}{2}\right)$ becomes $\frac{5}{9}\left(\frac{T_c + T_d}{2} - 32\right)$, and since the absolute temperature is to be used we must add 273.7° C. Thus in the final form the temperature is

$$\frac{5}{9}\left(\frac{T_c + T_d}{2} - 32\right) + 273.7 \ldots\ldots\ldots\ldots (3)$$

In like manner we find the absolute centigrade temperature corresponding to K^p to be

$$\frac{5}{9}\left(\frac{T_c + 200 + T_b}{2} - 32\right) + 273.7 \ldots\ldots\ldots (4)$$

Now, multiplying (3) and (4) each by 0.000364 (see above), and adding to 0.323 and substituting for $K_p \times$ and K_p of equation (2), we obtain the complete equation for efficiency:

$$E = \frac{\left\{0.323 + 0.000364\left[\frac{5}{9}\left(\frac{T_c + T_d}{2} - 32\right) + 273.7\right]\right\}(T_c - T_d)}{h_1 + \left\{\left\{0.323 + 0.000364\left[\frac{5}{9}\left(\frac{T_c + 200 + T_b}{2} - 32\right) + 273.7\right]\right\}(T_c + 200 - T_b)\right\}} \ldots (5)$$

This equation (5) seems to be somewhat complex, but after substituting the values of T_c, T_b, T_d; and h_1 the solution is, for any particular case, a matter of only a few moments of straightforward work.

Now let us take up the solution of a special example by the above method. In a certain gas engine test the quantities required by the formula were found to be T_c = 2500° F., T_d = 800° F., T_b = 432° F., h_1 = 807 B.T.U.'s per pound, H = 18,530 B.T.U.'s, and L = 17,178 B.T.U.'s. Substituting these values in equation (5) we obtain

$$E = \frac{\left\{0.323 + 0.000364\left[\frac{5}{9}\left(\frac{2500 + 800}{2} - 32\right) + 273.7\right]\right\}(2500 - 800)}{807 + \left\{\left\{0.323 + 0.000364\left[\frac{5}{9}\left(\frac{2500 + 200 + 432}{2} - 32\right) + 273.7\right]\right\}(2500 + 200 - 432)\right\}}$$

$$= \frac{\{0.323 + 0.000364\,[\frac{5}{9}(1650 - 32) + 273.7]\}\,1700}{807 + \{\{0.323 + 0.000364\,[\frac{5}{9}(1566 - 32) + 273.7]\}\,2268\}}$$

$$= \frac{\{0.323 + 0.000364\,[899 + 273.7]\}\,1700}{807 + \{\{0.323 + 0.000364\,[852 + 273.7]\}\,2268\}}$$

$$= \frac{(0.323 + 0.000364 \times 1172.7)\,1700}{807 + (0.323 + 0.000364 \times 1125.7)\,2268}$$

$$= \frac{(0.323 + 0.426)\,1700}{807 + (0.323 + 0.41)\,2286}$$

$$= \frac{0.749 \times 1700}{807 + 0.733 \times 2286}$$

$$= \frac{1273.3}{807 + 1675.8}$$

$$= \frac{1273.3}{2482.8}$$

$$= .513 \text{ or } 51.3\%$$

Now we have E = 51.3%, H = 18,530, and L = 17,178.

18,530 — 17,178 = 1,352 = H — L.

Substituting in E (H — L) + L we get 0.513 (1,351) + 17,178 = 693 + 17,178 = 17,871 B.T.U.'s per pound for the heating value to be used in the calculations.

The engine from which these calculations were deduced was an example of the general automobile type. Now two other calculations have been made of values of E for engines of both high and low compression types (see table bottom of page).

It is seen that for these different types calculated, the smallest value of E is 0.485 and the largest 0.528. In view of the fact that the temperatures as taken are inexact, it seems reasonable that one could, in ordinary calculations, use the mean value of 0.50 and obtain very nearly correct results. However, in engines materially different from those above mentioned it would be advisable to recalculate a value for E to fit the special case.

In order to show just what effect the use of the different heating values has on the efficiency calculations in an actual case, I have made the efficiency calculations with high, low and calculated heating values for a 5x6 inch single cylinder engine. The engine made a three hour economy run at approximately one-half load. Heat equivalent of B. H. P. hour = 2,546 B. T. U.'s, and the heat lost in the cooling water per B. H. P. hour = 5,780 B. T. U.'s. Gasoline used per B. H. P. hour = 0.814 pound.

(1) High heat value. Heat supplied = 18,530 × .814 = 15,080 B. T. U. per B. H. P. hour.
(2) Correct heat value. Heat supplied = 17,871 × .814 = 14,510 B. T. U. per B. H. P. hour.
(3) Low heat value. Heat supplied = 17,178 × .814 = 13,980 B. T. U. per B. H. P. hour.

Per cent. of heat going to useful work in	(1) = 16.8
" " " " "	(2) = 17.5
" " " " "	(3) = 18.2
Per cent of heat lost in cooling water in	(1) = 38.4
" " " " "	(2) = 39.9
" " " " "	(3) = 41.6
Per cent. of heat lost in exhaust, radiation, etc., in	(1) = 44.8
" " " " " "	(2) = 42.6
" " " " " "	(3) = 40.2

The above table shows very nicely the effect on the calculations of using different heating values for the fuel, showing that the lower the heating value given the higher the apparent efficiency, the greater the cooling water loss, and the lower the other losses.

While the above method is not exact, it is approximately correct, and I see no reason why it, or a similar method of calculation, could not be used to great advantage by anyone who has to deal with calculations involving the various heating values of hydrocarbon fuels.

How Much Power Is Required to Drive a Sparking Magneto?

By Albert L. Clough.

The writer does not call to mind having seen any figures published in these columns as to the power required to drive an ignition magneto of the so called high tension type. It has been generally understood that these generators absorb very little energy, but apparently few, if any, figures on this point have been given out. Having a magneto connected up for the purpose of making a test, it occurred to the writer to make some rough determinations upon its mechanical input.

The magneto was of the two impulse type, delivering its electrical output to a jump spark coil through the agency of a condenser. It was intended to be geared to the engine to be ignited and to spark a four cylinder motor—the distributer being gear driven from the armature shaft at one-half the speed of the latter. Both armature and distributer shafts run on ball bearings and the armature and distributer contacts are made by carbon brushes. A one-quarter horse power direct current motor was used to drive the magneto, the armature shaft of the latter being belted to the motor with a 1 inch belt. The sizes of the pulleys were proportioned so that the magneto ran at about 1,100 revolutions per minute, which reproduces the conditions, so far as the number of sparks required is concerned, existing with a four cylinder engine running at the above rate of speed, which is a rate of rotation frequently attained in practice by automobile motors.

At this rate of speed the magneto delivered sparks of somewhat over 1 inch in

Type.	Tc.	Td.	Tb.		E.
High compression	3,000°	1,000°	445°	corresponding to 95 lbs. compression and 380 lbs. explosion pressure,	0.528
Medium compression (calculated as above)	2,500°	800°	432°	" " 84 lbs. " " 335 lbs. " "	0.513
Low compression	2,000°	600°	371°	" " 40 lbs. " " 160 lbs. " "	0.485
				Mean,	0.508

length with great regularity—the discharges being bright and crackling. With a somewhat shorter spark gap paper was almost instantly ignited by the spark, and a stick of soft wood set on fire promptly.

A low reading ammeter and voltmeter were connected to measure the input of the motor and a set of volt and ampere readings was taken with the motor running free of the magneto, then a similar set with the magneto running, but not electrically connected in circuit, and finally a set with the magneto delivering its discharge, as described above. The first set of readings, when reduced to watts, represented the losses in the motor when running light, and the second set the motor losses plus the mechanical and electrical losses of the magneto. The third set, when expressed in watts, gives the motor losses plus the losses and output of the magneto. The results were as follows:

(1) Watts input to motor driving magneto (sparking) 178.3
(2) Watts input to motor driving magneto (not sparking)................... 161.5
(3) Watts input to motor running free (magneto not turning)............ 149.2

The difference between (1) and (3) 178.3 — 149.2 = 29.1 watts is the total energy required to drive the magneto at 1,100 revolutions per minute while delivering its normal spark.

The difference between (2) and (3) 161.5 — 149.2 = 12.3 represents the losses in the magneto, such as gear friction, brush, bearing and air friction and hysteresis and eddy currents.

The difference between (1) and (2) 178.3 — 161.5 = 16.8 watts represents the electrical output of the magneto, minus the electrical losses resulting from the current generated.

The total energy absorbed by the magneto was thus 29.1 watts = .039, or about one twenty-fifth horse power—an amount of power which is decidedly trivial.

No attempt was made to evaluate the loss in the belt connection between the motor and the magneto, but it may be taken as equivalent to the gear loss between the engine and magneto which would be sustained in practice. The differences in wattage between that required by the motor running light and slightly loaded through driving the generator were considered to be entirely absorbed by the magneto—the additional losses in the motor being extremely slight.

No special degree of accuracy is claimed for this test, the data being qualitative rather than exactly quantitative, but it is doubtless fairly correct as regards the particular machine experimented upon, and in order of magnitude is probably about what magnetos of this general type may be expected to show.

At the last meeting of the French Automobile Manufacturers' Association, presided over by the Marquis De Dion, it was announced that the automobile exports of France for the first eleven months of 1906 showed an increase of 33,841,000 francs.

The Operation of a Car.

By Sidney Aylmer-Small.

There are two parties to the sale of a motor car—the agent and the purchaser. The agent tries to make his car appear to suit the wants of the purchaser, and in doing so makes two classes of statements.

1. He talks of the good points of his car which are really good—points which the mechanical minded man will at once grasp, but the tyro will not.

2. He mentions as good points things which are non-essential, sometimes untrue, and things which, though true, never ought to be mentioned in the presence of an innocent motorist.

It is these statements of the latter class which the mechanical man scoffs at, or at best listens to with his tongue in his cheek and shrewd thoughts in the back of his mind, while the inexperienced or even slightly experienced swallows them whole. Worse yet, when he gets the car he at once puts these statements to test, with the inevitable result to his pocketbook. Among the statements of the first class are:

"Four full elliptic springs."
"Motor and transmission a single unit."
"Offset cylinders."
"Three point support."
"Metallic disc clutch."

The new entrant to the market is puzzled by many of these expressions, and it takes a salesman too long to explain and to teach; in fact, the salesman often makes them in a perfunctory way, hoping against hope that he will see the gleam of interest and understanding in the man's eye, and be able to sell a car on its merits.

The blank expression or assumed look of intelligence which usually meets these statements turns the agent quickly to his second array of facts (?):

"Twenty horse power."
"Will take any hill on high gear."
"Starts from standstill on high gear."
"Very easy on tires."

The look of appreciation on the face of the purchaser is enough to make any man try to increase the visible supply of happiness, and he at once says quite loud "35 miles an hour," and mentions the price softly, and a car is sold.

There is nothing the matter with that car which will not also be found in nearly all the others. The electric wires are run unprotected under the floor awaiting the first puddle to wet them. All the steering and brake rod joints are open to dust and dirt; there is no apron under the machinery, although one is needed; but it is a good car, and when put into commission by its owner at a cost of about $25 to $50 for little necessities, another $25 to $100 for lamps, and, say, $75 to $1,750 for a top and storm curtains, this car is good for rain or shine, hill or dale, when properly operated.

Will the car be properly operated? The very statements made by the salesman to the new owner tend to prevent the proper operation of the car.

"Twenty horse power," says the cheerful salesman. To be sure, the literature of the manufacturer says it is a 16-20 horse power, and the auto magazines say it is a 16 horse power, but that "twenty" sticks in the owner's mind. He proceeds to get 20 horse power out of it. That is, he tries to refuse to allow any car of equal size or even area or that has a horn of about the same loudness to pass him on the road. I do not mean the fool who tries to beat everything on the road, but the man who honestly believes his car is a 20 horse power, and hence ought to keep pace with the others of its class.

What is the result? In order to get the speed he has to keep the throttle wide open on smooth, level roads. This runs the motor faster than normal speed, and it wears out more rapidly than it should. The crank and piston rod bearings require too much attention; both work loose and the manufacturer is blamed.

"Takes any hill on high gear." The owner begins to hunt for hills and ends by having them hunt him. Of course, with everything tight and clean the new car could "eat" hills, and, as the motor gets dirty and things loosen up a little, the owner forces her up until she knocks, never thinking to retard the spark a little as she mounts the grade. This course is persisted in by many a sensible man because the agent said the car would do it, and he feels it ought to. He goes about quietly proud of the grades he has accomplished on the high gear.

"Can you climb —— hill on high gear?" his friends ask.

There is only one other question equally incompetent and irrelevant, viz., "How long did it take you?" The lack of the moral courage to answer these two questions with flat falsehoods has sent many a good motor to the scrap pile.

I personally always lie with a clear conscience, not because I am ashamed of my speed and hill climbing, but to protect the reputation of the manufacturer of my car.

"Can you climb —— hill on high gear?" "Perhaps I can, but I don't." My advice, when in doubt, as to whether she will take the hill on high gear is, *Don't.*

This mania for sticking to the high gear is deplorable, and its acquirement by the public is fostered by the agents, many of whom are the personal representatives of the manufacturers.

The trouble involved in changing gears is in a large measure responsible for the high gear craze, but if it is really much trouble to slip from high to low and back again, there is something radically wrong with the transmission or its method of control. This should have been inquired about and looked into at the time of purchase.

If the fault is that your car goes very slowly on the low gear, it is a proof that there is too little motor for the weight of the car. The manufacturer dare not give you higher speed, as he fears getting stuck on very steep hills.

Should you posses such a car, there is but one thing to do: Go slow on hills. Operate the car properly. The car was built to do so, and nothing but grief will result from doing anything else.

I know it is disagreeable to climb a long hill like a snail, especially on hot summer days, and when other autos are passing you, many of them on their way to the scrap pile.

The remedy was that a very light, heavily powered two speed car, or a heavier moderately powered three speed car should have been purchased. Either of these should be two cylindered for good hill work, and the "always at it" feature of the four cylinder car makes it a good hill climber.

The comfort of having three speeds is well worth the cost. The high is for speeding, the middle for hills, and the low for starting—very bad roads, very steep hills and "young" mountains.

"Starts with the high gears in mesh." Certainly no one denies it, it may be done but it ought not to be. The salesman found that it "starts on the high speed," a good talking point. It is a statement which seems to mean a whole lot but really does not. It sticks in the purchaser's mind and he tries it.

It ruins tires, wears clutches, pounds bearings, loosens up the vitals of the car, and quickly develops any inherent defects. Why should one start on the direct drive? It would never have occurred to anyone to try it, unless he was told that he could do it.

Let me say how I think a car should be handled in starting and during hill climbing. A knowledge of the speed of the motor may be gained by its sound, and that of the car by a glance at the road side, or your front wheels, either directly at them or as reflected from the backs of your searchlights. The motor sound you must listen for will be quite different according to the type of car. In one the fan whir is most noticeable, in another the valve noise or the exhaust noise. In my car, up to a certain speed, I judge by the valve noise and beyond that I judge by the sound of the fan.

You must learn what is the slowest motor speed at which you can start the car on low gear without "pumping." To start, accelerate the motor to a little above this speed, using more gasoline than spark. Allow the low gear to engage easily, letting the clutch slip. By clutch I mean the bands of a planetary or the master clutch of any transmission.

When the motor has been brought to normal speed, shift to the next higher gear quickly, without allowing the motor to accelerate. Give gas to motor the instant the clutch takes hold, but not before. The car will go faster while the motor drops in speed, at the same time making more powerful explosions.

Adjust the gasoline and the spark to get the desired speed, and limit your desire by a knowledge of what the car ought to be expected to do. Do not speed up the motor during the shift to a higher gear; if anything reduce it. The reason is that when your car is going at 4 m. p. h. on low gear the motor is making 800 r. p. m., but when you change to a gear twice as high, your car at the instant before clutch engagement will be running at 4 m. p. h. and the engine at 800 r. p. m., while at the instant the clutch takes hold the car must go at 4½ miles and the motor drop to 450. This produces a lurch which is unpleasant to the occupants of the car, very hard on the pins of the universal joints, and bad for the differential gear.

If you have speed up to 5 m. p. h. on the low gear the change will be to 5½ m. p. h., producing a still greater shock to the mechanism, for the change is from a motor speed of 1,000 at 5 m. p. h. on low gear to 550 r. p. m. at 5½ miles on middle gear. If you have allowed the motor to accelerate during the shift the lurch is much worse.. This is the reason why a multiple disc metallic clutch run in oil has proved such a factor in reducing the upkeep of the motor, transmission and differential gears, and the rear tires. The great slippage of such a clutch accelerates the car and slows down the motor gradually, eliminating much of the shock which with improper handling will always appear. Even with such a clutch a gear shift improperly made will jerk the car a little.

To shift to a higher gear softly, keep the spark retarded and just as the clutch comes out cut down the gas (to slow the motor), make your shift quickly (to prevent car from slowing down), and just as the clutch goes in again give the motor gas.

Should your control be so arranged that you cannot change the gas supply during a gear shift, you can avoid a deal of the jar by shifting the gear very quickly, thus preventing the energy stored in the flywheel from accelerating the motor while it is running free. Furthermore, always make your gear shifts to a higher gear at as low a car speed as possible, for then the drop in motor speed is less and the shock of the change less; in fact, small enough to be absorbed by the slippage of a proper clutch. The relative magnitude of the jar on the mechanism due to gear changes at different car speeds is shown in this table:

Change from.	Motor Speed On Low Gear.	On Middle Gear.	Drop in Motor Speed.
2 to 3 m. p. h.	400	300	100
3 to 4	600	400	200
4 to 5	800	500	300
5 to 6	1,000	600	400
6 to 7	1,200	700	500

If for some reason the car has been forced to the higher speeds of the gear in mesh by use of the throttle, and a shift to a higher gear is to be made, take out the clutch, reduce the gas supply, shift the gear and hold out the clutch until your motor comes down to the proper speed. This manœuvre, when performed on a grade, is a good test of a driver's ability. If while ascending a long hill on the middle gear two teams pass each other right in front of you, it means a change to low gear or else you run into them, for you cannot reduce speed sufficiently on the middle gear without slowing the motor below its critical speed, say 200 revolutions per minute. The long hill again confronts you, and you feel that you have the motive power to negotiate the grade on the middle gear. All right, force your car to its utmost speed as quickly as possible; don't hold it there, but at once kick out the clutch, shift the gear, reducing your motor speed while shifting, and let the clutch in easy, giving gas again as the clutch is engaging. Unless you have a foot controlled throttle and a spark lever you can knock first one way and then the other by a careless blow of the finger; but you cannot do this trick and still operate the car properly.

Almost anything may be accomplished by a tour de force; but to do all the things that are needful, and always produce a smooth acceleration or retardation of the speed of my car, is to me a keen pleasure, and is a standard to which we can keep pretty close. The proper way to shift to a higher gear is then:

1. See that spark is not too far advanced.
2. Draw clutch out; cut down gas.
3. Quickly shift gear.
4. Let clutch in; increase gas.
5. Set spark to suit your speed.

If the motor will not accelerate quickly after the clutch is in up to the speed you desire, the fault is in your carburetor adjustment or in the valve setting or motor design. Until some adjustments or perhaps radical changes are made the car is incapable of proper operation. According to the tabulation above the sequence of events will be:

Car M. P. H.	Motor R. P. M.	Clutch.	Gas.
3	600 low gear.	in.	normal.
3	500 free.	out.	reduced.
4	400 middle gear	in.	normal.

When reducing speed on level roads by gear change slow down the car by gas and spark to the speed it will take after the shift. Take clutch out, shift gear, hold clutch out till motor is up to proper speed and let clutch in again.

For hill climbing get up a momentum if possible, and as the car mounts the grade listen to the motor and retard the spark as necessary as the motor slows down, so as to keep it producing the maximum power.

When it has slowed to a certain speed shift to the next lower gear leisurely, neither slow nor fast, thus allowing the motor to speed up. You must demand that the clutch do its part of the work in shifting on hills. You cannot spare the time to "coax" the clutch, else your car loses its momentum.

The man who waits for his motor to knock is a brute. His punishment is immediate, for by proper operation you get to the top in fewer seconds than if you persist in the high gear too long.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Automobiles in Stress of Weather.

During last week's snow storm the commercial motor vehicles in use in New York city had another opportunity of demonstrating their superiority to horse vehicles under abnormal weather conditions. To those who have followed the commercial development it is well known that a motor car in city streets is little affected by a blizzard that will practically bring all horse traffic to a standstill. A well known New York firm when interviewed on their experiences last week gave the information that the horses under such weather conditions, after having slipped and fallen a number of times, become balky, and it is practically impossible to make any headway, whereas motor delivery wagons had no difficulty in covering their regular routes. The same observation was made in London during the recent extreme cold there, with respect to motor omnibuses. While the horse buses were creeping along, the horses straining to their limit of effort, the motor buses proceeded at practically their usual speed, with no evidence of abnormal strains.

This increased reliability or independence of weather conditions will prove a factor of no mean importance in the substitution of mechanical for animal haulage in our big cities. The losses to business houses due to the several more or less complete interruptions in traffic during extremely hot spells in summer, and snow storms in winter, amount to very large sums annually. Moreover, with the increase in size of our large cities and the growing complication of our modes of life, an absolutely dependable system of traffic becomes of increasing importance. Consequently, the general conditions affecting the practicability of the commercial motor car are becoming more favorable as time goes on, while at the same time the vehicles are being improved upon mechanically.

Demonstrations Losing in Value.

The practice of demonstrating cars to prospective customers at the shows is still being continued, although it must be recognized that in recent years such demonstrations have lost much of their value. Time was when a purchaser ran the risk of buying a car that would not go unless he first satisfied himself of the contrary, and when there were so many irresponsible firms in the business that it was often impossible to get any satisfaction from the manufacturer after purchase. Now all is changed. Of the exhibitors at the Madison Square Garden Show a majority have thousands and practically all have hundreds of cars in successful operation, and a reputation for fair dealing has become a most valuable asset in the automobile business. Cars are frequently bought simply on their general reputation, and properly so, because a manufacturer who has thousands of cars in successful use may be expected to do all in his power to prevent dissatisfaction among his customers and thus retain his reputation.

The majority of cars are now so capable and generally so well made that a short demonstration in the city streets proves very little, and is not in any sense a test of the qualities of the car. Yet the practice is continued as a sort of formality incidental to the purchase of a car. Also as cars have approached each other very closely in mechanical design, and practically all of them have the same mechanical features, the talk of the salesmen centres more upon such rather indefinite factors as easy riding qualities, perfect control, great comfort, fine upholstery or finish, etc., which can only be appreciated while occupying a seat in the car during a run, yet most of these qualities cannot be properly judged during a spin over asphalted city streets or parkways, but ought to be judged when riding over country roads.

Age Limit of Auto Drivers.

The relation of the age of automobile drivers to the safety of the public is soon to be a subject for legislative action in some of the States, particularly in Minnesota, where a bill is to be introduced in the Legislature prohibiting persons under twenty years old from operating motor vehicles on the public highways. Many complaints have also arisen in California because licenses are issued to drivers too young to be able to drive with a due and proper regard for public safety. The proper age limit for auto drivers is a question which admits of much argument. Obviously there should be some limit, but whether it can be fixed arbitrarily, irrespective of the intelligence of the person, is a serious problem. In law, a person under the age of twenty-one is deemed incapable of performing many acts which are mainly of a contractual nature. Those who are under that age are termed "infants," and are not entitled to act sui juris until the twenty-first year has arrived. Infants have always been treated as "incompetent" and classed with persons non compos mentis; in the early history of our jurisprudence they were placed in the same category with married women, who practically had no distinct rights. But it will be found that the persons who were deemed non sui juris were considered more particularly incompetent to enter into relations of a contractual nature. The law says that an infant's contract shall not be binding upon him, but shall hold the other party, but this is for the infant's protection only. He, and he alone, can repudiate his obligation. The other party cannot. This doctrine has a bearing upon the right to declare a person under a certain age incompetent to run a power vehicle on the public thoroughfares. We must not labor under the delusion that an infant is not liable for his civil wrongs as torts, for he is so liable. He is also liable criminally for violating the criminal laws, but under the age of seven the law presumes him incapable of crime. From seven years to fourteen he is presumed incapable of crime, but the presumption is only prima facie, and may be rebutted. From fourteen years and over he is liable criminally just the same as any adult. The status of the infant has been thus defined in order that it might be understood in considering his just rights in respect to using the public highways.

Manifestly a boy from five to twelve years old and even older should not be allowed to drive an automobile in the streets. But where should the line be drawn? Does the safety of the public demand that all automobile drivers should be at least twenty years old, regardless of exceptional intelligence? We want to protect the users of our highways from danger, but at the same time proper persons should not be excluded from using the avenues of travel. The age limit of twenty years seems too high and fixes an unjust arbitrary standard. It absolutely debars all persons under that age from using automobiles as their own drivers. And it may be asked, Does the age limit of twenty years have any logical relation to the protection of the public, any more so than the age limit of eighteen years, as now provided in New Jersey? A better way or method would be to provide that all persons under a certain age, say sixteen years, are prohibited absolutely from driving automobiles, and all over sixteen years of age and under twenty-one are presumed incompetent until satisfactory proof has been presented to the licensing authorities. After all, it is a question of intelligence and discretion and not one of age.

Eliminating the Spark Lever.

The belief seems to be gaining ground among engineers that the time required for the inflammation of gasoline vapor and air is so infinitesimal that it does not necessitate variation of the time of spark with the ignition speed. This does not mean, however, that in a high tension ignition system the time at which contact is established in the primary circuit need not be varied. Owing to the fact that the current in the primary circuit rises gradually, it takes some time before the magnetic force of the core overcomes the tension of the vibrator spring, and when that has been accomplished the inertia of the vibrator spring has still to be overcome, as the contact points must be at some appreciable distance apart before a spark of sufficient volume to ignite the charge can be formed. These two factors, the gradual building up of the force actuating the vibrator spring, and the inertia of the spring, cause a certain lag in the time of the spark with relation to the time when contact is established, and this lag, though actually constant, corresponds to a greater angular motion of the crank at high speeds. Consequently, if the spark is always to occur at exactly the same period in the cycle of the cylinders, the time at which contact is established in the primary circuit must be varied with the angular speed.

In make and break ignition the force actuating the contact mechanism is derived directly from the engine shaft and does not require any time to elapse before it becomes sufficiently large to overcome the pressure of the spring. Also, the actuating spring which separates the contact points can be made so strong in proportion to the inertia of the contact lever as to insure a very rapid break. The contacts are brought together positively or mechanically, and the action of the separating spring begins always at exactly the same point in the cycle of the engine. From that moment to the time when the spark attains sufficient size to ignite the charge is an extremely short interval, and the result is that there is very little lag in the firing of the charge, thus permitting of using a fixed point of ignition, as is done by Brasier, for instance. The great volume of the contact spark is an important factor in this connection. Moreover, with a magneto the volume of the spark increases with the engine speed, so that if the size of the spark really determines the rapidity of inflammation, this would tend to cause an advance of the inflammation with increase in motor speed.

It now appears that the use of a stationary spark point is also quite feasible in connection with the high tension magneto which also generates a very powerful spark, and in which the vibrator or interrupter is also of the mechanical order and consequently quick acting. Louis Renault, writing in a French contemporary, remarks that numerous experiments made by his firm have shown that within the speed limits of 600 and 1,400 r. p. m. only a very slight gain in power can be realized by varying the time of the spark, so slight as not to justify the complication of a timer, spark lever and connections. In driving it is extremely difficult to find the most advantageous point for the spark, and this also makes it preferable to determine this point in the shop once for all, and then fix the spark point. The aim in all recent make and break design seems to be to reduce the inertia of the moving parts as much as possible, and if at the same time the strength of the springs is increased as much as the size of the parts bearing their pressure will allow, we may soon see the practice of making the spark point stationary more widely adopted.

Automobiles in Algiers.

By Jules Rouanet.

Algiers, at the threshold of the African Continent, offers great opportunities for the rapid development of automobilism. In the first place there is the attraction of touring in a country, so near to Europe, which possesses exceedingly picturesque scenery and a native population which has retained its ancient customs to the present day—a country which, by its historical associations and its excellent climate, excites the curiosity of the traveler. Along the coast and in the large cities European customs prevail, there being the same docks, offices, paved streets, high buildings, industries and mode of living. If we penetrate into the interior of the country, directly away from the coast, we soon enter an agricultural district, where the French colonist intermingles with the native, a country of cereals, wines and stock raising. Next to the farms and European villages lives the Arab in a tent or in a hut of branches.

Automobiling has developed in Algiers coincident with the economical advance of the colony. European modes of life have brought with them their need of activity and have superseded the lazy indolence of the natives, to whom time does not count, and who never hurry in anything. The cities are at considerable distance from each other, and railroads have not yet penetrated everywhere. It thus became necessary to make use of the automobile for commercial purposes and for pleasure trips, to supplement the other means of communication.

There are as yet no automobile factories in Algiers. All the vehicles in use have been imported from Europe, and they represent all the better known makes, such as De Dion, Renault, De Dietrich, Darracq, Panhard-Levassor, Clement, Richard-Brasier, etc. Trade is solicited by means of advertisements in the local papers and by the installation of luxurious and well equipped garages in the principal cities. All the usual models are finding a sale, but vehicles of from 10 to 20 horse power meet best the requirements of the country, and are in most extensive use.

It may be readily understood that a country extending 1,200 kilometres east and west, from Morocco to Tunis, and 800 kilometres north and south, from the Mediterranean to the Desert, cannot well have a uniform climate. Near the coast the winter is charming, the weather being mostly sunshiny, and the average temperature somewhat higher than at Nice and at the famous Cote d'Azur. The variations in the daily temperature are also smaller. This period of the year is ideal for touring. In the interior the winter is also very pleasant. In November nature awakes from its long slumber of the hot season; the gardens are flowering, the fields become green and the orange trees bear fruit.

In the highlands the winter is more rigorous, however; the peaks are snowclad, and in certain parts of the country about the same low temperature prevails as in central France. In the southern part of the country there are very great variations in temperature between noon and night, and it is not at all rare for the mercury to drop in twenty-four hours from 77° Fahr. to the freezing point. During the winter there are frequent rains, but never of long duration. From the month of April on the rains become rarer, and the dry period sometimes extends to the month of October. It is marked by very intense heat in July, August and September, reaching frequently 104° in the shade in the lowlands, which high temperature is due to the sirocco, a southern wind heated in its passage through the vast sandy desert.

The tourists prefer driving in Algiers during the winter months. Nevertheless, the summer season also has its charms, par-

Fig. 1.—The Road Through the El-Kantara Gorge. At the Left the Railroad Below the National Road and to the Right the Old Arab Road.

ticularly in the southern region, where the local coloring then attains its maximum interest.

The mode of life of the European population is the same as that in their native country, with the exception that the warm climate invites outdoor life and encourages outdoor sports, travel and excursions. The natives, on the other hand, have preserved their patriarchal customs and follow all the rules of the Koran. They thus offer a certain resistance to progress, and it is only in the capital, in the large families descending from the Turks and the Moors, that one may find young natives who have been educated according to the European custom, and some few of whom make use of the automobile.

Up to recently the automobile was used only as a private conveyance. A short time ago, however, a public service was established for carrying passengers between Affreville and Teniet el Haad (36 miles), and various lines are now under consideration for connecting the railway with centres of population of sufficient importance (Setif to Bougie, 70 miles; Berrouaghia to Laghouat, 200 miles). The general layout of the railroad system is such as to make many of these lines necessary. Algiers is traversed by a trunk line parallel to the coast, from which extend three lines toward the south. But these branch lines are at a distance of 200 to 250 miles from each other, and the parts of the country enclosed between them are without means of communication.

It would seem that the automobile was destined to fill a real need in the economical system of Algiers. This might seem strange at first, if it is remembered that this colony produces a great number of fine horses which sell at low prices, and the maintenance of which is quite inexpensive. The automobile, however, offers advantages from the standpoint of increased speed, endurance and relative cost in many instances, and for omnibus service over distances of 30 to 60 miles, for regular lines in suburban districts, and for the transportation of merchandise, the motor vehicle will no doubt find advantageous use.

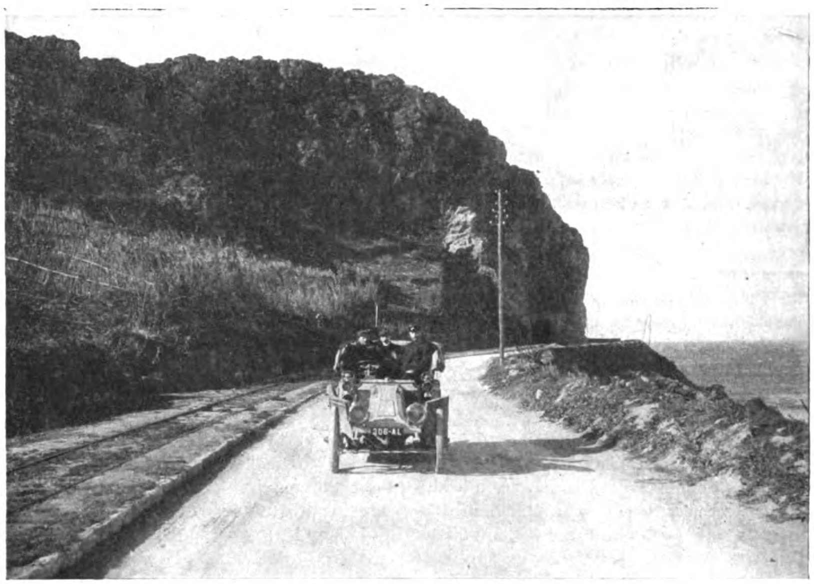


FIG. 2.—A CLIFF ROAD ON THE COAST OF THE MEDITERRANEAN.

Some modest applications in this last mentioned direction seem to be giving encouraging results. The railroad rates are still very high (over distances of 56 miles the old style mail coaches compete successfully with the railroad); moreover, as was pointed out above, all the districts which offer a certain amount of traffic are not yet provided with railroad facilities.

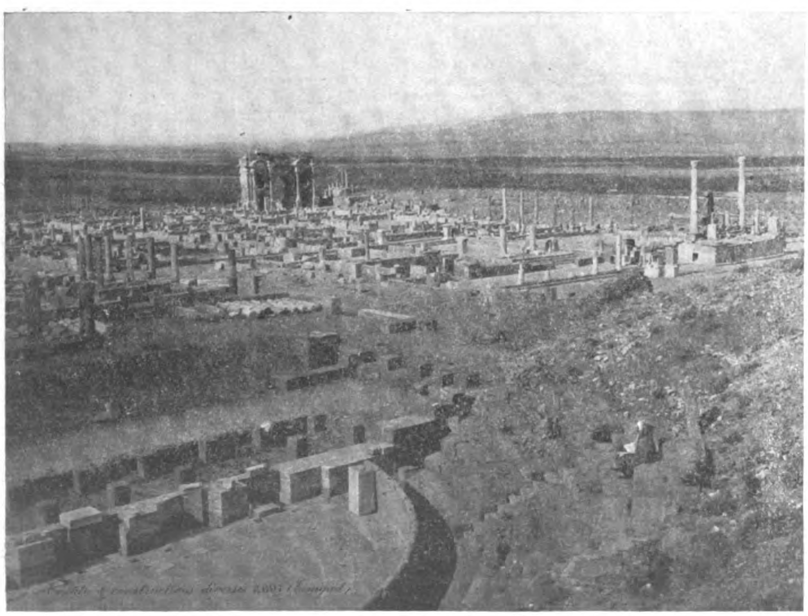


FIG. 3.—THE ROMAN RUINS AT TIMGAD.

It may be added that if the petroleum wells which have been discovered in the Province of Oran should give as large a yield as is expected, there would surely result a movement in favor of the gasoline motor, and its application would become more common.

As already stated, there are as yet no automobile factories in northern Africa. All machines come from outside. During the year 1905 Algiers imported from France 2,851 "quintaux" and from elsewhere (Belgium) four quintaux of automobiles. The tariff on automobiles is based on weight, and the importations are therefore expressed in metric quintaux (1 quintal = 220 pounds). During the first half of 1906 the importation amounted to 1,405 quintaux from France and 12 quintaux from elsewhere (England and Belgium). The total value of cars imported in 1905 amounted to 2,851,000 francs, and during the first half of 1906 to 1,400,000 francs. Algiers being included in the French tariff regulations, any machines from France are admitted without the payment of duty, while machines imported from elsewhere are subject to the same duty as on entering France.

If the distinction between vehicle and motor is applicable, there must be paid for the body 60 francs under the general tariff and 50 francs under the special tariff for vehicles weighing 275 pounds and more; 150 and 120 francs for vehicles weighing less than 275 pounds. For gas and gasoline engines, 18 or 12 francs must be paid for machines of 550 pounds and over, and 30 or 20 francs for machines of less than 550 pounds, according to whether the country of origin enjoys the special tariff or not. There is an extra tariff of 3.60 francs on products produced outside of Europe and imported via European ports.

In order to give the readers of THE HORSELESS AGE more definite information

FIG. 4.—A CARAVAN ON THE ROAD TO THE SOUTH.

regarding the volume of imports than may be obtained from the official importation figures, the writer obtained from the different automobile registration bureaus the number of vehicles which had been registered with them. There were found to have been registered 455 cars in the Department of Algiers, 117 in the Department of Constantine and 65 in the Department of Oran, making a total of 637 cars up to the time of writing. This number may seem small when compared to the number of inhabitants of the country, but it must be taken into account that of the 5,000,000 inhabitants of Algiers 4,500,000 are native, and the French population, which alone can enjoy the advantages of the automobile, amounts to only 300,000. It will thus be seen that there is one car to every 500 persons of French nationality in Algiers, while there is only one car to each 2,000 inhabitants in France.

The automobile trade was first introduced into Algiers about a decade ago, and has led to the establishment of numerous garages and sales repositories. The same conditions of sale prevail as are offered by the manufacturers themselves, viz., one-third of the purchase price must be paid down at the time of placing the order and the rest on delivery. The majority of agents have always on hand a stock of new vehicles for immediate delivery.

The price of vehicles is the same as in France if the vehicles are taken possession of at the factory; otherwise it is increased by the cost of transportation, which amounts to from $30 to $40 per vehicle from Paris to Algiers. Gasoline cost 4 cents more per gallon than in France. Gasoline is kept for sale at all the garages, and at nearly every locality connected by a road suitable for automobiling. The garages in the larger towns are equipped for making all necessary repairs. In these latter establishments, vehicles are housed and cared for for owners at the rate of $6 to $8 per month. It will thus be seen that although Algiers is a country of relatively recent development, it offers the same facilities in the way of supplies and repairs as most of the provincial districts of France.

Chauffeurs are trained locally; they are quite numerous, and the wages range from $24 to $44 per month. For touring the country it is possible to hire vehicles at prices varying from $16 to $20 per day, according to the mileage. Touring maps are available which show all the principal roads and indicate also the radius of the curves and the steepness of grades.

As to the roads, they elicit the admiration of all tourists, and the various excursions of the Automobile Club of France and the Automobile Club of Belgium, which have traversed the country in every direction, having descended to the Holy City of M'zab and pushed forward toward the south Moroccan boundary, were delighted to find roads the like of which many of the European countries do not possess. The national and departmental roads are generally eight metres wide and have a central paved track of four metres. Other roads are six metres wide and have a paved track of three metres. An idea of the traffic on these roads may be gained when it is stated that the ton-mileage over the whole national road system in France is only one-tenth as great as on the same roads in Algiers, though the total length of these roads is fifteen times greater in

FIG. 5.—ENTRANCE TO THE OLD ARAB CITY OF BISKRA.

France. In spite of this enormous traffic, represented by an average of 336 vehicles per 24 hours, the roads in Algiers are kept in a good state of repair, the colony expending a considerable sum for this purpose annually.

The manufacture and use of automobiles in Algiers are regulated by the decree of May 28, 1902, which provides measures generally similar to those in force in France. It is provided, however, that vehicles of foreign origin, before being placed in service, must be submitted to the Department of Mines to determine whether they conform in every respect to the legal requirements; if the vehicle is found to be of the proper construction, the manufacturer or owner is furnished a certificate. If a certificate is refused, however, the interested parties may appeal to the Governor General, who renders his decision after consultation with the Government counsel and upon advice of the Central Committee on Steam Engines. For placing a car in use an application must be made to the prefect of the department; "declarations" made in France are honored in Algiers. Except where races are especially authorized, the speed must not exceed 30 kilometres per hour and 20 kilometres in built up sections. It must be admitted that in Algiers, the same as elsewhere, this provision is a dead letter.

Automobile Law for Sweden.

An automobile law went into effect in Sweden on January 1, the object of which is said to be to protect the public against reckless drivers. In cities and other closely built up districts the speed is limited during day time to 15 km. p. h., and in the country to 25 km. p. h., while after dark the maximum speed permissible is 10 km. p. h. Only persons of eighteen years or over are allowed to drive automobiles, and these must furnish proof of their competency. Special regulations are issued for Stockholm, where many streets and bridges are entirely closed, and the narrow streets and alleys of Old Stockholm must be traversed at a very low pace. The weight of commercial vehicles in crossing certain bridges and viaducts must be inside a certain limit, which is said to practically prohibit the use of many standard motor trucks.

Unpleasant Experience of a Paris Show Exhibitor.

One of the British exhibitors at the recent Paris Salon, the Enfield Autocar Company, Ltd., had a very unpleasant experience. Three days previous to the closing of the show a number of police officials appeared at the stand and served the company's representative with a writ, claiming that a certain part of the Enfield car was an infringement of a French patent. They took possession of both chasses on exhibition, removed the alleged infringing part and plastered wax seals over the remaining portions. Only after payment of 50 francs, the cost of the proceedings, and much protestation, could they be induced to release the chassis, which were to be immediately shipped to Dublin for the show there.

On Intake Manifolds.

By P. S. Tice.

The inertia of gases is well illustrated in the passage of the combustible mixture through the intake pipe to the engine intake ports.

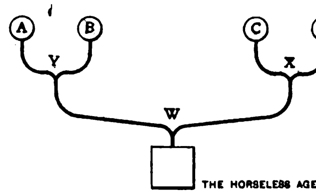


Fig. 1.

Its effects are almost always made apparent by inequality in the explosion pressure in the different cylinders. Equalizing the lengths of the passages from the carburetor to the various ports has not the effect of equalizing the volumes of charge drawn in, as would at first be expected.

A popular form of intake manifold is shown diagrammatically in Fig. 1. The order of suction is A, C, D, B. Beginning with C the inertia of the column W X C is overcome by the piston action in C, and the charge is drawn in. Then, immediately following the flow of gas through W X C, cylinder D becomes active, but owing to the previous flow it must accelerate only the column X D.

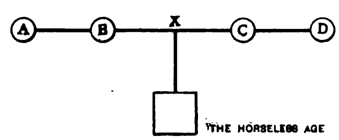


Fig. 2.

The conclusion is obvious. In addition to this, the column W Y A was the one in motion immediately preceding the motion of W X C, so that we may presume that there was a partial vacuum (greater at high speeds) in W Y at the instant of opening of C, which also militates against C receiving as full a charge as D. The form of manifold in Fig. 1, while shown applied to an individual cylinder engine, is practically the same as is found on engines with cylinders in pairs with the intake ports siamesed. In the latter case the passages Y A, Y B, etc., are, of course, shorter.

For individual cylinder engines the manifold shown in Fig 2 is much better. Using the same order, A, C, D, B, and beginning with C as before, C has only to overcome the inertia of the column X C, and D that of the column C D. The effect of the previous motion X B A and X C D is not so great as that noted in the case of Fig. 1, since the passage A B X C D is straight, and is capable of an enlargement in diameter without taking up too much space. If A and B, and C and D are made coincident, as in a siamesed port construction, we have the same conditions as exist in Fig. 1.

Another design sometimes met with is shown in Fig. 3. Here no attempt is made to reduce the inertia of the gases by shortening the passages, but it has the saving quality that each cylinder must move columns of practically equal length, and thus receives the same amount of charge.

A novelty in intake manifolds was observed by the writer a short time ago. The object of this design is to overcome the effects of the gas inertia by causing a continued flow through the manifold. The construction is shown in Fig. 4. A and B, and C and D are siamesed, as shown at Y and X respectively. Observing the same order of suctions as before, and beginning with C, the column W X is placed in motion with a slight movement in the column X Y W toward X; D, following C, also moves W X, and causes an increase in speed in column X Y W. B, following in

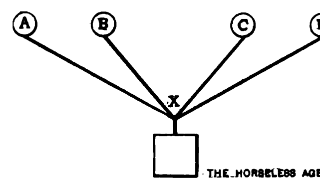


Fig. 3.

order after D, moves the column W Y, which is already moving in the proper direction, but reverses the motion of column Y X, and keeps W X moving toward C and D with an increased speed, as A comes into action.

The directions of movement of the various columns are shown by the arrows, W X and W Y, always moving in the direction of their respective valve ports X and Y, and the column X Y changing its direction of movement as the gas is drawn through either X or Y.

While the speeds of the gas columns are not constant, the flow is always in the proper direction between the carburetor

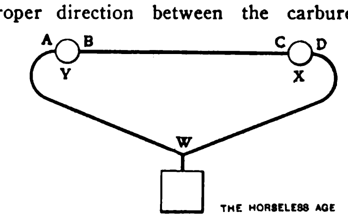


Fig. 4.

and the ports, and the effect was that the power impulses were shown to be almost absolutely equal in intensity.

The first country to use a picture of an automobile on postage stamps is Bosnia. It may be remembered that a military motor mail wagon has been in use in Bosnia for some years.

NEW VEHICLES AND PARTS

The Miller Commercial Car.

The Miller Garage Company, of 559 Fairfield avenue, Bridgeport, Conn., are marketing a commercial vehicle for truck or sightseeing purposes. The wheel base is 138 inches and the tread 60 inches; semi-elliptic springs, 42 inches long by 2¼ wide, are used at the forward end, and platform 43 by 2¼ wide, with a cross spring of the same dimensions, at the rear. A four cylinder Continental engine, rated at 40 horse power, is placed at the front under a rather low bonnet, which overhangs the front axle, as shown in Fig. 1.

MOTOR.

The four cylinder Continental motor is of the 1907 pattern, the inlet side of which is shown in Fig. 2. The arrangement of the intake pipes, carburetor and exhaust manifolds and the method of holding them by means of wide yokes is clearly shown. The crank case is of the ordinary form with very wide lap joints in which oil passages are cored, the splash system of lubrication being used, in connection with a gear pump enclosed in the case, which forces the oil to the bearings through these channels. The oil supply is shown by a glass bull's-eye at the front lower end of the case. All the gears are enclosed and are exposed to the splash. The timer is on a short vertical shaft at the rear and is driven by bevel gears, which are enclosed in the case and oiled by splash. Fig. 3 shows the other side of the engine, which is very plain, except for the centrifugal circulating pump, which is mounted a little forward of the centre on a bracket, and driven by a flexibly jointed shaft from a gear meshing with the crank shaft gear.

The Continental five ring type of clutch, the rings being alternate bronze and gray iron discs, is used.

A longitudinal Cardan shaft drives to the change speed gear, of the sliding gear type, which gives three speeds forward and one reverse, and is operated by a single side lever. This change speed gear is shown in Fig. 4. It is placed well toward the rear, so that short chains can be used from the jack shaft to the rear wheel sprockets. All the gears and shafts of the transmission are made of chrome-nickel steel, a lock quadrant acting in conjunction with the clutch pedal prevents shifting the gears without disengaging the clutch. The shaft and gears are of ample dimensions and are said to be fully capable of transmitting double the power of the motor. Between the clutch and this transmission are two universal joints. The bearings of the transmission driving shaft are plain bronze, but of good length.

FRAME AND AXLES.

The frame of the machine is made of ship channel steel 5 inches in depth, and the sub-frames for the engine and transmission are 2½ inch angle steel. Very broad gusset plates are used in the corners as stiffeners. The front axle is hammered steel, 2 inches square, and the yokes are steel drop forgings, with 8 inch openings. The steering knuckles are 2 inches in diameter at the large end, and are attached to the yoke by means of a pin 1 inch in diameter. The upper end of the yoke is 2½ inches in diameter and is fitted with a large bronze collar to take the initial strain of the load. Roller bearings are used, the rolls being three-quarter inch in diameter and 2½ inches long, and run on hardened steel sleeves fixed to the axles. The rear axle is also hammered steel, of 2½ inch square section, with a heavy spindle and collar forged on to it, and runs on standard roller bearings proportionately larger than those on the front axle. The wheels are 34 inches in diameter and are fitted with 4 inch solid tires. A honeycomb type of square tube radiator is arranged at the front, and, as will be seen from the view of the completed car, extends below the frame. For sightseeing cars ordinary running boards and the usual form of mud guards are used. The spur gear type of differential is enclosed in the transmission case, runs on

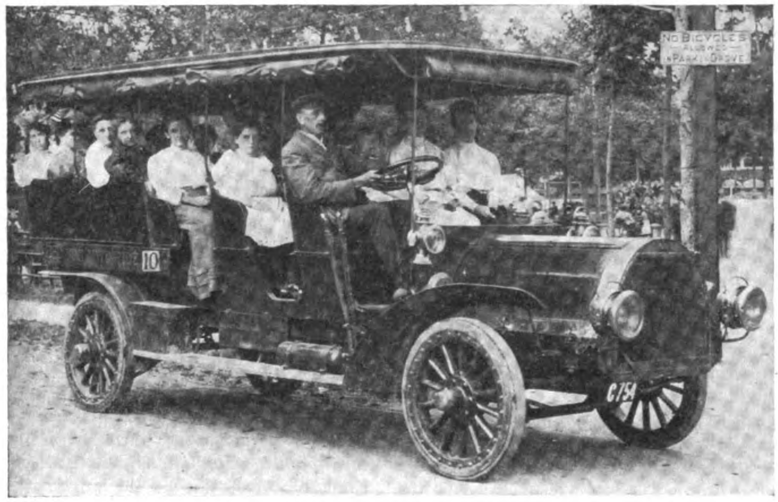


FIG. 1.—MILLER FOUR CYLINDER COMMERCIAL CAR.

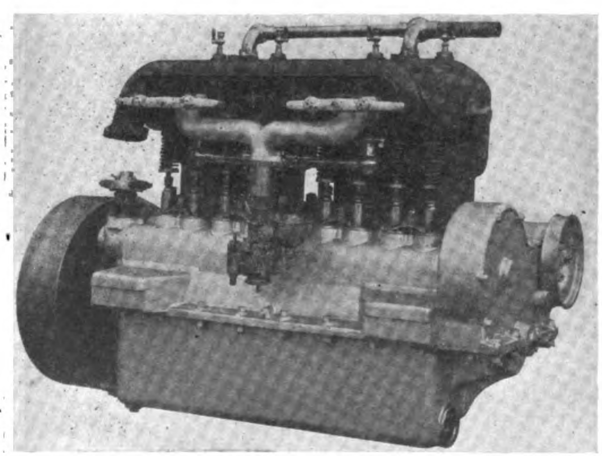


FIG. 2.—1907 CONTINENTAL MOTOR OF MILLER CAR.
Showing carburetor, timer inlet and exhaust manifolds.

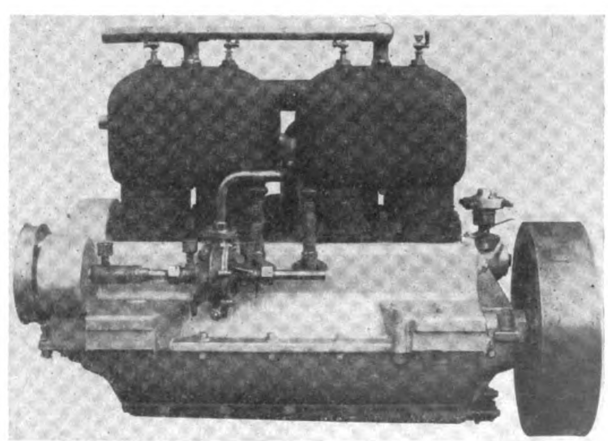


FIG. 3.—1907 CONTINENTAL MOTOR USED IN MILLER COMMERCIAL CAR.

Timken roller bearings and is also provided with a Timken roller thrust bearing.

CONTROL AND STEERING GEAR.

The Gemmer double screw type of non-reversible steering gear of large size is used. The control arrangements are similar to those on a touring car, and consist of spark and throttle levers on the wheel, clutch and service brake foot pedals, the service brake being of the Raymond type, and consists of a 2 inch friction lined steel band which encircles a 10 inch steel drum. This brake pedal also disconnects the clutch. On the rear wheels internal expanding hub brakes, the shoes of which are 2 inches wide and lined with fibre, engage 12 inch drums. These are operated by the usual side lever.

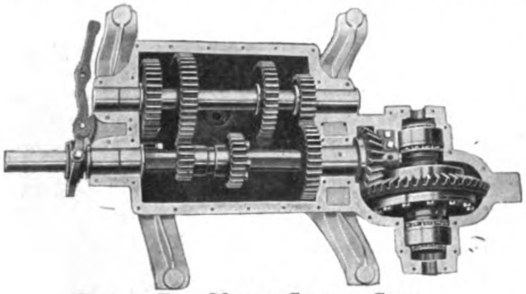


FIG. 4.—THE MILLER CHANGE GEAR.

The Miller Garage Company are manufacturing these machines to order and will furnish any style of body desired.

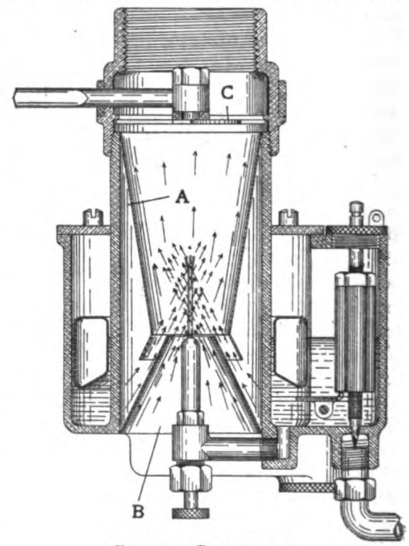
The New Bowers Carburetor.

The F. E. Bowers Company, Incorporated, of New Haven, Conn., have recently placed on the market a carburetor which, it is claimed, furnishes an exceptionally good mixture. The accompanying sectional drawing gives a good idea of the general arrangement. The instrument is of the float feed type, the float being an annular ring, as shown. The needle valve at the right controls the gasoline inlet at the bottom. This needle is held to its seat by a weight, which, however, is offset by the weight of the float when the gasoline level lowers. The chief feature of this carburetor is the arrangement of two cones around the nozzle in the central air passage. The upper cone A has a small lip or flange at the upper end which holds it in position, while the lower cone is permanently fixed. The air enters the bottom at B, passes directly around the nozzle, as shown by the arrows, and straight out of the top, passing through a Maltese cross type of throttle valve at C. Near the bottom are two small chambers containing leather poppet valves, which act as auxiliary air inlets. The air after passing these valves enters the central chamber outside of the lower cone, but following its contour rushes from all sides toward the centre, as shown by the arrows, the converging currents meeting just above the point of the nozzle, thus mixing thoroughly with the rich vapor which has just been made by the air from the main inlet. The completed mixture then passes out through the top. This arrangement gives the mixture practically a direct passage through the instrument, there being no sinuous or tortuous passages. The size of the nozzle can be adjusted from below after the well known manner. The same carburetor can be adapted to different engines by substituting a different upper cone, which will give a different sized opening at the lower end. The instruments are finished in polished brass.

Designs for a New Type of Vehicle.

The Snutsel Auto Supply Company, of 1534 Broadway, showed at their booth at the Garden, and are now showing at their office on Broadway, the drawings made by M. P. Daniel, civil engineer, in Paris, of an automobile which presents many new and radical features in design. A four cylinder, vertical, two cycle engine is employed. This motor, owing to its type, can be run equally well in either direction, but has a special arrangement in connection with the sparking and an automatic starting device, so that it can be started in the direction desired. No carburetor is used, but fuel is allowed to drop in measured quantities onto the heated valve in the intake pipe at the top, the mixture being formed by the rush of pure air under pressure from the crank case. For forcing the proper amount of fuel into the intake pipe the varying displacement of a copper accordion shaped piston in a chamber is employed. The displacement is in direct proportion to the throttle setting.

The engine drives direct to a hydraulic clutch, or, more properly speaking, hydraulic change speed mechanism contained within the flywheel, which is at the forward end. This mechanism will allow any speed variation in the car, regardless of the engine speed, so that change gears are eliminated. From the clutch or flywheel a short shaft runs forward to a differential over the dropped front axle, and from the large gears of the differential short Cardan shafts drive each of the front wheels by means of Cardan joints.



BOWERS CARBURETOR.

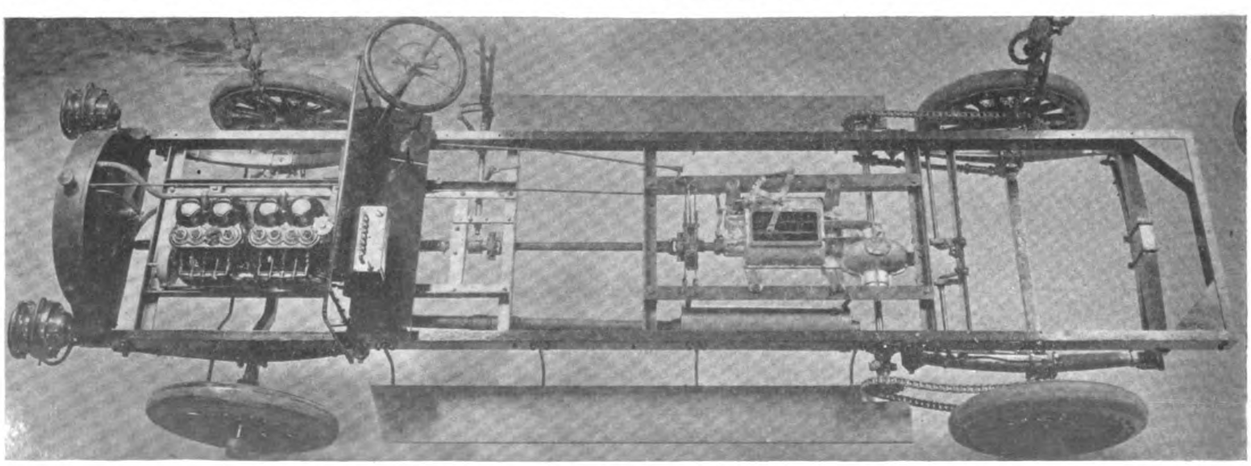
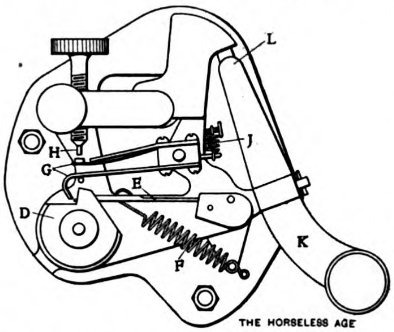


FIG. 5.—MILLER COMMERCIAL CAR CHASSIS.

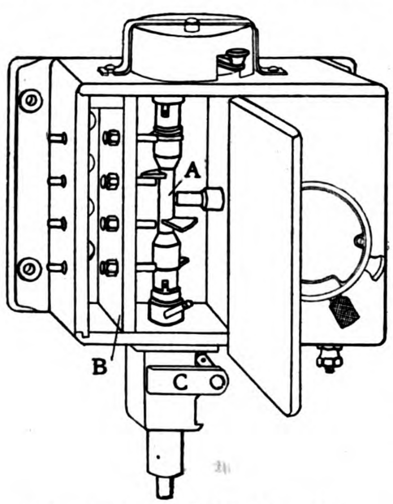
1907 Atwater Kent Generator.

The Atwater Kent Manufacturing Works, 42 North Sixth street, Philadelphia, have for some time been exploiting their new spark generator. This device is for producing sparks with the least possible amount of current consumption in an automobile engine, so that it is suited for use with dry batteries, but, of course, can also be used with storage batteries. It is claimed that in several test cases cars have run from 4,000 to 6,000 miles on an ordinary set of six dry cells; and that when properly set perfect ignition can be maintained on a current consumption of approximately one-tenth ampere. In the accompanying illustration is shown the device which is to be attached to the rear of the dashboard. It consists of a mahogany case, on the top of which is the contact making mechanism, which is connected with the primary circuit and covered by a pressed housing, which protects it from the weather. This is so arranged that it can be quickly removed to facilitate inspection. In the right side of the case is an ordinary nonvibrating coil, and in the left side, which is practically a cupboard, the door of which opens, as shown, is the distributer mechanism. This distributer is similar, of course, in principle to other devices for the purpose, but is entirely different in construction. As shown, it consists of a vertical shaft A, against the centre of which a spring pressed secondary plunger makes a contact. This shaft carries four protruding segments, the ends of which come very close to but do not touch four brass terminals set into a heavy vulcanite plate B; to these are attached the four secondary wires which lead through the back of the case to the plugs. The segments on the distributer shaft are so spaced that they are respectively opposite the brass terminals when the rapid contacts and brakes of the primary circuit are made by the mechanism on top of the case. These segments are of sufficient arc so that when the distributer shaft is slightly rotated in either direction for the advance or retard, a part of their periphery will still be opposite the brass terminals. The rotation of the shaft A for timing is effected by means of the lever C, which moves up or down a small collar around the lower end of the shaft A. This collar carries a pin which works in a helical slot in the shaft, and thus gives it the proper rotation. The shaft A is connected by a clamping collar to the driving shaft below, so that its relation to the piston positions of the engine can be altered, thus making it possible to adjust the timing. At the left of the case are four small push buttons for short circuiting or cutting out and testing the cylinders. By pushing in any one of these a dead short circuit of the secondary wire to that cylinder is made. A small plate at the side of these push buttons indicates cylinder No. 1, or that next to the radiator; cylinder No. 2, second from the radiator, etc. This distributer, it will be seen, is of such a design that it is impossible for any arcing to take place. The feature, however, which makes it possible to get more than the usual mileage with dry batteries lies in the mechanism of the contact maker, and this is shown in the accompanying drawing. The principle employed for reducing the amount of current used is to make but a single spark for each cylinder at the proper time for ignition, instead of a volley of 1,000 or more, as is the case with a vibrating coil. The contact and break are extremely rapid, by which means again current is saved over the comparatively long duration of the contact made by the usual timer. The mechanism consists of a notched rotating shaft D, which catches and carries forward the lifter E against the action of the spring F. The motion is so rapid that this lifter when released flies upward and backward, but in so doing strikes and throws upward the mechanism G, a platinum point on the end of the upper spring of which makes a contact with the screw H and a rapid break when it leaves the point of this screw under the action of the spring J. Thus a contact of very short duration and extremely rapid break of the primary circuit are effected. When this takes place the distributer segments are in the proper relative position. The screw H, as shown, is adjustable and can be locked in position. For the purpose of starting on the spark, a lever K is provided, the button end of which protrudes from the housing at the top of the case. By pressing down on this button the opposite end of the lever L makes a contact, and when the lever is suddenly released, a break is made, causing a spark to jump in the cylinder whose segment in the distributer is opposite the secondary terminal. So that this device gives the same chance of starting on the spark that the use of an ordinary timer affords.

The mechanism is driven from the lower end, where the shaft protrudes from the box usually by means of a short Cardan shaft driven by bevel gears from the cam shaft.



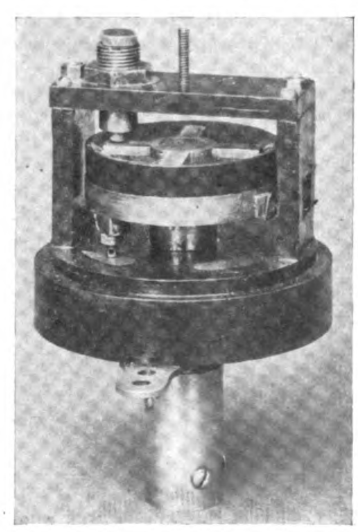
Contact Maker of the Atwater Kent Generator.



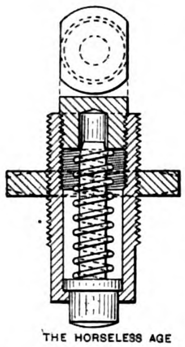
Atwater Kent Spark Generator.

The Lindsay Timer and Distributer.

The Lindsay timer and distributer, manufactured by A. M. Lindsay, Jr., of Rochester, N. Y., is one of the latest ignition devices placed on the market. The accompanying photograph gives an idea of the instrument. This shows the device with the bell shaped glass cover removed, which ordinarily protects it from dust and moisture. The glass is very heavy and the screw cap at the upper end is so arranged that it cannot come off and get lost, but always stays with the glass protector. The upper rotating portion consists of vulcanite cut out in the form of a star into which a four armed piece of hardened steel is fitted; the middle portion or hub of this star shaped piece fits over the central metallic shaft. The four arms pass in succession when rotated under the plunger contact held by the cross frame at the top. This portion of the instrument serves as the timer. In the accompanying drawing is shown a section of the spring contact point, which is made of hardened steel, has a shoulder or flange near its lower end to guide it, and its upper end slides



Lindsay Timer and Distributer.



LINDSAY CONTACT PLUNGER.

in a guide screwed into the casing which holds it. The usual form of spring is used. This method of guiding the plunger effectually prevents wedging or sticking. By means of the nut on the outside the device can be locked in the proper position so that the plunger will make a good contact. On the under side of the vulcanite or hard rubber disc a ring of brass is fitted and wiped by a metallic brush carried by the right vertical portion of the frame. This brush is connected to the secondary, and the brass ring carries an adjustable length stud, as shown, the end of which sweeps over but does not touch four arc shaped brass blocks set into the hard rubber base of the instrument. The lower ends of these brass pieces carry the thimble shaped Herz terminals into which the four secondary wires fit. By means of these terminals the rotation of the instrument for timing the spark by the lever, which is shown protruding from the front, allows the wires to swivel so they are not twisted, thus preventing the breakage of the wires at their point of union with the distributer, which is one of the things which in many ignition devices has given considerable trouble. The driving shaft connects to the lower end of the central shaft. The instrument can be placed on the engine or on the dash board, as desired, a special base being provided for instruments placed in the latter position.

The Steele-Harvey Furnaces for Melting Alloys.

The Monarch Engineering and Manufacturing Company, of Baltimore, are manufacturing special furnaces for melting aluminum, brass, phosphor bronze and other alloys, such as are used extensively in automobile construction. In Fig. 1 is shown their crucible tilting furnace, which is known as the "Steele-Harvey" melting and refining furnace. The chief feature of this furnace is the arrangement by which it is possible to retain the molten metal in a heated condition while pouring, as it is not necessary to remove the crucible from the furnace. Aluminum particularly is quite easily overheated, as it melts at a low red heat. If "burnt" the castings made from it will be full of small holes and be apt to crack in the mold. The method usually employed is to melt the aluminum gradually and pour it immediately it is at the right temperature. In using the Harvey furnace it is possible to bring the crucible to a good red heat before putting any aluminum in it, then the oil or other fuel is turned off and the aluminum is introduced into the crucible and the cover replaced and the metal is allowed to melt simply from the radiated heat. The oil may be turned on again for a short period to bring the aluminum to the proper temperature. This method produces a better quality of metal, as there are no products of combustion to be absorbed by the aluminum. It is claimed that the tensile strength is also increased by this method of melting. The furnace containing the crucible is swung on trunnions and can be tilted and held at any angle for pouring. The fact that the crucible is not removed while the pouring process is being carried on increases the life of the crucible. The fact that the flame does not bear directly on the crucible but against a carborundum block upon which it rests also increases its life. In Fig. 2 is shown a sectional drawing of the Monarch non-tilting crucible furnace. As will be seen, the flame is forced against a central block of carborundum and spreads around the crucible, passing out of a hole in the cover on top. The furnace is arranged to be used with compressed air and fuel oil or natural gas, and is, therefore, very clean, and it is claimed is so easy to operate that one attendant can care for several furnaces. The lining of ordinary wedge fire brick, which weighs 1,000 pounds, will stand about 500 heats. As no stack is used with the furnace, no draught or hood is required, and when the air and oil are properly regulated there is no smoke or odor, and very little heat outside, owing to the very thick lining.

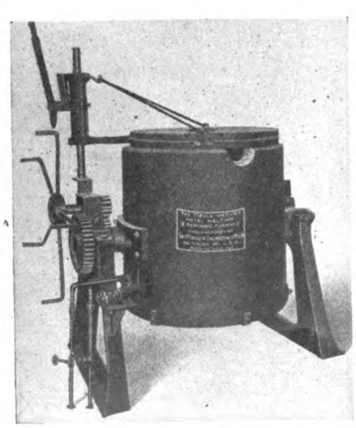
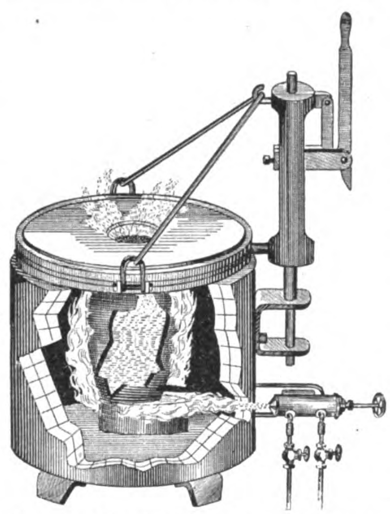


FIG. 1.—STEELE-HARVEY MELTING AND REFINING FURNACE.



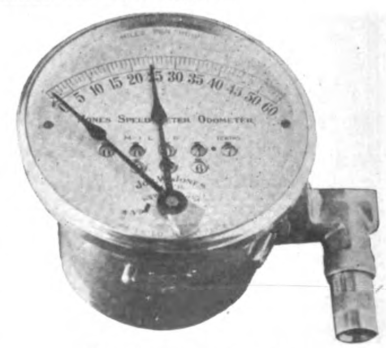
MONARCH NON-TILTING CRUCIBLE FURNACE.

New Features of the Jones Speedometer.

The 1907 models are practically the same in construction and design as those of 1906. A new feature, however, has been added to the 1907 instrument. This is the addition of another, or maximum, hand, which moves forward, but does not return, and at all times indicates the highest speed which has been attained. This second hand is not included as part of the regular model. The two hands are placed directly over each other, as in a stop watch. The upper or regular hand is black, the lower or maximum hand is red; each moves independently of the other. The black hand indicates the exact speed at all times, changing with every change of car speed. If a car is traveling at 25 miles per hour, for instance, the red hand indicates 25, and stops at that point. If the car reduces speed to 10 miles per hour, the red hand remains at 25, the black returning to 10.

If an officer should signal the motorist to stop while traveling at 12 miles per hour, by a simple press on the button the red hand instantly indicates the speed at which the car is then traveling and remains there—it does not return to zero. Here is proof and proof positive that the speed limit has not been exceeded. Heretofore the indicating hand returned to zero when the car was not in motion, and arguments were practically always settled in court.

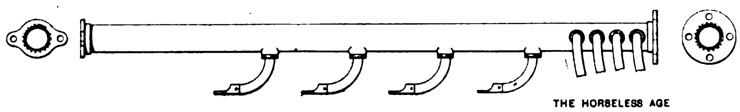
The second or red hand will also prove invaluable to the manufacturer for "tryouts." Cars are frequently sold to enthusiasts on a guarantee that they will "do" a certain speed. By use of this new instrument the red hand will indicate the highest speed and stop at that point. If at any time one should not want to use the red hand, by a simple turn of the resetting stem both hands will move together.



THE JONES SPEEDOMETER.

The Autoduct.

A neat and practical fitting for gasoline automobiles has recently been brought out by William Van Wagoner, of Bridgeport, Conn., and is handled by J. S. Bretz Company, Times Building, New York. It consists of a metal tube with flanged ends and is surrounded by a water jacket for cooling purposes only. The carbide basket is carried in the upper part of the lower half of the generator. Claims are made for this device that it is very substantial and simple to operate, and has very little, if anything, to get out of order; that it can-



THE AUTODUCT.

brazed on, designed to extend between the dash and the radiator of a car, supporting the latter, and also carrying within it the high tension cables leading from the coils to the spark plugs. These cables enter the tube through insulating bushings arranged close together near the rear end, and leave through similar bushings at the bottom of the tube, spaced according to the distance apart of the cylinders. These so called "autoducts" are made according to the specifications of automobile manufacturers, fully wired, if desired. The tubes are of steel, with hard rubber vulcanized into it in one piece. A fitting of this kind certainly adds to the neat appearance of a car.

The American Carburetor.

The recently incorporated American Carburetor Company, of Detroit, have taken possession of their factory at 907 and 909 Michigan avenue. F. R. Murdock, vice president and superintendent, and Ralph H. Whistler are the designers of their product, which will be known as the American carburetor. The float is adjusted by a threaded stem passing through a metal bushing fastened to the float proper, which is provided with a key and keyway. By removing the key and revolving the float or stem, the carburetor may be adjusted. The entire parts of the auxiliary air valve may be removed by taking out two screws. The air valve has an adjustment for spring tension and lift, either of which can be adjusted without changing the other. An extra supply of gasoline is mechanically turned on for high speed. These carburetors are designed so that they may be constructed entirely of aluminum.

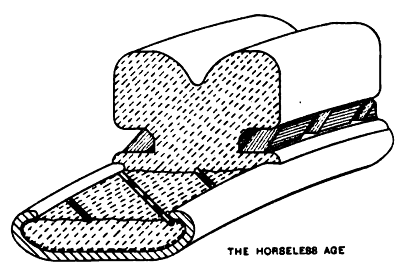
Atwood Manufacturing Company's Generator.

The Atwood Manufacturing Company, of Amesbury, Mass., announce their new heavy, seamless drawn brass acetylene gas generator. The outside measurements of this device are 15 inches in height, 8 inches in width and the lower bracket holes are 5⅛ inches. It is provided with a carbide basket capable of holding 4 pounds and will supply 1½ feet of gas per hour according to the size of gas tip, or sufficient to run two ordinary headlights. The device is divided into three parts, the upper, lower and carbide basket. The upper portion carries the water and the lower part is a receptacle for holding the residue or ashes

not spring a leak, as there are no seams to unsolder, it being made of seamless drawn brass. The entire outside is finished by burnishing.

The Motz Cushion Clincher Tire.

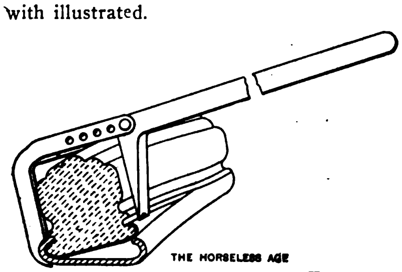
The Motz Clincher Tire and Rubber Company, of Akron, Ohio, have brought out a new solid rubber automobile tire which is quite different in form from any now on the market. The Motz method of fastening by means of inclined metal rods vulcanized into the rubber and engaging under the inturned edges of the clincher rim is



THE NEW MOTZ TIRE.

retained, but the usual convex form of tread has been replaced with a concave tread. In this way the weight of the load is transferred from the centre to the sides of the tread, and the sides being undercut, forming a sort of ledge, increased resiliency is claimed to result from the bending of the rubber. The convex form of tread is also claimed to make an ideal tire for sandy roads, as the sand is confined under the tire, thus forming a solid support.

The Motz Company also make a simple applying tool, by means of which owners living at a considerable distance from any of the company's branches can apply their tires themselves. In other cases it is recommended, however, to have the tires applied at the branch office. The tool is herewith illustrated.



THE MOTZ TIRE APPLYING TOOL.

OUR FOREIGN EXCHANGES

German Automobile School.

The first German automobile trade school, which was opened in Aschaffenburg in November, 1904, was removed to Mainz on January 1, 1907, the latter city having placed at the disposal of the institution a site with suitable buildings. This first German automobile drivers' school was organized in Aschaffenburg in connection with the technical college located there, and until now has offered two different courses of instruction. The individual courses that have been held so far have had the following attendance: 1st, 34; 2d, 35; 3d, 25; 4th, 28; 5th, 49; 6th, 46; 7th, 33; 8th, 42; 9th, 37; 10th, 29; 11th, 30; 12th, 31. Consequently a total of 419 professional drivers has been trained in the institution or have received their diplomas there. According to nationality, 355 of these were Germans, 28 Austrians, 23 Swiss, 3 Dutchmen, 2 Russians, 2 Spaniards and 1 each a Frenchman, Italian, Englishman, American, Chinese and East Indian. Classified according to trades there were 113 locksmiths and mechanics, 122 coachmen, 93 servants, 12 carriage makers, 18 joiners, 25 clerks and 36 of other trades. In addition to these professional drivers, a large number of private owners and engineers attended the institution. The new school in Mainz will be considerably broadened, so as to enable it to train competent help for the whole of the automobile industry. The plan of instruction provides for the following branches: 1. A drivers' school for training professional drivers and amateurs. 2. A fitters' and foremen's school for training automobile fitters and foremen. 3. An engineers' school in which young men may familiarize themselves with the construction of automobiles. 4. An automobile technical information bureau at which everybody taking an interest in the automobile movement may obtain any information on automobile matters free of charge. 5. A repair shop for automobiles, with storage room for twenty-five cars. 6. A motor boat school, in which, in addition to professional motor boat skippers, also those taking the automobile drivers' course may at the same time train themselves in operating motor boats, only during the warm season, however. 7. Training of salesmen for the automobile trade (four weeks' course).

The engine dimensions of the four cylinder 1907 Mercedes cars are as follows: The 18-28 horse power, 100x130 mm.; the 35 horse power, 110x140 mm.; the 45 horse power, 120x150 mm.; the 70 horse power, 140x150 mm. The dimensions of the six cylinder 70 horse power are not definitely made public, but they are stated to be 130x150 mm.

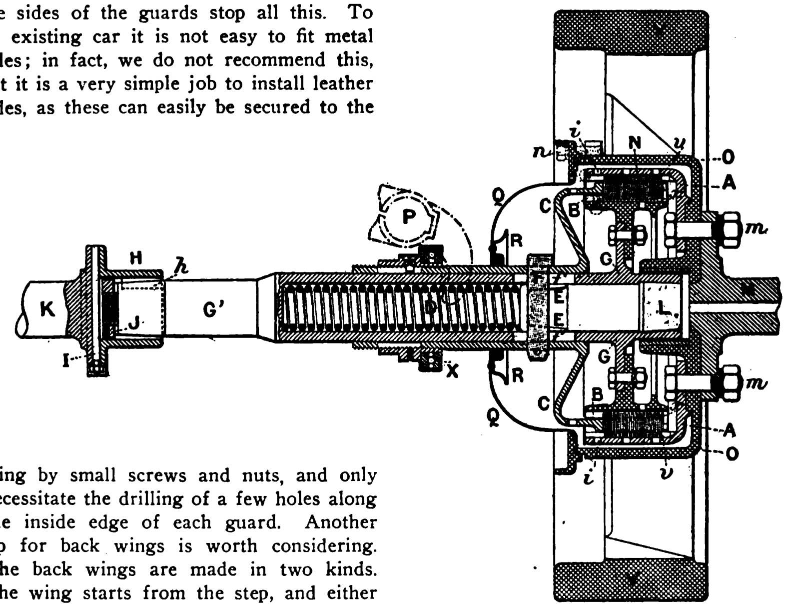
The Panhard Multiple Disc Clutch.

The Panhard-Levassor firm, having been the first to use the leather faced cone clutch for automobiles, have stuck to it tenaciously, as to other items of construction originated by them, though they may have been long superseded in general practice by improved designs. However, in 1905 this firm came to the conclusion that for very powerful vehicles the disc clutch has certain advantages, and accordingly adopted it on their 50 horse power model. Last year, after having had one year's experience with the disc clutch, they applied it also to their 24 and 35 horse power models, and this year they are using the disc clutch exclusively.

According to Messrs. Panhard, the discs should be sparingly lubricated and should not be run in a bath of oil, as a heavy layer of oil between adjacent discs would cause them to stick together by adhesion and render unclutching difficult. In the Panhard clutch no other means of lubrication is provided than a small passage from the crank chamber through the crank shaft journal M. Oil is prevented from passing through the hollow clutch shaft and the slot for the key F by a plug L. It, therefore, passes through the bearing in which the end of the hollow clutch shaft is mounted. The clutch housing is provided with orifices *i i* through which any excess of oil may be thrown off by centrifugal force.

Owing to the fact that the special tools for making these parts are quite expensive, the same diameter of discs and clutch housing is used for all the different sizes of motors, and the power of the clutch is varied by varying the number of discs, or even only the strength of the spring. The clutch in the 18-24 and 35 horse power models has a total of 41 discs, and the clutch on the 50 horse power model 53 discs. The discs are cut from a sheet of high carbon steel. No further operation is performed on them, except if large burs are left by the die.

Following is a key to the reference letters in the drawing herewith, which was taken from *Omnia*: A, driving drum carrying the discs fixed to the motor; B, driven drum carrying the discs fixed to the change gear shaft; C, compression plate; D, clutch spring; E, plug transmitting the thrust of the spring to the plate C by means of the spline F; *f*, slot in which spline F may move; G, plate fixed on shaft G'; H, coupling flange; I, key for coupling flanges; J, nut for securing coupling flange in place; K, shaft extension; L, cork plug; M, end of crank shaft; N, steel discs; O, clutch housing; P, shaft of clutch fork; Q, brass casing; R, oil guard; V, flywheel; X, ball thrust for clutch lever; *n*, one of the bolts securing the brass cover; *v*, disc fixed to the motor; *x*, disc fixed to the change gear; *m*, bolt for securing flywheel to crank shaft.



PANHARD DISC CLUTCH.

To Save the Paint.

Many cars now have leather or metal sides to the front wings, so that mud is not thrown upon the bonnet or dashboard. These wings are a great convenience, and all cars should be fitted with them. They not only protect the occupants of the car from mud splashes and dust which escape the guards proper, but they save the bonnet and dashboard from a great deal of cleaning, and consequently from needless scratching and rubbing. Now, however, one or two makers have gone further, and they are having similar inside guards to the back wings. These do not save the occupants of the car in any way, but they are excellent because they protect the sides of the body from a continual bombardment of grit and mud. In the ordinary way the paint is very soon ruined at this point, but the sides of the guards stop all this. To an existing car it is not easy to fit metal sides; in fact, we do not recommend this, but it is a very simple job to install leather sides, as these can easily be secured to the wing by small screws and nuts, and only necessitate the drilling of a few holes along the inside edge of each guard. Another tip for back wings is worth considering. The back wings are made in two kinds. The wing starts from the step, and either half encircles the wheel or else when it reaches the top of the wheel it is projected straight out backwards. This second type has the advantage of rendering the tires more accessible when it is necessary to remove them, but unless the wing is a very long one, mud thrown up by the back wheels escapes the guard and bespatters the back of the car; in fact, unless a hood is fitted the occupants of the back seats are more than likely to come in for some of the mud splashes. If a hood is carried this covering suffers, as it gets shockingly muddy. The way to stop these splashes is to fix a piece of leather at the bottom end of the guard and let it drop straight down to within two or three inches of the tire, but a wire frame must be fitted to the leather, otherwise it will flap about and sometimes let mud pass it. This defect of the straight guard has been recognized in a few cases, and a sort of downward box extension has been fitted. It is quite satisfactory, but certainly does not look at all nice.—*The Autocar.*

British Horse Statistics.

In the new agricultural statistics it is shown that there were only 136,941 unbroken horses under one year in Great Britain in 1906, against 139,681 in 1905. The decrease is wholly in England and Wales, the horse having held its own in Scotland. Ireland does not figure in the board of agriculture's tables. What is the reason for the falling off? The head of the board's statistical department seems to think that the decrease in the importation of horses from abroad and the smaller shipments of Irish horses to England should be taken account of. It is probably too soon to be positive as to the effect of atomobilism on the horse breeding industry, but the board appears to believe that the statistics available at present "may perhaps indicate that a limit has been reached and that the development of mechanical means of road locomotion is beginning to check the breeding of horses in Great Britain."

The contest committee of the Automobile Club of France has decided to organize a contest for small cars up to 12 horse power, of a type suitable for business men, physicians, traveling men, etc. This contest will be held over the same itinerary as the commercial vehicle contest, covering a total distance of about 2,500 miles, at a required average speed of 18 miles per hour.

A monument to Levassor, the originator of the so called Panhard type of automobile construction, who lost his life in an accident in an automobile race, will be erected in Paris on June 15 next, on the occasion of the anniversary of the Paris to Beaudeaux and back race. It will stand on a small lawn in front of the street railway loop.

Legislative and Legal

Interstate Highways.

By X. P. Huddy, LL. B.

In considering the framing of a national act to regulate interstate automobiling and the many important questions which arise in drawing up a proper bill to be introduced in Congress, the subject of interstate highways demands considerable attention and thought. A bill which fails to touch upon this subject will certainly fail as an effective national measure. It must be remembered that the term highway is a broad one and includes not only the common land thoroughfares, but waterways, railroads, bridges, etc., and it is over these that the Interstate Commerce Commission has jurisdiction in reference to the transportation of passengers and freight from State to State. In the case of carriage by water and interstate travel by land other than that by railroad, the Interstate Commerce Commission has no jurisdiction, unless the traffic is directly connected with or operated in connection with a railroad, as necessarily the tribunal already created by Congress would not, under its present power, have any jurisdiction over automobile travel over land highways. Of course, the powers and jurisdiction of the commission may be enlarged, but that tribunal is completely occupied looking after the railroads of the country, without placing additional burdens upon its shoulders. In order to show what legislative powers Congress possesses in regard to interstate highways, it has been held that the national legislature has the power to authorize or construct roads and highways as a means of communication between the States without the consent or concurrence of the States within which the work is performed (Stockton vs. Baltimore, etc., R. Co., 32 Fed. Rep. 9; Luxton vs. North River Bridge Co., 153 U. S., 525), and may remove everything put upon highways, natural or artificial, which obstructs the passage of interstate commerce. See In re Debs, 158 U. S., 564. How the highways of a State shall be improved for the public good is ordinarily matter for State determination, subject, however, to the right of Congress to intervene, when in its judgment the action of the State is deemed to encroach upon the highway as a means of interstate travel. So it will be seen that Congress has ample power to protect automobile travel upon interstate highways. Moreover, the power to thus regulate commerce includes the power to declare what roads shall be deemed interstate and what property or things may be considered subjects of commerce. Congress has the authority to say that certain highways leading through States constitute interstate ways over which the national government shall have supreme control and authority, both in respect to the highways themselves and the travel thereon. Furthermore, side roads leading into a main thoroughfare may be included within what might be termed a system of ways for interstate travel and the jurisdiction of the Federal Government may extend over the whole system. Only few State roads, purely State in character, would remain under the exclusive control of State laws. This doctrine may seem at first flush a little startling, but it is sound, nevertheless, and when it is developed it will be found capable of solving the whole automobile problem to the entire satisfaction of all, and completely. When there is need for uniformity in legislation, then action of Congress is not only desirable, but authorized, if the subject to be regulated comes under the jurisdiction of the national law making body. The legislation which Congress has enacted governing the railroads of this country is extensive, and the matters placed under supervision of the Interstate Commerce Commission are many. The subjects concerning which Congress has passed laws in the constitutional exercise of its power to regulate interstate commerce are also numerous. For example, Congress may legislate concerning highways, the construction of railroads, operation of trains, the qualifications, duties, and liabilities of employees on railway trains, the equipment of cars, freight rates, telegraph companies, wharves, piers and bridges; it may prescribe the qualification of pilots and engineers of vessels and the building and equipment of ships; establish buoys and beacons, provide for the enrollment and licensing of vessels and provide for the recording of the evidence of title to registered and enrolled vessels. If Congress can do all these things, if Congress can supervise shipping and navigation on the water, can it not supervise navigation over land highways? Can it not also provide for the registration and enrollment of means of travel over land, the same as it has provided for the means of travel by water? Indeed it can, and the practical working of all regulations governing land travel will compare favorably with the laws governing travel on the water. We have two kinds of highways in this country, land and water. The principles of law that apply to the authorized regulation of one class apply to the other. This is important in considering the regulation of interstate automobiling by the national legislature.

The jurisdiction of Congress over the land highways of the United States, in so far as the thoroughfares are interstate, is supreme and paramount. Congress has the authority to exercise exclusive control over all interstate travel upon such highways, and may legislate in reference either to all vehicles or one particular class, such, for example, as automobiles. Since the automobile possesses power to run long distances, many hundreds of miles, and in this respect is so unlike animal drawn carriages, the power vehicle is almost per se an interstate means of travel. It is as much an interstate locomotive as the engine on a trunk line railroad.

Any bill that is formed with a view of placing interstate motoring under the jurisdiction and control of the Federal Government should declare what highways and roads are to be considered interstate. Naturally, all direct roads running across State borders would constitute highways over which the national government would assume jurisdiction, but other ways could be included; for example, all thoroughfares necessary or convenient to the pursuit of interstate travel by the automobile.

The interstate highway system should be placed under the immediate control of the Federal Automobile Commission, and all the highways, roads and streets should be designated. Signboards and guide posts should be provided. Maps should be made; in fact, the whole system should be worked out to the greatest possible detail, that is, by the commission. Let us get busy and establish our national commission and interstate highway system. The highways of this country will then be put in such shape that long distance driving will be very easy.

In the course of a few days The Horseless Age will publish a proposed bill for introduction in Congress and discussion of

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Federal and Uniform Automobile Legislation Department

—of—

THE HORSELESS AGE.

I am ...... in favor of a movement for securing Federal and uniform automobile legislation and would like to see the matter vigorously pushed to a conclusion.

Signed..

Address..

Date..

Those who are interested in having Federal and uniform automobile legislation are requested to fill out the above coupon and send the same to THE HORSELESS AGE, which is making an effort to have a suitable bill presented to Congress granting a national license to tourists and remedying some of the existing evils resulting from State legislation. For further information in regard to this movement see THE HORSELESS AGE, January 9, 1907, page 67, and the current numbers of this paper, which will keep its readers informed as to the progress made.

its measures by all interested in automobiling will be invited. The proposed act may doubtless be improved upon in many of its provisions, and it is for the purpose of eventually securing a good law that suggestions are requested. We want to hear from more automobilists in regard to Federal automobile legislation, though we have already had numerous responses in connection with the proposed measures.

Federal and Uniform Legislation.

If we are to have a national automobile law passed in time to be of benefit to tourists next summer, something definite must be undertaken at once. A bill to be introduced in Congress is being prepared by THE HORSELESS AGE and will be published in full very soon in this paper. Those who are framing the proposed law have made a special study of automobile legislation in this country and abroad, so it can be assured that the intended law will contain features of special value, based upon exhaustive study of the position of the motor vehicle in our jurisprudence. Some of the provisions of this bill will, no doubt, strike many as remarkable, not because the provisions referred to will be radical, but for the reason that they will meet the necessities and conditions as no other law has done. They will, without doubt, be approved by all classes of persons, the automobilist, the farmer and the individual States themselves. Especial attention has been given to the phraseology of the bill and also to the constitutionality of its provisions, the author realizing fully the necessity of having a law which cannot be attacked in any particular.

We desire all who are interested in this movement to join with us in getting the bill passed. We want to know that the automobilists of this country are back of us, and before the bill is introduced we want to know that this measure is the wish of the motor interests of the country.

The manufacturer should come in strong in support of a national act. Anything that tends to benefit automobilists in making motoring easier, more pleasant and freer from annoyances necessarily benefits the dealer. Let the manufacturers and dealers send in their names to show their approval of what is being done.

We also want all the clubs of the country to give their support. Let the clubs discuss the matter and appoint a joint committee composed of representatives of separate club committees for the purpose of furthering the movement. Let there be meetings held to foster interest and to arouse enthusiasm. The representative of THE HORSELESS AGE in charge of the movement will gladly attend any meeting any evening for the purpose of explaining and discussing the provisions of the proposed law.

Fill out the coupon in THE HORSELESS AGE and send it to the department designated therein.

A. L. A. M. Automobile Engineers Discuss Important Subjects.

At the recent meeting of the mechanical branch of the A. L. A. M. during the Garden Show the engineers of the different companies discussed several important subjects, among which were gears, magnetos and the standardization of parts. The subject of metal alloys, which are so largely used today for automobile parts, also claimed a share of their attention. This subject has been given considerable time in their laboratory, as it is believed that there are many developments in connection with different mixtures a knowledge of which will be of great advantage in automobile construction. Very little is really known as yet as to the results which may be obtained by the use of different metals in certain proportions as alloys of the metals already well known among automobile materials. Aluminum particularly has shown that its entire nature and characteristics can be altered when suitably alloyed.

The discussion in regard to gears was entered into by many of the leading gear makers of the country, such as Messrs. Beall, of Brown & Sharpe; Gleason, of the Gleason Works, and Mr. Burgess, of Gould & Eberhart, Jr. The materials and treatments to which gears are subjected were discussed, as well as the character of the teeth, width of face, depth of flank, etc. The subject of tooth form for best engagement as used on the sliding gear was also considered. The involute tooth seems to be favored by the majority of manufacturers. Helical gears and the proficiency in action of the different types of gear teeth under varying conditions were discussed, and the subject of the best methods and machinery for cutting gear teeth was also taken up. The various discussions were entered into by engineers of nearly all the prominent firms, among whom may be mentioned Hiram P. Maxim, of the Electric Vehicle Company; Mr. Cutler, of the Knox Automobile Company; Russell Huff, of the Packard Motor Car Company; E. Haynes, of the Haynes Automobile Company; J. H. Jones and A. L. Riker, of the Locomobile Company; M. G. Bernin, of the Lozier Company; L. D. Hubbell, of the Pope Motor Car Company; C. B. King, of the Northern Motor Car Company; H. E. Coffin, of the E. R. Thomas Detroit Company, and David Ferguson, of the George N. Pierce Company. All were more or less in favor of standardization of certain parts, and particularly in regard to standardization by means of which the different magnetos can be placed on all the makes of cars without machine work. It is very desirable that there be interchangeability of magnetos, so that a manufacturer can without too much trouble furnish any standard magneto desired by a customer. The position of the magneto received considerable attention, and opinions were divided as to whether it should be mounted on the engine or placed in a position to the rear of the dash. Practically all the standard magnetos were on hand, either taken down or assembled.

In addition to the engineers of the association several electrical engineers were present, among whom may be mentioned Messrs. Heins, of the Robert Bosch Company; Remy, of the Remy Electric Company; Hart, of the Charles Splitdorf Company; Herz, of the Herz Manufacturing Company, and Hull, of the Polyphase Ignition System Company.

Meeting of the Executive Committee of the N. A. A. M.

At the recent meeting of the N. A. A. M. executive committee at the Hotel Victoria, New York, several changes were made as to representatives of different companies and reports of committees were heard. The good roads committee announced that the work of forming a national association to embrace all of the good roads associations of the country had progressed to such an extent that a substantial appropriation by the national association seemed desirable. They recommend an appropriation of $5,000, to be used on condition that twice that sum be raised by other associations interested. In accordance with an arrangement entered into with the Motor and Accessories Manufacturers, Incorporated, under which it is intended that the membership of the national association shall eventually consist exclusively of automobile manufacturers, all makers of parts and accessories being referred to the newer organization, the resignations of several of the associate members were accepted.

The Annual Meeting of the N. A. A. M.

Following the executive committee meeting came the annual meeting of the N. A. A. M. The report of President E. H. Cutler on the work of the past year was read. In this report the question of taking steps to make the organization somewhat more exclusive in its membership was proposed. Reports of different committees were read, and one report commented at considerable length on the efforts of the association to prevent unreasonable legislation. The association's test case, that no license at all shall be required when touring, is still in progress in New Jersey. However, it is stated that the association will be perfectly satisfied with the principle that one license must be recognized in all parts of the country.

The report in connection with the good roads movement was rather lengthy, and is to be printed and forwarded to the members of the association. A new executive committee was elected, the officers of which are: A. L. Pope, president; S. D. Waldon, first vice president; Thos. Henderson, second vice president; Wm. E. Metzger, third vice president; W. R. Innis, treasurer, and L. H. Kittridge, secretary. S. A. Miles remains general manager of the association.

COMMUNICATIONS.

"The High Powered Runabout Craze."

Editor HORSELESS AGE:

In your issue of January 2 there appears an editorial under the above heading. While the arguments there set forth may be correct in some cases, they are wrong in others. I have driven high and low powered cars myself, and I know how it feels and how hard it is on the machinery when the motor has to labor in pulling through sand or up grade. At present I have a 10 horse power, high grade runabout, with three forward speeds and one reverse, and in going through sand I usually have to come down to the low gear. I am often obliged to ascend grades 3 miles long, of such steepness that I might take them on the intermediate gear; but if I catch up to a team and am unable to pass by, it is necessary to come down to the low gear when the team moves faster than the car. This speed must be kept up until the top of the hill is reached.

Low powered cars may be all right for level country, but here in California we require from 25 to 30 horse power for a practical runabout for a doctor or farmer. A touring car should have no less than 40 to 50 horse power, and the speed should be from 35 to 40 miles per hour. A powerful motor is necessary, because it is easier on the car and the motor will last longer when it is not driven to its full capacity. I have driven my runabout for three years, and with the exception that its power is too low it is a reliable car. I intend to sell it and buy a 50 or 55 horse power runabout, and I am not doing it for the sake of sport, either—simply for business and pleasure. I admit that there are many who get high powered cars merely for the sake of speed and sport—there are entirely too many of these, as we farmers well know—and they will have to be checked by law. However, nothing should be done to stop the manufacturers from supplying high powered cars to those who will use them properly.

DUNCAN MCKINNON.

Trouble With Dry Batteries.

Editor HORSELESS AGE:

The article by Mr. Harry B. Haines in the January 5 issue, under the title "A Winter Tour," describes experiences which the undersigned can thoroughly appreciate, as he has had experiences of a similar nature.

These troubles continued until a storage battery was installed, and since then the machine has been doing finely and there has been no further trouble.

It seems to be short-sightedness for automobile makers, for the sake of twenty to twenty-five dollars, to be content to inflict on an unsuspecting public the old style dry cell, with its patience wearing annoyances, in lieu of the more improved storage batteries. Certainly the makers could afford to go to the additional trouble and expense which this would involve in order to insure for the automobilist the highest degree of pleasure and satisfaction, and the investment would be a paying one.

D. M. MCALLISTER.

[Certain recent inventions in connection with ignition devices in which the amount of current used is maintained at the minimum use ordinary dry cells and claim that from 2,000 to 6,000 miles can be covered with them. This tends to show that perhaps some of the difficulty is in the quantity of current used rather than in the battery itself.—ED.]

"Fuel Improvements."

Editor HORSELESS AGE:

On page 617 of your Engineering Number is an article on "Fuel Improvements," which seems to me should lead from experimentation to proven facts. Along this line I wish to record a failure in the hope that some experienced chemist will set me right. I dissolved one ounce of powdered ammonium nitrate in a minimum quantity of water, but on trying to add this to nine parts (by weight) of alcohol the nitrate was at once precipitated as a snowy white mass and would not go again into solution. However, I shook it up and added it to 1 gallon of gasoline and ran my car with this mixture, but, of course, with no good effect. It seems to me we need a perfect solvent for the ammonium nitrate, water free, which is mixable with gasoline. What is it?

M. D. HOGE, JR., M. D.

Cork Inserts in Clutches.

Editor HORSELESS AGE:

In reply to the comment by the National Brake and Clutch Company, which appeared in THE HORSELESS AGE of January 9, 1907, on a certain paragraph relating to cork inserts in my clutch article of December 19, 1906, I wish to say that the paragraph was prompted by a belief that in car design, simplicity and reduction in number of parts are desirable above all else, where simplicity and few parts serve the purpose satisfactorily.

It is a matter of common knowledge that the chief fault of leather faced cone clutches is their tendency to seize. Spring pressed plates under the facing relieve this. So also do cork inserts, but at the same time the clutches shown were of sufficient size to hold properly without the aid of cork inserts. Therefore the paragraph. The idea meant to be conveyed was that spring plates and cork inserts in conjunction with a leather facing, when the facing alone will hold properly, is simply a case of "too much of a good thing."

P. S. TICE.

Why Do Rear Cylinders Heat More?

Editor HORSELESS AGE:

The letter of "L. S." in your issue of January 9 describes a trouble which I also have had, in slight degree, with a similar car. I have been running the car since November 1, and during most of that time have noticed more oil working out around the valve rods and the base of the front cylinder than around the other. A day or two ago the spark in this cylinder failed from oil and soot on the plug, and there seemed to be much oil in the cylinder, while the others were quite dry. On running the engine (in daylight) with all auxiliary exhaust ports exposed, a bright flash came from the port of this cylinder, and not from the other. Also, when the engine is run on each cylinder alone, it runs much more slowly on the first, in spite of a good spark and good compression.

The company directs that the oil feed to each cylinder should be three drops, but one of the demonstrators told me to use less on the front cylinder and, if I remember right, more on the rear where the oil lead also goes to the crank shaft bearing.

The editor's explanation that the trouble is due to a lower temperature in the front cylinder seems to me a good one, although the company claims that tests show only 4° difference in the temperature of front and rear cylinders. I should like to know why the front cylinder, with better lubrication, develops less power or speed. And does the flash in the exhaust show delayed combustion or is it due to the oil?

W. C. D.

[The flash proves that the combustion is delayed, but this may be due to the presence of an excess of oil.—ED.]

Anti-Freezing Solutions.

Editor HORSELESS AGE:

Respecting your request for testimony regarding anti-freezing solutions I take pleasure in submitting my experience. For three seasons I have used a mixture composed of glycerine, wood alcohol and water, equal parts by measure, with no apparent detriment to any part of the car. The cost of this solution is about $1 per gallon, which is not expensive when one considers the pleasure and satisfaction in feeling absolute security from freezing or bursting in any weather. I have tested this solution to 40° Fahr. below zero, where it began to congeal slightly.

J. WM. GRAVES.

Address Wanted.

Editor HORSELESS AGE:

Can you give me the address of the party who makes the equipments to change a 1904 Franklin car from automatic feed to a mechanical feed?

S. I. F.

[We cannot, but if the party concerned should see this and will send us his address we will gladly forward it to the above enquirer.—ED.]

Non-Freezing Solution—Vulcanizing Outer Patches and Covers.

Editor HORSELESS AGE:

In response to request in your last issue I will give you my experience of trials this winter of anti-freezing solutions which your periodical has mentioned. I found the water, alcohol and glycerine solution good till the alcohol evaporated, which depends upon how hot the motor is run. Glycerine and water up to 25 per cent. will easily freeze at —10° C., which we have had this winter. Glycerine in the solution seems to serve the object of helping to keep the alcohol from evaporating so fast. I found it troublesome to watch and keep up the proper proportion of alcohol. Silicate of soda was suggested, because it will not separate out by concentration nor corrode metals. But up to a high percentage it will freeze at —10° C., though it takes some time to reduce it to a freezing temperature.

Next I tried a neutral solution of common salt, three-quarter saturated solution, one-quarter water, neutralized by sodium carbonate or sal soda, so that when two pieces of litmus paper, one red, one blue, were dropped into the solution neither would change color. As an anti-freezing mixture it is good down to any temperature we have had this winter; also, it can be easily replaced even on the road. But it attacks the solder, probably electrochemically. The resulting product does not go into solution easily, but remains on the soldered surface (both in and out of solution) as a white deposit. This insolubility probably makes the attack slower than it would otherwise be. The solution is so handy and good that for a machine having a circulating system with small exposure of soldered surfaces I would be willing to risk it. The solution does not attack copper, iron or rubber, immersed or not.

Please tell me how to vulcanize rubber patches or cases hard enough to stand wear, and how to regulate the degree of hardness. I have a small vulcanizer of a popular and convenient type, which, as an inner tube patcher, is a grand success, making a patch quickly, as good or better than the tube, but such a patch is too soft to stand the wear of a case or shoe. It will either grind off quickly or strip off the old rubber and fabric. The manner of patching is as follows: The cut is cleaned dry first and then with gasoline, then two coats of vulcanizing cement are applied, allowing each to dry well. Next, patch the cut with raw rubber, after cutting away the dirty and ragged edges or roughing the space with a new file; then apply the vulcanizer on the raw rubber and heat to 140° to 150° C. for about an hour. Before applying the vulcanizer I dust everything with French chalk to prevent sticking. Now, the trouble is, as I stated, the patches are too soft for outer cases. Is it in the quality of the rubber I use or the manner of vulcanizing?

A SUBSCRIBER.

[For outer tubes an entirely different grade of rubber compound is used than for inner tubes, as the outer shoe must be fairly hard to resist wear, while the inner tube must be soft and pliable. The vulcanizing solution is so compounded as to incorporate in the raw rubber patch during the vulcanizing process the proper percentage of sulphur. You should apply to the manufacturers of the vulcanizer as to the kind of patches and vulcanizing cement to use for outer cover repairs, and the length of time the vulcanizing should be continued.—ED.]

Some Advice to Purchasers and Owners.

Editor HORSELESS AGE:

THE HORSELESS AGE has been so useful to me in my early experience with motors that I would like to return in part my indebtedness to it by sharing my experiences with its readers.

My first was a 15 horse power runabout, as good as I ever expect to own, but dirty because the engine was splash oiled and under the back seat. I sold it (at a good price) after it had run 3,000 miles, because there was no agent for it within 500 miles of my home city, and I found the garage men did more harm than good each time they touched it.

My second was a standard make of runabout, with an excellent reputation, but, in fact, in this case, at least, quite worthless. I sold it quickly through an agency on its general reputation, and hope never to know who bought it.

My third is another standard runabout. An almost perfect little machine, which costs me about $75 a year for all repairs and renewals except tires. It goes everywhere, even on hunting and fishing trips, and never gives any trouble except when I become overconfident and permit some garage man, not an agent for this make, "to tune it up." The first time this occurred it cost me $5 to tune it and $50 to untune it, and the last time I was laid up forty-eight hours in a large New England city while the best garage worked on it, and then did six hours' hard work myself to undo their work.

Having had so much experience, and, in the main, good luck, I thought I knew the game, and at last year's show bought an expensive touring car, a little on the freak order but built of high grade steel throughout, by a firm I knew to be honest, and certainly more of what I wanted than any other car on the market. Also I bought one of their exhibition cars, which I thought smart in me, and I ran it 100 miles before paying for it. Then I ran it 400 miles more —always, of course, on city asphalt, as our country roads were in bad order. It ran so well, silent as a watch, quick, easy control, etc., that I felt that, like little Jack Horner, "I'd stuck in my thumb and pulled out a plum"; so when country roads became fairly good I loaded in passengers, including two patient and enduring women, and started for a 1,000 mile trip. We got there and back, but we averaged only 50 miles per running day, and broke nearly every small piece about the car. That is to say, all the vital parts of the machine had been carefully designed and were good, but there had been absolute neglect in designing the small parts, and, furthermore, for cheapness the car had been put together by careless boys. I found, also, that no road tests are made of their car. On my return I put the car up for sale and got no offers. The factory offered me one-fourth of what I had paid, inferring that they had never been able to sell their second hand machines. So in anger I put my machine in the hands of a small mechanic who owns and runs a car. He worked at it in his spare time for four months, redesigned all the small parts, and charged me $300, which I willingly paid, for the car as it stands is superior to anything I know. But add this $300 bill to $300 I spent on my 1,000 mile trip in makeshift repairs, and I am out $600 in cash, with about six months' use of the car. The factory provides freely all broken pieces, which are, however, useless to put on, as they break again at once. But the factory will not pay for replacing them in position. One piece which cost this factory $1 cost me about $50 to get into place. Also they refuse to stand any part of my $600 repair bills.

Permit me to draw the moral:

(1) Never buy a car from a factory which does not produce and sell at least 100 cars a year. If a firm has not capital and energy to produce 100 cars a year there is something the matter with them or with their product; such a firm is certain to economize on unforeseeable points, use boy labor in assembly, neglect road tests, etc.

(2) Never buy any except a standard make. The least freakishness in design prevents a sale at second hand, which may be essential in even the best makes.

(3) Never buy any make which has not an agent in your home town, and other agencies along your usual touring routes; as a rule, and it has few exceptions, it is impossible to get even passable work or care for a car except at its own agencies. Not a few garages will deliberately place a car out of repair in order to convince you that their agency car is better than any other.

(4) Remember that a factory guarantee to replace breaks means nothing—what costs them $1 may cost you $50 to put in place. If they offer to put in new parts in place freely, find out what your freight bills will be to factory.

(5) Use a gasoline lock and place good strong locks on your tool box, battery box and radiator covers. Keep them locked day and night when in a garage.

(6) Insist on 36 inch wheels, and for any car weighing over 2,500 pounds 5 inch tires on the back wheels. Tire troubles come, first, from factory efforts to save expense in wheel and tire sizes; second, from careless driving.

(7) If you are present and help in all

repair work your bill will probably be small and the work well done.

(8) Never allow anyone except the agents for your make of car to do repair work on it. If you cannot go to an agency, go to a blacksmith or small machine shop, such mechanics are generally honest and good workmen.

(9) Do all the work you can on your own car. Garage mechanics have to have work, and are seldom out of work if they can get at your car when it is alone.

(10) In touring let someone of your party not in automobile costume engage rooms and stipulate prices before an appearance on the scene with your car. In one town of 100,000 people, at a first class hotel, I dropped my friend near the hotel and he got his room while I looked for a place to leave the car. He paid $4 for room and board; I, who came with the car, paid $7 for exactly the same accommodation. On complaint they said my friend had been undercharged; they did not know he was in my party.

(11) When buying ask your agent the weight of your car. Then insist upon the car being at once weighed in your presence. The difference between agent's and scale weight of the car will enable you to estimate how much truth the agent tells about other points of the car.

(12) Final and most essential point: Buy no car until you have tried it with its full complement of passengers on 100 miles of country roads. Choose poor roads with several hills up to 15 per cent., and at the end (not at first) try it for speed on 10 miles of the best road you can find. Thus you may know something about the car you buy before you have agreed to pay its future bills.

HACIENDA.

Wants to Discuss the Merits of Machines.

Editor HORSELESS AGE:

In the January 2 number the article by H. P. Illsley appeals to me as being right to the point, especially the part referring to the publisher. He has voiced the sentiments of four-fifths of the subscribers. Let the communication columns be thrown open for the discussion of the merits and demerits of any make of machine so that we all may know what is being talked about; let the talk be open and above board, as long as it is respectable and decent. It has been hinted in these columns that this information coming from the user was likely to be unreliable. What if it is? How about the other fellow who tells you his machine is 16-20 horse power, when it really will on testing show about 10? I think there is about as good brains to be found among the users of machines as there is among the makers. When it comes to knowing it all honors are nearly equally divided, or at least that is the decided belief of the writer.

GEO. J. EDWARDS.

MINOR MENTION

The first motor delivery wagon in Walla Walla, Wash., has been introduced by the grocery house of M. C. McGrew. It is said that a number of other business men are contemplating the use of autos for delivery service.

Assistant Postmaster General Hitchcock reports that the use of specially equipped automobiles in the collection service in Baltimore has proved so successful that the Department is now planning for a similar collection service in several other cities.

The original Haynes automobile, the first machine to be placed in practical use in this country, is now being made ready at the Haynes factory at Kokomo, Ind., to take its place at the Smithsonian Institution at Washington, where it will be a permanent exhibit. This ancient relic is actually in running order today, and is still a good car.

The Berkshire Automobile Club, of Pittsfield, Mass., has gone out of existence because of lack of interest. M. B. Warner, L. A. Merchant and Dr. F. W. Brandow have been authorized to settle the affairs of the organization and dispose of its lease of the club rooms in the Whittlesey Building on Revenue avenue.

The new Dragon automobile plant at Thirty-first and Chestnut streets, Philadelphia, is rapidly being equipped with new machinery. A special railroad switch has recently been laid so as to pass the various buildings to facilitate the loading and unloading of supplies and cars. The finished automobiles will be loaded on the cars inside the building.

The National Brake and Clutch Company, of Boston, after carefully testing the efficiency of cork inserts in clutches, have decided that they are thoroughly practical, and have concluded negotiations with the Standard Brake Company, of New York city, whereby they have become the selling agents and representatives for that company in the United States.

The farmers in some districts in England claim that owing to the fact that the dust raised by the motor cars settles upon the grass it now takes a man two days to cut an acre with a scythe, whereas it only took one day before motor cars came into existence. The dust so dulls the edge of the scythe, it is claimed, that very frequent sharpening is necessary, and much time is wasted.

The financial success of the recent automobile show held in the Central Palace, New York city, is attested by the fact that the committee's books show a net profit of $52,000. S. M. Butler, secretary of the A. C. A., sent out a notice to the effect that the exhibition committee of the A. C. A. has been able to reach a speedy financial settlement, and in accordance with its policy of profit sharing with the exhibitors has refunded to them one-half of the net proceeds of the show, which amounts in this instance to 45.9 per cent. on the amount of space rental paid by each exhibitor.

The American Motor Truck Company, of Lockport, N. Y., held a meeting January 12, and the following officers were elected for the ensuing year: President, Carl R. Bishop; vice president, H. C. Eddy; secretary, Robert Hall; treasurer, H. J. Babcock; secretary and general manager, J. A. White. Their new plant is nearing completion, and the company expect to begin business by the 1st of February.

New Incorporations.

Devas Auto Company, Newark, N. J.—Capital, $500,000. Incorporators, F. C. Ferguson, Chas. O. Geyer and A. W. Condit.

The Garret Automobile Company, Garret, Ind. —Capital, $10,000. Directors, Chas. Rollins, C. Colesgrove and Wm. Mitchell.

The Troy Motor Carriage Company, Troy, N. Y. —Capital, $1,000. Directors, Myron J. Adams, Warren A. Pine and Charles L. Pine.

The Parkway Garage Company, Bay Shore, L. I. —Capital, $4,000. Directors, Chas. H. Covel, C. Covel, Richard H. Genker and Henry Fenker.

Coppock Motor Car Company, Marion, Ind.—Capital, $100,000. Incorporators, Harry Reynolds, M. Earl Brackett, Harry Ward and Lambert W. Coppock.

Four Wheel Drive Wagon Company, Augusta, Me.—Capital, $3,000,000; for the manufacture and sale of gas and other engines. President, M. M. Spinney; treasurer, E. J. Pike, of Augusta.

American Pneumatic Leather Company, Lewiston, Me.—Capital, $250,000; to manufacture automobile and wagon tires. President, James E. Manter; treasurer, Clarence E. Eaton, both of Portland.

Dixie Motor Company, High Point, N. C.—Capital, $125,000; to manufacture automobiles and vehicles of all kinds propelled by mechanical power. Incorporators, E. W. Van Brunt, C. S. Dutton, H. A. McGraw.

The Long Island Garage Company, Glen Cove, L. I.—Capital, $25,000. Directors, Walter J. Blair, of Brooklyn; Arthur J. Farrels, Theo. C. Farrels, Lewis H. Titus, of Glencove, and Chas. A. Vietsch, of New York city.

F. E. Bowers Company, Hartford, Conn.—Capital, $10,000; to manufacture automobile parts and supplies. Incorporators, Fredson E. Bowers, Clarence S. Spaulding, Harold T. Warren and Edward S. Spaulding, all of New Haven.

The Shoemaker Automobile Company, Freeport, Wis.—Capital, $100,000. Officers: President, C. C. Shoemaker; secretary, W. N. Cronkrite; directors, Jacob Weiss, Dr. D. E. Sunderland, F. R. Perkins, Chicago; C. E. Clark, Elkhart, Ind.; W. N. Cronkrite and Dr. J. T. White

New Agencies.

New Orleans, La.—H. A. Testard, 411 Baronne street, Buick.

New Orleans, La.—Tulane Auto Company, 933 Perdido street, Royal Tourist.

Houston, Tex.—Texas Automobile Company, 614 Milam street, Pierce Arrow and Pope-Toledo.

Houston Motor Car Company, 410 San Jacinto street, Houston, Tex.—Stevens-Duryea, Thomas.

Montgomery, Ala.—Capital City Garage Company, Franklin, Pope-Waverley and Orient Buckboard.

Oakland, Cal.—Haynes & Daw, agents for the Frayer-Miller car, have appointed E. W. Agnew Nevada State agent.

The Behn-Faugh Motor Car Equipment Company, of Chicago, have recently opened their new automobile accessories store at 3961 Olive street.

Garage Notes.

The Southern Auto Company, of Mobile, Ala., are erecting a brick garage 100x36 feet on Concepcion, between Government and Church streets.

Savage & White are now building a one story garage on State street, Salt Lake City; the structure is to be 30x100 feet.

D. F. Poyer, of Menominee, Mich., is now remodeling the old Ramsey & Jones sawmill on Main street, and will turn it into an up to date automobile garage.

The Auto and Motor Boat Company, Houston, Tex., are erecting a garage and repair shop of brick at 608 Travis street. It will be occupied by February 15.

A permit has been taken out by Geo. W. Biehl, of Reading, Pa., to erect a one story brick garage 40x32 feet; it will be located at the corner of Pearl and Cherry streets, that city.

The Fee-Vincent Electric Car Company, of Detroit, will handle the Woods electric vehicles. This company will soon erect a building 50x200 feet, to be used as an electric garage.

The headquarters of the Cartercar Company have been moved from the Albine Garage, Philadelphia, to 1519 Belmont avenue, which will be the headquarters for the Philadelphia Cartercar agency.

Albert Reeke and Chas. W. Eber connected with the firm of O. F. Weber have opened a new automobile livery at 1322 Michigan avenue, Chicago, with a fine line of limousine, as well as touring cars.

Bonney Motor Car Company, of Kansas City, Mo., have taken the garage at 1112 Locust street, formerly occupied by the Western Automobile Company. They are Kansas City agents for the Wayne cars.

Shinholser & Co., of Macon, Ga., have erected a two story brick and concrete building at 217 Third street. The upper floor will be used as a salesroom for the Cadillac cars, and the lower floor will be a garage and repair shop.

The Cleveland Motor Car Company have recently moved into their new quarters in the Whitney Power Block in Cleveland. Besides having their finishing and repair shop, and an excellent garage, they have salesrooms and offices in the same building.

Close Brothers, of Schenectady, N. Y., are preparing to build an automobile garage to cost between $30,000 and $40,000 on Smith street. It will be a brick structure, 39x180 feet, with facilities for storing 200 autos. They will do general repairing and storage.

The Metropolitan Automobile Company, of Cleveland, Ohio, will shortly move into their new garage. It is one of the largest in the city, having more than 40,000 feet of floor space. Compressed air will be used for cleaning upholstery and inflating tires, while dry steam will be used to clean the oily parts of the machines.

Coming Events.

January 21 to 28—Los Angeles show.

January 22 to 26—Ormond-Daytona Beach races.

January 28 to February 2.—The Cincinnati show.

January 21 to 26—The Baltimore Show, Lyric Hall.

February 2 to 9—Chicago show, Coliseum and First Regiment Armory.

February 11 to 16—Detroit show, Light Guard Armory.

February 18 to 23—The Buffalo show.

February 18 to 23—The Cleveland show, Central Armory.

February 25 to March 2—The Portland (Me.) show, Auditorium.

March 4 to 11.—The Kansas City show.

March 5 to 9—The Grand Rapids Show.

March 13 to 16—The Omaha Show.

March 9 to 16—Boston show, Mechanics Building and Horticultural Hall.

March 18 to 23—Providence show, Infantry Hall.

April 6 to 13—The Montreal show.

April 8 to 13—The Pittsburg Show.

MOTOR VEHICLE PATENTS.

Patents Issued December 25, 1906.

839,094. Tire for Vehicles.—John G. Bell, Ivegill, near Southwaite, England. Filed February 12, 1906.

839,098. Means for Securing Flexible Tires to Motorcar and Like Wheel Rims.—Alfred Birchall, Liverpool, England. Filed January 6, 1906.

839,218. Vehicle Tire.—Milton B. Smythe, Holton, Kan. Filed December 29, 1905.

839,221. Universal Joint for Transmission Gears.—Jacobus Spyker, Trompenburg, near Amsterdam, Netherlands. Filed December 8, 1905.

839,222. Vehicle Brake.—Terry Stafford, Topeka, Kan., assignor of one-half to Smith Automobile Company, of Missouri. Filed March 14, 1906.

839,266. Automobile.—Gaylord H. Browne, Chicago, Ill., assignor of one-half to Charles A. Baker, Milwaukee, Wis. Filed March 16, 1905.

839,281. Nut Lock.—Farris S. Fluke and Frederick P. Vaughan, Chicago, Ill.; said Vaughan assignor to said Fluke. Filed March 7, 1906.

839,417. Wheel.—William H. Pierce, Maquon, Ill., assignor of one-third to Joseph Hoxworth, and one-third to Henderson Woods, Maquon, Ill. Filed April 21, 1906.

839,463. Deformation Clutch.—Gustave E. Franquist, New York, N. Y. Filed December 23, 1905.

839,499. Roller Bearing for Automobile Wheels.—Charles S. Mott, Utica, N. Y., assignor to Hyatt Roller Bearing Company, Harrison, N. J., a corporation of New Jersey. Filed January 6, 1905.

839,512. Variable Speed Gear.—William E. Robinson, Salem, Ind. Filed March 12, 1906.

839,552. Controlling Device for Spring Supported Vehicle Bodies.—George D. Clapp, Boston, Mass. Filed December 26, 1905.

839,626. Device for Inflating the Pneumatic Tires of Vehicles.—Carl Nielsen, Copenhagen, Denmark. Filed December 14, 1905.

839,634. Vehicle Tire.—Edwin O. Pease, Bangor, Me. Filed February 20, 1906.

839,652. Spring Wheel.—William J. Schampel and Chris H. Rasmussen, Chicago, Ill. Filed June 30, 1906.

839,707. Carburetor.—Frank A. Biehn, Chicago, Ill. Filed July 11, 1904.

839,728. Vehicle Wheel.—Thomas T. Chaloner, New York, N. Y. Filed May 8, 1906. Serial No. 315,791.

Patents Issued January 1, 1907.

839,914. Driving Mechanism for Traction Engines.—Matthew Wilson, Dysart, Ia. Filed February 19, 1906.

840,049. Suspension Device for Vehicles.—Gustav Diezemann, West Hoboken, N. J. Filed April 3, 1905.

840,055. Change Speed Gear.—Frank A. Ferguson, Belleville, Kan. Filed March 17, 1906.

840,143. Nut Lock.—William D. Leonard, York, Pa. Filed April 27, 1906.

840,202. Variable Speed Gear.—John P. Davis, Chicago, Ill. Filed August 23, 1906.

840,204. Carburetor.—Gustave E. Franquist, New York, N. Y. Filed August 11, 1905.

840,207. Clencher Tire Releasing Tool.—John E. Glickert and Alfred L. Swigert, Jr., Indianapolis, Ind. Filed May 3, 1906.

840,209. Tire.—George E. Heyl-Dia, Stretton, near Warrington, England. Filed September 29, 1905.

840,295. Radiator for Automobiles.—Frank A. Bryant, Seattle, Wash. Filed August 22, 1906.

840,383. Transmission Gear.—Joseph Schmidt, Jr., Chicago, Ill. Filed December 11, 1903.

Patents Issued January 8, 1907.

840,489. Automobile Crane and Tip Car.—Patrick J. Healey, Boston, Mass. Filed June 30, 1905.

840,503. Vehicle Tire.—Arthur H. Marks, Akron, Ohio. Filed March 1, 1905.

840,504. Variable Speed Gearing.—William R. May, Newton, Mass. Filed January 27, 1906.

840,527. Nut Lock.—Channing M. Thompson, Newark, Ohio. Filed August 20, 1906.

840,529. Universal Joint.—Walter S. Turpin and Jonas H. Holden, Washington, D. C. Filed May 10, 1906.

840,588. Vehicle.—Joseph D. Rourk and Godfrey J. A. Baddett, New York, N. Y. Filed August 20, 1906.

840,593. Vulcanized Joint for Vehicle Tires.—William F. Stearns, Batavia, N. Y. Filed November 10, 1905.

840,605. Transmission Gear.—Charles H. Brooks, Detroit, Mich., assignor to the Brooks Motor Company, Detroit, Mich., a corporation of Michigan. Filed March 30, 1906.

840,626. Friction Clutch.—Russell Huff, Detroit, Mich., assignor to Packard Motor Car Company, Detroit, Mich., a corporation of West Virginia. Filed October 19, 1906.

840,642. Machine for Wrapping Tires.—Charles E. Miller, Anderson, Ind. Filed October 13, 1906.

840,660. Steering Mechanism for Vehicles.—Andrew L. Riker, Short Hills, N. J., assignor, by mesne assignments, to Electric Vehicle Company, Jersey City, N. J., and Hartford, Conn., a corporation of New Jersey. Filed May 15, 1902.

840,694. Starting and Controlling Internal Combustion Engine Driven Launches and Vehicles.—Marshall W. Hanks, Madison, Wis. Filed February 24, 1905.

840,695. Engine Mount.—Marshall W. Hanks and James T. Atwood, Madison, Wis.; said Atwood assignor to said Hanks. Filed November 21, 1905.

840,708. Carburetor.—Elijah D. Parrott, Portland, Ore. Filed November 3, 1905.

840,742. Friction Clutch Coupling.—Hans H. Benn, London, England. Filed March 21, 1906.

840,781. Body Support for Axles.—Thomas J. Lindsay, Indianapolis, Ind. Filed April 9, 1906.

840,782. Steering Spindle.—Thomas J. Lindsay, Indianapolis, Ind. Filed April 9, 1906.

840,805. Ball Bearing.—August Riebe, Berlin, Germany. Filed April 18, 1906.

840,824. Vehicle Wheel.—Samuel S. Childs, Bernardsville, N. J. Filed June 27, 1906.

840,842. Driving Axle Suspension for Motor Vehicles.—Charles R. Greuter, Holyoke, Mass., assignor to Matheson Motor Car Company, Wilkes-Barre, Pa., a corporation. Filed December 29, 1905. Renewed November 22, 1906.

840,851. Wind Shield for Vehicles.—Joseph E. Johnston, Ardmore, Pa. Filed February 21, 1906.

840,882. Friction Clutch.—Samuel Upton, Somerville, Mass. Filed August 1, 1904. Renewed December 18, 1905.

840,927. Variable Speed Gear.—Charles E. Funk, Enterprise, Ore. Filed May 4, 1906.

840,930. Motor Vehicle.—George T. Glover, Chicago, Ill. Filed February 10, 1906.

840,935. Power Transmission Means.—Knud Gulbrandsen, Chicago, Ill., assignor of one-third to Cristian M. Hansen and one-third to Edward Torgerson, Chicago, Ill. Filed April 16, 1906.

840,938. Tool for Manipulating Pneumatic Tires.—Lewis L. Heller and Cooper W. Hancock, Binghamton, N. Y.; said Hancock assignor to said Heller. Filed September 20, 1904.

840,985. Vehicle Wheel.—George W. Zwiebel, Papillion, Neb. Filed March 12, 1906.

No. 841,025. Hub Attaching Device.—Philip Le Sueur, Calabasas, Cal. Filed January 31, 1906.

841,072. Bow Spacing Clamp for Vehicle Tops.—Miles M. Trout, Elmira, N. Y., assignor to Guy W. Shoemaker, Elmira, N. Y. Filed February 15, 1906.