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VOLUME 17 APRIL 4, 1906 NUMBER 14

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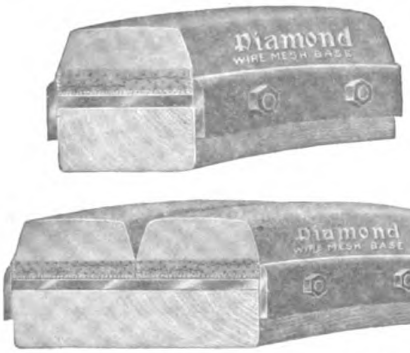

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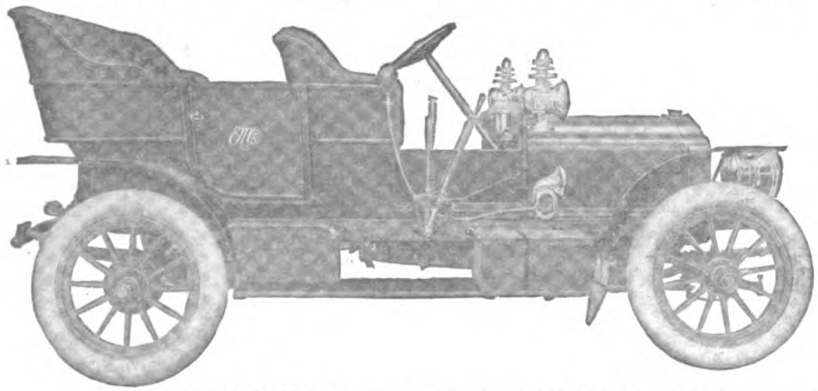

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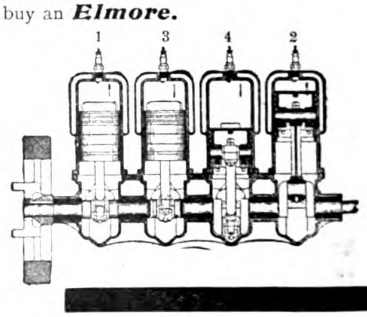

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Spring Overhauling.

By Albert L. Clough.

Every motor car claims as its due an annual general overhauling, and March or April is the most appropriate season in which to perform this, as the condition of the roads during these months is usually most unfavorable. Owing to the very mild winter which many parts of the United States have been enjoying, a great many cars have been kept in commission all through the winter months, and thus especially deserve to be thoroughly "gone over." The overhauling process is essentially an inspection, a general cleaning out, tightening up and readjusting process, and involves, perhaps, some minor replacements as well.

SCREWS AND NUTS.

About the first thing to do is to look to the tightness of every bolt, cap screw, stud and other holding device on the chassis. This requires the car to be run over a pit and plenty of light from an incandescent lamp carried upon a flexible cord. No mattery how conscientiously a car is washed while in service, the inside of the frame and many attached parts will probably be found encrusted with mud, almost concealing some of the nuts. Everything should be scraped clean, in order to make possible a rigid inspection. If any nuts, check nuts or cotters are missing, they should be at once replaced. The attachments of the gear case and engine base to the frame should be most carefully tightened, if found to require it, and the fastenings of brake, clutch and gear operating devices to the chassis, as well as those of the pump and other auxiliaries, should be seen to be secure. Special attention should be paid to spring clip nuts, as any looseness there will lead almost certainly to broken spring leaves, and the integrity of spring hanger fastenings requires investigation. The nuts that secure the body to the frame and those which hold the running board and mud guards should be set up to perfect tightness. Aside from loose nuts, one should be on the watch for loose rivets or other defects in the frame.

Sometimes, through successive adjustments for wear in chains, rear springs are forced out of their regular shape and position and "cocked up" so as not to act properly. In such instances the chain should be renewed and the springs set in the correct position by adjustment of the distance rods.

Spring leaves should be inspected for breaks, and the ends of the leaves may be slightly sprung apart and a little vaseline inserted between them in order to obviate squeaking.

STEERING GEAR.

If there is any one part of the overhauling of a car which should be done more thoroughly than others it is that of the steering gear. The fastenings of the foot of the steering column to the frame should be demonstrated to be tight, and if the irreversible device is found to operate with lost motion, this backlash should be taken up. This can generally be done with modern steering devices. Those of the screw and nut type sometimes employ a split nut, the halves of which after wear can be adjusted tighter around the screw, and those of the worm and sector type often have provisions for adjusting the sector closer to the worm as the tooth surfaces wear. The steering device should, of course, be freshly packed with grease. Every joint in the steering linkage should be inspected with the utmost care, because its condition is actually a life and death matter. Where ball joints are used, there is almost always provision for taking up wear by adjusting more closely the cap of the joint, which should be fastened with great care. Where joints are made by plain cylindrical pins no adjustment for wear is possible, and new ones have to be supplied, the holes in the ends of the linkage being reamed out to a good fit with them. Taper pins are occasionally used, and they afford some adjustment for wear. All nuts responsible for holding the linkage together should be locked in place in the most secure manner. The castellated nut with cotter pin is, on the whole, the best safety locking device. If not already provided, it will be well to supply each joint of the steering linkage with one of the small leather grease bags which buckle about the rods and protect the joint from dust, as well as constantly providing it with non-fluid lubricant, with which the bag is filled. When the front wheels of the car are jacked up the steering gear should turn with perfect freedom, and care should be taken that both wheels are adjusted perfectly parallel in the line of the car length when the steering wheel is set for straight ahead, otherwise the tires will suffer undue wear. The pivot pins upon which the steering knuckles turn should be demonstrated to be secure. When the front wheels are jacked up it will be well to notice whether their bearings are in correct adjustment. There should be only a very slight amount of play allowed, and nothing like a perceptible wobble permitted.

AXLE BEARINGS.

Ball and roller front wheel bearings should be washed out with gasoline, broken balls or rollers should be looked for and the bearings packed with grease and readjusted. Perfect freedom of rotation without "wobbling" shows a proper adjustment. Great care should be taken that the wheels are secure from any possibility of working off the axles.

In order to overhaul the live rear axle of a chain driven car, the chain should be taken off and the car be lifted clear by jacks under the axle spring clips. The axle should spin freely when one of the wheels is given a turn, and there should be no grinding or crunching sounds proceeding from the differential. Only a slight amount of end play should be observed when either wheel is alternately pushed toward and pulled away from the car body, and only the slightest amount of lateral play should be found when either wheel is lifted by hand. The axle should spin silently without any grinding or grating sounds. The wheels themselves must be seen to be most securely fastened in place. If the above tests result satisfactorily, it will only be necessary to pack the differential case with grease, to which has been added a little heavy cylinder oil, and to see that the nuts about the differential frame and truss rod are all tight. If, on the other hand, the wheels show too much play, or there is a grinding sound when the axle is rotated, it will probably have to be dissembled for the readjustment of the bearings, or the possible replacement of one or more of them, in case damage has been incurred. At the same time, the differential can be thoroughly inspected.

WORN SPROCKETS.

If the teeth of the rear sprocket show a very considerably different outline upon their opposite faces and are tending to become "circular saw like" in shape, it is time for a replacement. Once in a while a sprocket is found so arranged that it may be reversed—that is, the tooth faces which have heretofore been idle except upon the reverse, and are therefore but slightly worn—can be made the driving faces, and the life of the sprocket prolonged.

WEAR IN CHAINS.

To determine whether a chain is seriously worn it should be stretched out tight on a smooth floor, and then its ends should be pushed toward one another (without buckling it out of a straight line). The difference in its length when tightly stretched out and when its ends are forcibly pushed together is the sum total of the wear of the rivets. If this amounts to 2 inches or more in a chain of usual length, it may well be retired, although, of course, it will still give considerable service. It is rather bad practice to put a new chain on badly worn sprockets or a badly stretched chain upon new sprockets. Occasionally most of the stretch in a chain will be found localized at a few badly hardened links, and the replacement of these will obviate the necessity of discarding the whole. In replacing a chain the security of the master link fastenings is of great importance, and the utmost care should be taken that the rear axle is so adjusted by the strut rods that it shall be in perfect parallelism with the front axle, thus avoiding chain misalignment and excessive tire wear.

Distance rods which have worn their supports upon the rear axle and the frame are responsible for much rattling when a car is in use. Rather than endure the noise, one may be led to make new pins, properly fitted, to hold the rods in front and rear.

REAR AXLE ADJUSTMENT.

If the car to be overhauled has a shaft driven rear axle, the change gear should be placed in the neutral position, with the rear wheels jacked up, and the same tests as to end and side play and smoothness of operation should be made. The propeller shaft should also be tried for undue side and end

play. The axle should spin freely when one wheel is turned by hand, and if there is the slightest grind or bind in any part of the rotation, the cause should be sought and remedied. With one rear wheel on the ground, the other, when turned, should spin freely, carrying the drive shaft with it. Defects in an axle of this kind, unless some breakage of gears or bearings has occurred, are usually corrected by adjustment, and even adjustment is but very seldom required on recently designed axles. The driving gear case should, of course, be packed with lubricant and the grease cups over the bearings fully supplied. All nuts holding the halves of the axle and gear housing together and those securing inspection plates should be set up.

BRAKE ADJUSTMENT.

The brakes demand most careful scrutiny, as they are safety devices. When the rear axle is jacked up, it is well to be sure that when they are fully released they do not bind upon their drums, and when fully set they absolutely lock the drum against all attempts to turn the wheel by hand. There is only one safe way, however, in which to test brakes, and that is to drive the car part way up a short steep hill, stop it upon the steepest portion and see whether the brakes hold as they should. The inspection in the stable can assure one that the brake operating linkages are securely fastened together, and work freely, and that brake shoes or bands and their operating toggles or cams are not worn or insecure in any way.

FAULTY COMPRESSION.

After the running gear and its attachments are all secure and in proper adjustment, the power plant demands attention. After a season's use the engine will be none the worse for a thorough overhauling. Quite likely one or more cylinders will not show their usual compression. The motor should be cranked over and the cylinders which leak compression determined. It will then be well to gradually introduce, through the pet cocks or spark plug holes, a liberal quantity of kerosene, allowing the crank case to fill with it to such a height as to give a splash when the engine is turned over. The engine should be cranked briskly quite a number of times and kerosene injected once in a while. This treatment may be applied, from time to time, for a day or two, in order that carbon deposits may be softened and gummed oil removed. In order, however, to thoroughly remove carbon deposits from the piston heads they should be removed and gone over with a scraper. The kerosene treatment sometimes improves the compression, freeing the rings of carbonized oil which prevented them from springing out.

VALVE GRINDING.

Unless it has been done recently, all valves on cylinders which show any leakage of compression should be reground. In engines which have their valve seats integral with the cylinder casting the utmost care must be taken that not the slightest particle of the abrasive mixture of fine emery and machine oil gets into the passages and cylinder, as irreparable injury would be done to cylinder bores and pistons. Waste may be stuffed into the space around the valve before the grinding operation to catch the excess of abrasive, and all remaining particles should be carefully wiped off. Valves in removable cages are most conveniently ground.

The most common mistake in grinding valves is in the use of too great pressure in an attempt to hasten the operation. Light pressure, a frequent application of the abrasive and a brisk rotation of the valve on its seat—lifting it frequently to allow the emery to flow in—should give a good fit. The valve springs should be demonstrated to be of uniform strength, and the valves should close positively and freely.

LEAKS PAST PISTONS.

If, after the valves appear to be tight, a cylinder still shows leakage of compression, it should be removed from the crank case and the piston taken out. If a ring is found broken or partially black with oil, thus showing that it does not make perfect contact with the cylinder wall, new rings will have to be fitted. It will generally be found best to send the cylinder and piston to the factory to have this work done. The average repair shop does not possess the materials, the tools or the men to secure a first class job of this kind. If the work is done in a local shop, the rings should be obtained unfinished from the factory and carefully fitted, as having rings made by the repair man is expensive and uncertain. A few extra rings, in the rough, may well be kept on hand. Sometimes it proves quite difficult to determine whether leakage of compression is taking place past the valves or past the piston. If a supply of compressed air, intended for tire inflation, is at hand, it can be usefully employed to locate compression defects. An ordinary pipe plug which fits the spark plug holes may be drilled out to take a tire valve stem, from which the valve has been removed, and the valve stem soldered into the plug. This plug may be screwed into the spark plug hole of the cylinder to be tested and 100 pounds air pressure turned on, after the engine has been blocked on the compression stroke. It is then usually very easy to locate compression leaks, as there is so large a volume of air escaping. A lighted candle held at the exhaust or inlet port will show any escape of air, and the air may be detected passing the rings in a similar way. By blocking the engine at different points in the stroke the extent of the leak in such positions may be determined. Caps which close the valve openings in cylinder heads sometimes leak, as do screwed-in valve cages, and may require copper gaskets under them.

ENGINE BEARINGS.

When the compression has been rendered satisfactory, the bearings of the engine require investigation. The lower half of the crank case should be removed, as well as the hand hole covers, if any. The main bearings, as well as the crank pin bearings, should be freely squirted with gasoline in order to clean out the old oil. Looseness in the main shaft bearings can be detected by forcibly prying upward first upon the flywheel and then upon the forward end of the shaft (if it can be reached), and also upon the shaft between bearings. If there is much looseness it can be felt, and the oil will squeeze out of the bearings. Removable shims, between the bearing caps and their stands, are now usually provided, and such of these as will give the necessary take-up should be removed and the cap securely replaced. If no shims are provided, the flat portions of the caps should be slightly filed down to give the requisite adjustment.

In order to determine if there is looseness in the connecting rod tips, the crank shaft should be blocked and the connecting rods forcibly "worked" by hand in the direction of their length. If any lost motion is found, it may be taken up as in the case of the main bearings. When these bearings have been properly adjusted, with all nuts tight, the engine should spin freely without stiffness, when cranked, with the spark plugs removed. It is of great importance that all bearing caps should be left with their nut locking devices properly replaced. The bearings of the cam shaft or shafts should be demonstrated to be properly adjusted. Some idea of the wear in the wrist pin bushings may be obtained by working the connecting rod tips sidewise, when they are free from their crank pins.

In case any of the engine bearings are worn, so much that their further use is impracticable, they must be provided with new bronze bushings or rebabbitted, as the case may be. As the proper quality of bearing metal and of babbitt is not obtainable with certainty at the usual repair shop, it is well to procure the necessary bearing bushings in the rough from the factory, and to consult the factory as to the quality of babbitt which they use. In smoothing up shafts, preparatory to bushing or rebabbitting their bearings, emery or other abrasives should be used with great care and removed most completely from the surface of the metal. After rebushing, the engine should preferably be run from an outside source of power, until the bearings, which are kept flooded with oil, cease to show any tendency to heat.

The nuts which hold the cylinders to the crank case, those which secure the lower half of the case to the upper, and the nuts or clamps which fasten inlet and exhaust pipes to the valve chambers, indeed every nut or other holding device about the engine, should be left properly set up.

(*To be continued.*)

Two London automobile agencies employ lady demonstrators, and a project is being considered in Turin, Italy, to establish a school exclusively for women drivers, which would be the first of its kind in the world.

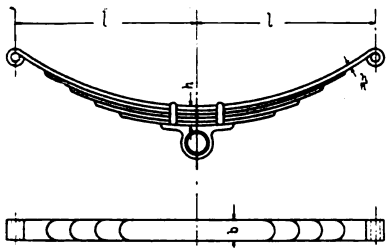
Springs.

By C. H. T.

Among the many problems that have arisen in connection with the development of motor cars is that relating to springs. The conditions which apply to horse drawn vehicles are not the same as those applying to the automobile. In the horse drawn vehicle we can use wheels of large diameter, which do not find every little inequality in the road as a smaller wheel does, and we also have the horse, which tends to anchor the vehicle to the road.

Spring design as applied to the automobile is still in its infancy, and the tendency of the times is not to improve on the springs, but to adopt some auxiliary device to help the springs out in their work. These conditions are to be regretted, for they are remedying the effect instead of "curing" the cause.

Judging from the many devices upon the market intended to prevent the breakage of motor car springs and to improve their action, one is truly led to believe that the automobile spring is in its first stages of development. While it is true that in a great many cases the breaking of springs is due to the overloading of a car, and also to reck-



less driving and violent rebounds, still it is also true that the motor car spring has not been brought up to its highest development. The spring maker has heretofore in the horse drawn vehicle never met the conditions which the automobile presents.

On the automobile we have to use a wheel of small diameter in order to keep our centre of gravity as low as possible, and where a larger wheel would eliminate much of the inequalities of the road the smaller wheel will find them all. Of course the pneumatic tire absorbs the smaller shocks, but that is not its true function, which is to reduce traction resistance, which it undoubtedly does on rough roads and at high speed.

The main fault of inefficient springs lies with the automobile manufacturer. He does not give the springs the attention they need, but has a spring drawn up by his draughting department, what he "thinks" is about right for his car. Nine times out of ten the spring is not suited to the conditions of his car, and the spring maker is then left to make up a number of springs, until he hits upon one that will not deflect too much under its full load, and that is the spring that is used. A little figuring beforehand would have saved money, time and trouble. We have any number of formulæ for plain springs, but those given by Reauleaux give the best results. These formulæ for semi-elliptic springs are as follows (Fig. 1):

$$P = \frac{S\,n\,b\,h^2}{6\,l}$$

$$\delta = \frac{6\,P\,l^3}{E\,n\,b\,h^3}$$

In these two formulæ

S = maximum direct fibre strain in the plate.
P = load on one end of the spring.
E = modulus of direct elasticity.
δ = deflection of end of spring in inches.
b = width of plates in inches.
n = number of plates.
l = half length of spring between eyes.
h = thickness of plates.

The value of E is usually taken as 30,000,000 and S at 80,000.

The formula for ascertaining the load is then

$$P = \frac{13{,}333\,n\,b\,h^2}{l}$$

while the formula for deflection is

$$\delta = \frac{P\,l^3}{5{,}000{,}000\,n\,b\,h^3}$$

The above calculations assume that the load on a spring is applied gradually. If the load was suddenly applied the stress and deflection would be momentarily double that due to a gradually applied load.

After a spring is tempered its tenacity and elastic limit increase. The steel from which springs are made has a tenacity of 100,000 to 140,000 pounds per square inch, and an elastic limit of from 70,000 to 90,000 pounds per square inch, before being tempered. After tempering in oil its elastic limit increases to from 100,000 to 140,000 pounds, while its tenacity increases from 140,000 to 200,000 pounds per square inch.

The safe working stress in a spring subject to bend may be taken at 80,000 pounds per square inch, and 60,000 pounds in springs subject to torsion.

In helical springs, such as are used for engaging the clutch, the following formulæ apply for finding deflection, stress and diameter of wire:

$$\delta = \frac{64\,N\,L\,R^3}{E\,d^4}$$

where

N = number of free coils.
L = load in pounds.
d = diameter of wire.
R = mean radius of coil in inches.
E = modulus of transverse elasticity.
δ = deflection of spring in inches.

If we take E = 11,500,000, then

$$\delta = \frac{N\,L\,R^3}{180{,}000\,d^4}$$

and by substituting we find

$$L = \frac{3{\cdot}43\,d^3}{2R}$$

and

$$d = \sqrt[3]{\frac{L\,2\,R}{3{\cdot}43}}$$

Cast Aluminum Automobile Bodies.

By W. G. Wall.

As the automobile industry advances wood is fast losing its popularity as a material of construction. Wooden frames are a thing of the past, as are also a few of the smaller parts which were formerly made of wood, and metal is now fast driving wood out of the field for dashes, lockers and bodies.

The reason for this change is that metal is much stronger for a given weight, neater in appearance, more durable, impervious to moisture and not so liable to crack, which latter defect is one of the greatest causes of trouble experienced in the use of wood. Especially is this true in regard to bodies, where large surfaces are exposed to the weather and at the same time subjected to very severe and continuous strains, as in going over rough roads even at ordinary speeds, so that it is a wonder that bodies made of wood hold up even as well as they do. It is also difficult to form wood in a substantial manner into the graceful lines and curves which are now demanded for automobile bodies.

These reasons have forced manufacturers to replace wood bodies with metal ones, the most common type of which are those made of sheet steel or sheet aluminum, supported on a wood frame. The disadvantage of using wood is, however, not eliminated in these bodies, and, besides, as the sheet metal is necessarily very thin, any slight knock is apt to either punch a hole through it or else mar it quite badly.

A few motor car manufacturers have been experimenting with and are now using seats of aluminum castings for their bodies, while some are making the entire body, with the exception of the base, of aluminum castings. When it is properly made and where cost is no consideration this is without doubt the ideal body for an automobile. It is quite light, very rigid, will stand hard knocks, does not require the use of wood (except for the floors and attaching the trimming), takes an excellent finish, is proof against all kinds of weather and, in fact, is nearly indestructible. That it is very substantial can be easily realized when it is considered that a great majority of all gear, transmission and crank cases are now made of aluminum castings.

The manufacture of a large body out of cast aluminum is quite a difficult undertaking, especially if the tonneau is to be cast in one piece, as the great size of the pattern makes it very hard to handle in the foundry, and even the making of these patterns requires considerable ingenuity. First a wood form of the exact shape of the body wanted must be built, upon which to make the master pattern, and it is from this master pattern that the final aluminum or brass pattern is made. Sometimes a white metal pattern is used for making the castings, but it is apt to spring and get out of shape owing to its weight. So, as there are to be two shrinkages—aluminum generally shrinking three-sixteenths of an inch to a foot—

double shrinkage has to be allowed in making up the form. It has been found that aluminum in very large, thin pieces shrinks sometimes as much as five-sixteenths of an inch to a foot, which makes it difficult to figure out the exact size that the form should be to produce a certain size body and make all parts fit together nicely.

The thickness of the final castings should be about five-thirty-seconds of an inch, and not over three-sixteenths, except where heavy ribs are used for bracing, or flanges for bolting the parts of the body together.

There are a number of ways of making the master pattern after the form on which to build it has been completed. It can be made of sheets of bees' wax laid over the form, or of several layers of very thin wooden strips, about an inch wide, laid across each other and glued together, the cracks being filled with wax, or else pieces of white metal hammered into shape over the form and soldered at their joints.

After the master pattern has been made, "follow boards" which conform with the shape of the pattern must be built up of wood, to hold the pattern in shape, or else they would warp or spring so that you could do nothing with them; especially is this the case with the master patterns, as they are necessarily quite frail.

From these master patterns the final patterns are cast, preferably out of aluminum, on account of its light weight.

These patterns must then be scraped and finished, fitted together and gone over carefully to see if all dimensions are correct. You are then ready to begin making the aluminum castings for the bodies, provided, of course, the molding boxes or "flasks" for holding the sand have been finished. The aluminum foundry is responsible for the rest of the work, which is the most difficult part of the undertaking, for no matter how experienced the molder is, he will probably lose the first few castings. Especially is this the case if the tonneau of the body is cast in one large piece, for it is nearly as thin as aluminum can be poured, and at the same time very large, so that it may require as much as a ton of sand to cast it, and as all this sand when packed in the flask must be turned over, it is a very difficult thing to do without injuring the mold, and the "flask" must be especially rigid so as not to spring with the load it contains.

Considerable sand (that is, weight) can be saved in molding if the "flasks" are made of metal and conform to the shape of the pattern.

The front seats, being smaller, are not so difficult to cast, and the doors and other parts are comparatively easy.

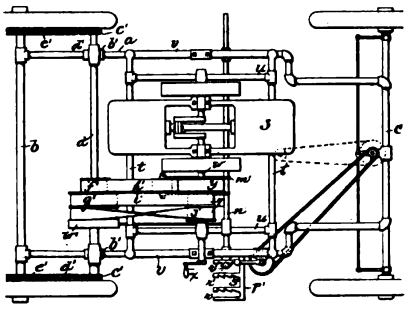
After the castings have been made, there still remains considerable work to be done, as the parts must be bolted together and the casting scraped down and finished, so as to get a good surface for the paint, and only a part of this surface can be ground down and buffed by machinery, as the corners and edges must all be gone over with a file, thus necessitating a great deal of hand work. The wood strips around the edges for holding the trimming, and the bottoms of the seats can then be put on, after which the body is ready to be painted and trimmed in the usual way. Thus it can readily be seen that, though this makes the best automobile body obtainable, it also makes the most expensive one to build.

Change Speed Gears of the Sliding Type—The Dyer Patents.

By Frederick W. Barker.

Two patents owned by L. H. and F. L. Dyer have been put forward as covering certain features of sliding change speed gears, and guide plate with separate recesses to hold the operating lever in its several positions.

The earlier of these patents, No. 675,650, issued September 11, 1900, on an application dated June 8, 1898, shows a motor vehicle whose motor shaft and



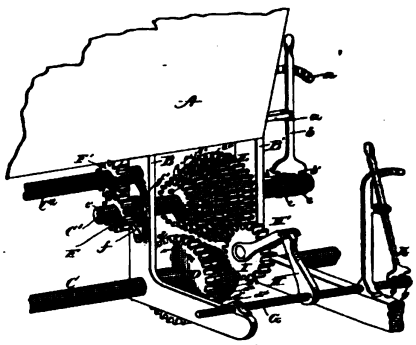
No. 675,650.

countershaft have pulleys connected by belts, a single shifting jockey pulley being employed to tighten the belts. The lever used in shifting the jockey pulley is adapted to engage in the recesses of the guide plate. The motor shaft w carries large pulley y and small pulley z, which are respectively connected to small pulley f' and large pulley g' on countershaft a', by belts h' i. The pulleys z, g' also carry a crossed belt j' to afford reverse movement. The jockey pulley l' is carried by arms m having lever o', which is connected to shaft n'. Said axle is capable of longitudinal movement in its journals, and can be shifted by the lever i', which latter is entered in one of the recesses r' in plate P' and locked by the notches s'. Thus the jockey pulley can be shifted to any one of the belts accordingly as the high speed, low speed or reverse movements are desired.

Claim 9 of the patent, which covers the guide plate, without reference to the particular form of transmission mechanism employed, reads as follows:

"In an automobile vehicle a transmission gearing therefor, the operating handle o' therefor, the fixed guide plate p' having recesses r', r' therein, substantially as set forth."

The claim is narrowly drawn, as it refers to the several elements by reference



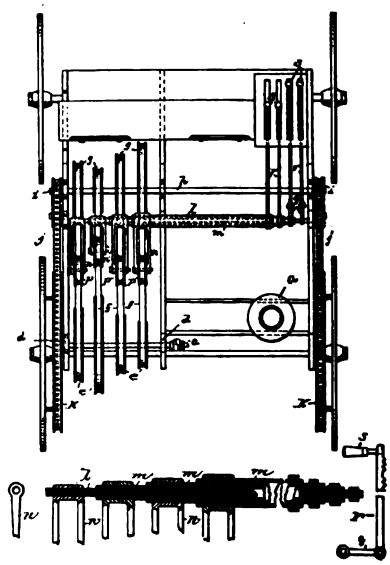
No. 295,536.

characters, indicating them as shown in the drawings. For a liberal interpretation of this claim it would be necessary to prove the alleged infringing devices to include the exact mechanical equivalents thereof.

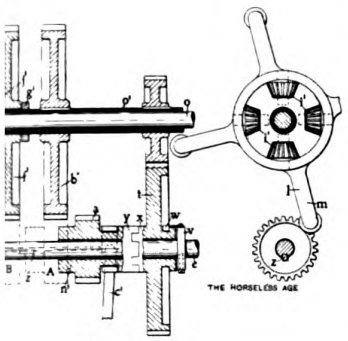
There are several earlier patents which show a recessed plate used in holding the change speed lever for sliding gears.

Gallup, No. 295,536, of March 25, 1884, shows a device relating to change speed gearing for seeding machines and grain drills; its mere application to a motor vehicle would not constitute invention. The shaft C^2, carrying cone series of gears, is rotated by shaft C', through pinions F' c', and the parallel shaft C, carrying a reversed cone series of gears, is adapted to be engaged through an idler I, carried by shaft G. Shaft G is shifted longitudinally by operating lever K, which may be engaged in one or other of the recesses in a plate K'. To increase the number of speed changes, the shaft C' may itself be shifted by a lever b, which engages in a recessed plate a'.

Blake, No. 535,937, of March 19, 1895.—In this patent change speed pulleys and belts, a separate belt tightener P is used for each belt, the several belt tighteners being carried by separate hollow shafts m, each having an operating lever r and handle s. The handles slide in separate slots, and have



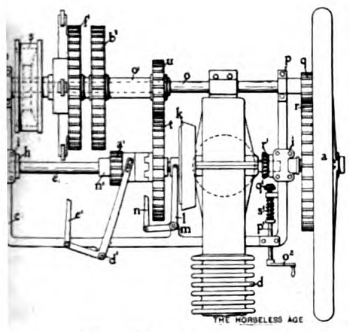
No. 535,937.



No. 662,401.

ıg racks as locking devices. The ecessed guide plate, with single oper- ever controlling the several speed s, clearly involves invention over the ınd various other early patented de- ound in the art.

's second patent is No. 662,401, of ber 27, 1900, filed April 26, 1899. which has clutch teeth *x*, is loose or shaft *e*, while small gear *a'*, hav- *n'*, and clutch teeth *y*, is slidable on aft. Countershaft *o* has end pinions shing with driving gears *r r*, said connecting with its sleeve *o'* through ıtial *s*. Sleeve *o'* carries the small and large gears *b'*, *f'*, the latter be- e and having bevel *j'* on one face with bevels *i' i'*, *i' i'*, which engage vel *k'*, that is splined to shaft *o'*. vels *i'* are carried in a frame *h'*, s loose on sleeve *o'*, and has radial When clutch *x y* is engaged the on the high speed through gears, *t*, The low speed is acquired by slid-



No. 662,401.

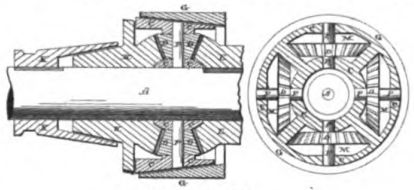
r *a'* into engagement with gear *b'*. in the reverse, gear *a'* is moved into h with loose gear *f'*, an arm *l* of *i'* then contacting with hub *n'* of whereby, through the bevels *k'*, *i'* motion is communicated in the re- irection to sleeve *o'*.

12 which includes the means for g, reads thus:

n an improvement in gearing, two parallelly arranged, a gear rigidly to one shaft, a second gear in ith the first gear, but free to ro- out its supporting shaft, a clutch upon said gear, a third gear rigidly d upon one of the shafts, a loose jacent thereto, normally inoperative intermediate mechanism interposed between said gear and its supporting shaft, a gear keyed to the other shaft but capable of lateral or endwise movement thereon, a clutch member upon one face of the fourth gear, and a projection or hub *n'* upon the opposite face, substantially as set forth."

The normally inoperative mechanism between loose gear *f'* and shaft (sleeve) *o'*, comprising frame *h* and bevels *k'*, *i* and *j'*, which, together with hub *n'*, form the reverse, is the feature of this claim which is sought to be upheld. The prior art includes a number of different patented reversing devices, using sliding gears, of which several are noted hereinafter.

Lehmer, No. 320,665, of June 23, 1885, covers a reversing gear for traction engines. The power gear H, which is loose on shaft A, is locked thereto by clutch K, and transmits motion in one direction to shaft A.

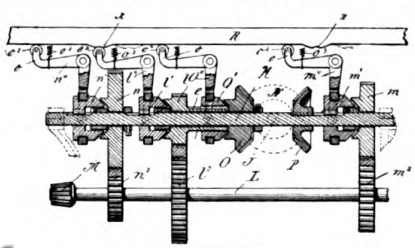


No. 320,665.

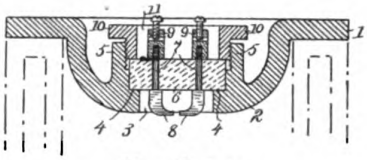
But when clutch K is released, and brake G is applied to wheel C, which pivotally carries the bevel pinions D, then motion is communicated through the splined gear E to turn shaft A in the reverse direction.

Duryea, No. 540,648, of June 11, 1895.—Shaft K has the bevel gears P, O, which are driven in opposite directions by bevel N from the engine shaft J. Gear P is fast on shaft K, while gear O is loose thereon. Clutches *l'*, *m'* and *n'* on shaft K, respectively, engage the loose gears *l*, *m*, and *n* to respectively drive the low, intermediate and high gears l^2, m^2 and n^2 on shaft L. For the reverse, clutch *l'* engages gear *l*, and the extension clutch O' on hub *e* of gear *l* engages with bevel gear O, whereby gear *l* turns gear l^2 and shaft L in the reverse direction. The device employs a separate clutch for each gear, using two clutches for the reverse, and it cannot be considered anticipatory of the Dyer patent, although interesting as showing the earlier state of the art.

Clapp, No. 577,185, of February 16, 1897.—(Copy of this patent could not be obtained.) Shaft 3 is the driving shaft and 4 the driven shaft which receives its power from the crank shaft through gear 63. Gears 69 and 81 give the high speed, 68 and 80 the intermediate, and 67 and 79 the low speed. These



No. 540,648.



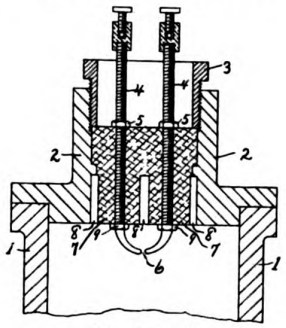
No. 582,540.

gears are always in mesh, the upper ones being loose on shaft 3, but adapted to be connected thereto by separate clutches 47, 46 and 45. The clutches being released, reverse motion is imparted to shaft 4 by connecting clutch members 71, 70 and 77, 78, the sprockets thereon being connected by chain 75. This arrangement does not conflict with the Dyer claim.

The Mueller and Canfield Spark Plug Patents.

It was recently announced that the Association Patents Company, an off shoot of the A. L. A. M., had acquired patents Nos. 582,540 and 612,701, the former entitled "Igniter for Explosive Engines," and issued to Oscar Mueller, of Decatur, Ill., on an application filed May 11, 1897, and the latter entitled "Igniter or Sparker for Gas, Oil or Vapor Engine," and issued October 18, 1898, on an application filed August 5, 1897.

Both patents show jump spark plugs with both spark terminals insulated. The Mueller plug, as shown by the illustration, consists of a disc of insulating material (glass, marble or some other substance of considerable strength, according to the specification), which is clamped into the wall of the cylinder head between a



No. 612,701.

shoulder in the opening and a gland, and the spark terminals are clamped into the disc. The two claims appear to be drawn very narrowly, and would not cover any of the present spark plugs, but the patent is probably considered of value because it is the first American patent relating exclusively to a jump spark plug. Claim 1 reads as follows:

An igniter for explosive engines comprising a cylinder head having an opening with a seat formed therein and a threaded rim encircling and extending outward from the seat, a non-conductor disc bearing against the seat and closing the opening, an annular nut screwed into the rim and against the disc, and a circuit wire connected with a pole piece that extends

through the disc, substantially as set forth.

The Canfield patent, No. 612,701, purports to provide a method of insulating the spark plug electrodes that will prevent fouling of the plug. The means of avoiding the fouling consists of a deep counterbore or recess around the inner end of the spark terminal, as shown by the drawing. The first claim reads:

In a gas, oil or vapor engine igniter or sparker a recess or counterbore around the electrode or electrodes and above its or their sparking points when said electrodes are used vertically, for the purpose of preventing an injurious accumulation of the products of combustion or other foul matter on the insulation of said electrodes, substantially as and for the purpose set forth.

The Automobile in Italy.

By Carlo Rizzardi.

In few countries has the automobile developed as rapidly as in Italy. As the means of a sport it is now enjoying great favor among the public, and the great contests are attracting general interest. This has aided in bringing about the high degree of perfection of construction which has been attained by the national automobile industry, a perfection which enables cars of Italian manufacture to rival with the best foreign makes in point of both speed and endurance. The success in international contests of any of the leading makes is considered by many as a thing of national importance. In consequence of these general sentiments automobile competitive events multiplied in 1905, and some among them, as, for instance, the Susa-Mont Cenis Hill climb and the Florio Cup race during the Brescia week, scored an international success. During 1906 there will be four of these great international meetings, as follows:

In April, Sicilian Circuit, a race over a distance of 600 kilometres, near Palermo, over rather hilly roads. The race is limited to touring vehicles selling at 20,000 francs, or less, and the prizes will consist of the Targe Florio and cash prizes aggregating $10,000.

In May, Gold Cup Circuit, an endurance and regularity contest over a distance of 4,003 kilometres, completed in eleven days. The aggregate of the prizes already exceeds $40,000.

In July, Susa-Mont Cenis Hill climb, a distance of 23 kilometres.

In September, Brescia week, a race over a circuit of 61 kilometres, which must be covered nine times without neutralizations. The prizes include the Florio Cup and cash prizes aggregating $20,000.

The international success of these meetings is already partially insured by entries received.

The Italian automobile industry, although still very young, has made enormous progress in the construction of cars, and already competes successfully in the markets of the world. Its products are known for neatness of design, high class finish, extremely scrupulous selection of material and reasonable prices. By reason of the constantly increasing demand for cars, particularly for export, there is a manifest underproduction in Italy of cars of the voiturette class, and of low priced larger cars—that is to say, cars selling complete with body at up to $2,400—and this type of machine is mostly purchased abroad. At the present the manufacture of small runabouts and of motor trucks (which latter must frequently be built special to suit individual cases) is considered as less remunerative than the manufacture of high grade touring cars; but it is certain that this field will receive greater attention by the Italian industry within the very near future. Evidence of the renown enjoyed by Italian methods of automobile construction may be seen in the fact that six of the largest and best known French manufacturers and one English have combined with Italian capitalists for the construction of vehicles of their design at Turin, Genoa, Florence and Milan.

The recently closed third annual Turin automobile show was a very successful event. The show comprised two curiosities of the 1905 season, the Richard-Brasier racer, which won the last Gordon Bennett race, which was exhibited by the "Fides" Société Italienne Richard-Brasier, and the "Itala" racer, which won the Florio Cup during the Brescia week. The 1906 models of Italian cars follow very much identical lines, the principal features being as follows: Pressed steel frame narrowed in front and without sub-frame; four cylinder motor, with cylinders cast in pairs, symmetrical valves and enclosed cam shaft gears; make and break ignition; constant level carburetor, with warm air inlet; fan in flywheel and behind radiator; very careful mounting of radiator; disc clutch; four forward speeds; chain drive in a majority of cases; water cooled brake on the differential, and expanding brakes on the rear wheel hubs; strongly inclined steering column and steering gear with large reduction factor; large diameter steering wheel carrying at the centre the throttle and ignition levers; all bearings, except those of the motor, of the large diameter ball type; very long and nearly flat springs; lubrication in proportion to the speed of the motor; gasoline tank under pressure at the rear of the frame; cars of 24 and 36 brake horse power for ordinary touring, 60 horse power for "grand tourisme," and 16 horse power for city use. At the recent Turin show there were among the exhibits four cars of American construction, three Reos and one White. It is to be regretted that no other American makes were represented, as they would certainly have met a demand. The importation of American cars into Italy occasions an average expense of $100 to $120 for transportation and $80 to $120 for tariff duty.

The practical application of the motor car is also expanding in Italy, notwithstanding the high price of gasoline, which varies in different localities from .90 to 1.10 lire per kilogram (48 to 60 cents per United States gallon). The high price of the fuel has had for its immediate effect most determined efforts to increase the fuel efficiency of the motor, and it has become the custom among manufacturers to furnish with each motor delivered a guarantee of its fuel economy. The roads in Italy are generally good, very numerous and well maintained, and even in the least frequented districts the peasantry have never shown any hostility toward the new method of locomotion, the rare exceptions having always been due to regrettable imprudence on the part of automobilists.

The Italian Touring Club, a national association comprising a membership of 50,000, is deserving of much credit in connection with the development of practical automobiling in Italy. It has organized several tourists' meetings which proved quite successful, has furnished a complete series of guides, profiles and monographs, and at present is engaged in the publication of a new and special touring map of Italy on a scale of 1: 250,000, which will be given free to all members for 1906-7.

There is in Italy a "Club Automobilisti d'Italia," with its headquarters at Turin, which is a federation of a number of wealthy automobile clubs in the different principal cities, each of which possesses its own garage and organizes automobile contests.

Public services by automobile vehicles are also rapidly increasing in number. There are already several lines which exceed 100 kilometres in length, which have been in operation for some time and have given altogether satisfactory results. These lines are especially increasing in the vicinity of small towns in mountainous localities where the merchandise and passenger traffic is insufficient to justify the installation of an electric tram line. These services usually comprise a number of omnibuses capable of maintaining an average speed of 18-20 kil. p. h. on average roads, carrying about 20 passengers and a corresponding weight of baggage. The majority of vehicles in use are of the gasoline type, which appear to be entirely superseding steam. In Milan electric trucks have been in use experimentally for some months for the collection and distribution of mail matter. These trucks are fitted with a body arranged inside like a small office, in which two clerks are at work while the car is running. These electric mail wagons will be definitely adopted in Milan on April 1 next.

The A. C. G. B. and I. employ a 12 horse power Star car as an "instructors' car" to teach novices the art of driving. There is an extra pedal on this car in front of the seat beside the driver, by which means the instructor can instantly unclutch and apply the brakes in case his pupil should lose his head.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Pleasure Car Manufacturers as Commercial Vehicle Makers.

Although no definite announcements have yet been made, we have reason to believe that the engineering departments of several of the most prominent pleasure vehicle manufacturers are at present engaged upon commercial vehicle designs, and the practice of filling in the dull season of the year in the pleasure car trade with work on commercial vehicles appears to be spreading. This was a very natural development after it was once recognized that the pleasure car with delivery body substituted makes at best only a very poor commercial vehicle.

It is difficult for any new industry to gain its first foothold, and the commercial vehicle industry is no exception to this rule. By developing it in this manner, in connection with the pleasure vehicle industry, it may be possible to considerably reduce these difficulties. For one thing, we believe pleasure vehicle manufacturers can well afford to sell their commercial cars at a smaller profit than their regular product. The manufacture of pleasure cars is their regular business, and this requires a certain equipment, which, unless other work is found for it, must lie idle during a certain portion of the year. During this period of idleness the fixed charges on the plant—interest on capital invested, insurance, depreciation, etc.—continue, as does also the salary of officials. If the plant is being worked equivalent to its full capacity for half a year, the share of these fixed charges which must be borne by each car produced is just twice what it would be if the plant was fully occupied the year round in making cars of the same type.

Working the year round at the same rate on the pleasure cars which can be sold in a season is obviously impossible, and other methods must therefore be resorted to if the fixed charge item in the cost of manufacture of cars is to be reduced. As the plant must be maintained anyhow, it obviously pays to manufacture commercial cars during the slack season, even if only a small excess above actual cost in material and labor can be realized. Of course, the manufacture of commercial cars must show an actual profit, but in the calculation of the cost of production the fixed charges of the plant need not necessarily be entered against the car, as they must be against the regular product.

An exaggerated example of these conditions is furnished by electric lighting stations. These require an equipment which is utilized equivalent to its full capacity for only about two hours in twenty-four. Such a large equipment is necessary in order to take care of the greatest demand. So far as the equipment is concerned, it might well be worked twenty-four hours a day, in which case the pro rata fixed charges would be greatly reduced. In order to increase the coefficient of utilization of the equipment, current for power (which is required during the day, when the lights are off) is furnished for as low as one-quarter the cost of current for light in some instances. This is, of course, a line of work in which the fixed charges are relatively very high.

Aside from the profits which are to be realized by the manufacture of commercial automobiles at present, there are two distinct reasons why pleasure car manufacturers ought to devote attention to commercial vehicles during the slack season. In the first place, it is generally conceded that eventually the business automobile will far exceed the pleasure car in importance as an article of manufacture, so that most manufacturers will naturally be forced to take it up in the course of time, and those who take the step early will have the advantage. Secondly, when a manufacturing concern can offer its employees work all the year round, it can secure more competent men, and often at more advantageous terms.

Some Recent Patent Deals.

It will have been noticed from our news columns that the Association of Licensed Automobile Manufacturers have recently acquired title to a number of early patents, including the Dyer change gear patents and the Mueller and Canfield spark plug patents. Of these the Dyer patents are strongly reminiscent of the Selden patent. Dyer, like Selden, is a patent lawyer, and, like Selden, so far as known, has never made any attempt to place his invention on the market, although there have been opportunities innumerable during the past few years to exploit practical inventions in the automobile line. In this connection we cannot help thinking that there is much abuse of the patent law by persons familiar with its weaknesses. The patent law was framed to encourage practical invention for the benefit of the public and to insure to inventors the fruits of their labors. It appears, however, that the law can also be made effective as a means of retarding practical invention. In the early stages of an industry it is easy for those familiar with its state of development to obtain patents on a large number of combinations of mechanism without regard to their practicability. Owing to the newness of the art broad claims may often be secured that will cover combinations which the inventor never thought of. It is generally a laborious and an expensive task to develop an invention to a practical state, so this is preferably left to somebody else, and when the other party has overcome all the difficulties and achieved commercial success, he is held up with threats of an infringement suit or suit is brought against him. This is obviously an abuse of the spirit of the patent law.

The most meritorious of the inventions for which the "Licensed" Association has acquired title is undoubtedly that of Canfield, which invention covers a spark plug with a recess in the insulator around the plug terminal inside the cylinder. At the time this patent was applied for (1897) the jump spark system of ignition was almost unknown in this country. The object of the recess is to prevent the fouling of the insulator by a carbon deposit. Of course the so called "petticoating" of insulators, to increase the length of the leakage path, had been practiced in electrical work long before that time. There is, however, quite another principle involved in the action of the recessed spark plug insulator, namely, that as no combustible mixture reaches the bottom of the recess no soot can be deposited there, and this principle was recognized by Canfield and is enunciated in his second claim. Canfield in his specifications also mentions that he has found certain proportions of the recess to be most effective, and there is every indication that his is a case of practical, original inventive work. The effectiveness of the recess is testified to by the large number of plugs now on the market embodying it. It is gratifying to note that recognition is thus given to an early meritorious invention in the ignition line, and that the inventor has received at least some reward for his labors.

Surety Companies' Bonds as Security for Bail.

Probably no law which has been introduced in any State Legislature will be so welcomed as the act recently passed by both houses of the New York Legislature, providing for the acceptance of a surety company's bond instead of other security upon admitting to bail an autoist who is charged with violation of the law. This statute will enable surety companies (upon complying with the law) to execute bonds in blank, which may be sold at any time or place within or without the State to those who operate motor vehicles within the State borders. But a better way to dispose of these bonds, enabling autoists to always have them ready for immediate use, would probably be to give to the holder authority under power of attorney to execute the bond on behalf of the surety company, thus making the holder the agent of the company for that particular purpose. Or bonds could be procured by the various clubs and sold to the members, but the former would seem to be the more practicable.

Every State in the Union should have a law similar to the one referred to, which is now in the hands of the Governor. To such a law there could be no possible objection by anti-automobile influences. The State is sufficiently protected where the company has complied with the law, and the surety company is likewise amply protected in issuing bonds to automobilists, who constitute, as a general rule, men of good financial standing.

The A. C. A. Fuel Efficiency Contest.

After a prolonged period of idleness, so far as the organization of competitive events is concerned, the Automobile Club of America announces a series of practical trials to be held during the coming summer, starting off with a fuel efficiency test in May. Just now the thoughts of automobile men appear to be centring about such subjects as the possibility of a fuel famine, denaturized alcohol, fuel economy of motors, etc., and a test of this kind is therefore timely. There is still a good deal of misinformation extant in connection with this subject of fuel economy, and a practical competition, if well supported by the industry, cannot fail to have an educating influence in this respect. It is generally admitted that fuel efficiency increases with the size of cylinder, so that a single cylinder engine consumes less gasoline per horse power hour than a double cylinder of the same horse power; a double cylinder less than a four cylinder, and so on. The argument of increased fuel consumption has evidently been employed by salesmen against the four cylinder car, to judge from a recent experience of ours, when a gentleman investigating commercial vehicles was found predisposed against four cylinder machines on account of their "high fuel consumption," though he believed that none of the two cylinder vehicles was powerful enough for his purpose. He seemed to be under the impression that the fuel consumption was proportional to the number of cylinders, as he mentioned that in his opinion the disadvantage could be overcome if two of the cylinders could be cut out when their power was not needed.

There are essentially two possible bases of competition in a fuel economy contest, viz., least fuel consumption per unit of gross weight moved, and least fuel consumption per unit of useful load carried. Of these we consider the former the preferable one, as it takes account of the actual economy of the power plant, while the latter introduces questions of the proper relation of vehicle weight to load, and would encourage overloading the vehicles. If the former basis is adopted the best plan would obviously be to weigh each car with its passengers just before the start, and then measure it out a quantity of fuel in proportion to its weight, say 1 pint per 100 pounds. The car which went the farthest on its fuel allowance would be the winner. From an engineering standpoint this would be much more rational than supplying each car with the same quantity of fuel and declaring the one that went the farthest the winner.

Comparative Tests.

It often happens that car manufacturers wish to test different motor accessories, such as carburetors, mufflers, etc., in order to determine their comparative merits. Unfortunately, the equipment available for such purposes is not always the best, and the method employed frequently does not insure very reliable results. For instance, we have been present at tests of carburetors in which the method of procedure was as follows: The carburetor to be tested was connected to the test engine by a pipe, and the engine was started up on "small throttle," a rather crude Prony brake, with its arm resting on a balance scale, being applied to the engine flywheel. A certain weight was placed on the scale, and while one man gradually opened the throttle and adjusted the gasoline, the other adjusted the brake until the scale balanced, when the man at the throttle would quickly take the speed of the motor with a revolution counter. After a number of tests with different weights had thus been made, and the maximum power obtainable had apparently been found, another carburetor was substituted and the same procedure was repeated.

Now, it is obvious that this method is not only tedious, but is also more or less inaccurate, on account of the time elapsing between the tests of the separate devices, and the possibility of changes in the other conditions affecting the power of the engine, such as atmospheric conditions. If a very accurate comparison is desired, it is essential that the time intervening between the tests of the different devices be as short as possible, and that the engine be not stopped in changing from one device to another. In testing carburetors or mufflers this can easily be accomplished by connecting the two devices to be compared to a threeway valve, so that the change from one to the other can be made instantly, and if the power of the motor is absorbed by an electric generator provided with suitable instruments, the effect on the engine of the change from one device to the other can immediately be observed. Waste of time and errors due to miscalculation, etc., are avoided. It is quite possible to make a large number of tests to compare the different devices under the most varied conditions.

Amended New York Tax Bill.

In our issue of March 14 appeared an article on "Taxing Automobiles," in which the writer discussed and criticised the original automobile tax bill introduced into the New York State Senate by Senator L'Hommedieu. The original enactment has now been amended, and instead of the tax being levied and assessed according to the horse power of the machine, it is to be assessed according to the weight. "An annual State tax of $1 per vehicle and an additional 50 cents for each 500 pounds or major fraction thereof in weight exceeding 500 pounds" is now sought to be imposed "upon every motor vehicle, except motor cycles, owned by a resident" of the State.

The most objectionable part of the amended statute is the basis of computing the tax, which is founded upon weight. The tax sought to be levied by this enactment probably is meant to be a property tax, and it is supposed that the weight of the machine must have some relation to its value, or to the wear and tear upon the roads, since the revenue is to be devoted to the improvement of highways. Upon the latter theory the basis of assessment would seem to be more reasonable, but does the weight constitute a reasonable and lawful basis of levying a tax upon automobiles? This is the question that the courts will ask if the proposed act should be contested.

The objection to the original law of making a tax a lien on the vehicle exists in the amended act. By this provision there will arise complications in titles to machines, and no end of difficulty will ensue. Prohibiting the operation of automobiles upon which taxes have not been paid is also objectionable, as was pointed out in the article referred to, since it makes the intended property tax a privilege tax. Then, again, the tax may be easily avoided, since the law provides for assessing resident owners, and does not contain any provision preventing an evasion of the law.

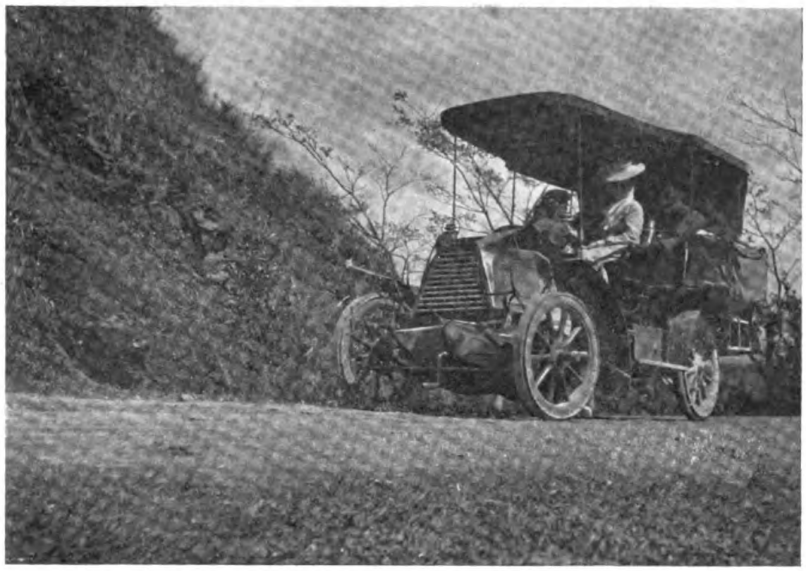
Although an act taxing automobiles and appropriating the revenue to the improvement of highways is favored by automobilists, nevertheless, an appropriate law should be framed, if motor vehicles are to be taxed. The amended act of the State of New York is no better than the original with respect to the objectionable features pointed out.

Automobiling in Porto Rico.

By E. P. Hodges.

The articles in The Horseless Age about a year ago, relating to the prevailing conditions in Porto Rico affecting the use of automobiles, have evidently borne fruit; for, while at that time there were only three cars on the island—one an air cooled touring car, and the other two single cylinder water cooled runabouts, which had difficulty in surmounting the long and dangerous grades between Caguas and Aibonito Pas—today Porto Rico boasts of no less than twenty-six cars of all sizes, with half a dozen more soon to arrive. Most of these cars are used as pleasure vehicles, but exception must be made of those employed in the American railroad service between Camuy and Aguadilla, a distance of about 22 miles, and those in a sporadic service between Rio Piedras (a suburb of San Juan) and Carolina, a distance of only 6 miles over an excellent and level road. The railroad service is furnished by touring cars of the air cooled type, and the air cooling feature is found quite satisfactory, though somewhat expensive in the matter of cylinder oil, which, like gasoline, may be obtained in Porto Rico in unlimited

Public Service Automobile Starting Out for Caguas.



On the Military Road, 2,300 Feet Above Sea Level.

quantities at a few cents advance over the New York prices.

The cars at present in use in Porto Rico, with one exception, are all of American make. Among the motorists of the island are Beekman Winthrop, Governor; Robert Frazier, his private secretary, and Terrence Hamill, chief of the island police. Many of the cars are kept in repair by the chauffeur and chief mechanic of the Governor's garage, and the demand for repair facilities has recently been increasing at such a rate that it is planned to shortly open a general automobile repair shop in San Juan, which will contain several lathes, a drill press, milling machine, etc. At present the mechanical repairs are done in local Spanish shops, the equipment and facilities of which are inadequate.

Seven Belgian 10 ton trucks will shortly arrive, and be put into commission about February 1 between San Juan and Ponce, a distance of 83 miles over the excellent but mountainous military road. These seven trucks will soon afterward be augmented by half a dozen more of equal horse power (70), and not only the Caguas-San Juan route, but all feasible roads will carry these successors of the present ox carts, which are satisfactory as to cost of moving freight but quite the contrary when it comes to the time occupied in transportation. Every effort has been made to secure an exclusive permit to handle freight between these more important points, but to no purpose, as it is plainly apparent that such a decision on the part of the authorities would work a hardship upon the poor ox teamsters who are dependent upon this employment for their daily bread.

The consensus of opinion regarding the tire question as gathered by the writer from the various owners of the cars in Porto Rico points to the fact that there is no satisfactory tire yet on the market which will not go to pieces before 3,000 miles have been run on it. To begin with, the damp and tropical climate, together with the constant chemical action of the intense sun rays, works havoc with the rubber fabrics used in these productions, and if we add to this the destructive grinding action of the flinty projections on the smoothly rolled roads and the abrasive action between the inner and outer tubes, we can readily understand that the question of expense enters seriously into at least the mercantile enterprises prospective and under way today. All first class makes of solid and semi-solid tires have been given fair trial, with the result that in both cases the material or fabric soon shows deterioration. The solid tires, while lasting longer than their more resilient competitors, have caused some serious breaks in axles and disalignments in cylinders, so much so that if we choose between tire expense and machinery expense the race is neither to the one nor to the other. Leather treads soon heat the rubber and wear through almost as soon as the main tread of rubber. The climate, too, deteriorates the leaf springs, which in some cars here show a drop of about an inch after running about 6,000 miles.

The photographs herewith are of the larger cars used mostly by Americans, although quite a number of Porto Ricans drive their cars with consummate skill. I firmly believe that within six months the number of automobiles on this island will be more than doubled. The climate is fine all the year, and the extensive system of good roads offers an unending field for enjoyment.

A Pleasure Vehicle of Native Construction.

Persian Motor Omnibus Line.

The Frankfort *Gazette* states, on Russian authority, that a regular motor service has been established between Enzeli on the Caspian Sea and Teheran, the capital of Persia, along a highway constructed by Russian engineers. Although the enterprise is Russian and is said to have been carried out at the instance of certain highly placed Russian personages, the initiative in the matter is reported to have been taken by the Shah in giving a twenty year concession for a motor service between the two places mentioned to Murtaza Kuli Khan, his brother-in-law, who studied mechanical engineering in Germany and is a friend of Russia.

WINTER EXPERIENCES.

Winter Experiences and Observations.

By Blank, M. D.

Automobiling is the beau ideal of summer sports. It is as surely the boreal of winter ones. But cold is not always unpleasant, nor is sport the sole function of the motor car. Eighty per cent. of my mileage is for business, pure and simple. That is why my cars have had to run 30 miles a day, at the least, through five seasons of slush and mud, of ice and rutted roads, of soft snow and occasional drifts. Winter riding is a necessity with me, often a pleasure, and a hardship only under conditions which would be equally potent in summer.

The success of cold weather motoring is very largely a matter of personal comfort. Work the car never so sweetly, if one is cold one is not happy, and trouble at such a time does not help one's eternal welfare. Here on Long Island we seldom reach extremes of temperature. Occasionally zero shows itself, but more often 30. But humidity is always high, and 30 is harder to stand under such conditions than a dry zero. Without a top a motor car is worse than an open trolley, summer or winter, and demands in the latter season all the fur and wool you can carry. Even then nose, fingers and feet suffer. But a top closed at back and sides makes all the difference in the world. My closed buggy top, entirely open in front, enables me to ride in bitter weather in my ordinary clothing and a cravenette rain coat. The air cushion formed in and by the top is as perfect a protection from cold and wind as a glass front, and much easier to see through. Of course, it is no protection from rain or snow. When facing the wind the effect of this cushion in my car extends ahead of the enclosure about 18 inches, as I have determined by observing the behavior of cigar smoke. A somewhat less distance when "reaching," and indefinitely when "running free." Now you have a glimpse at my other hobby. This makes a lap robe a matter of small importance with me, though it is very handy to tuck about the radiator.

Once on a very cold day this winter I put on the rubber storm boot (which completely closes the front of the car) to the eye level. The three cylinders of my motor are under the seat on the right side. The cushion is divided in the centre. The car handles from either side. The engine is designed to run hot, only valve and combustion chambers being jacketed. So I left the right hand cushion at home, also the right heel panel, and started out handling from the left side. In less than a mile I removed the boot. Again a mile and I unbuttoned my coat. Then my pretty plan being dissolved in perspiration, I went back home for the cushion and panel. Was roasted out. Yet with the cushion on (it is metal lined) the heat is not noticeable, even in summer. So with my car the personal comfort question takes care of itself. Given an enclosed top and I see no reason why, with a little expenditure of brains and money, any car may not be comfortable. In the very best cars about 30 per cent. of the heat furnished by the fuel burned gives you the enormous horse power you brag about at the club. Most of the remaining 70 goes into the cooling water and the exhaust, and is available for heating purposes. Considerations of bodily ease need in no way deter the coldest blooded from running 365 days in the year.

TRACTION.

Road conditions must be met by car design. My drivers are 36 inches in diameter, and carry three-quarters of the car's weight. I have one b. h. p. (honest) for every 70 pounds, all on, including myself. My tires are 3½ inch, with small cross corrugations. I have never used rope, chain, nor any other anti-skid or traction device. So far as traction is concerned, I've had no trouble, except when the car has rested some time in deep snow. Then starting forward generally results in one wheel slipping round and round, and no progress. Locking the differential, putting the lap robe under the slipping wheel or pushing are reliable but inconvenient cures. The easiest way out of the difficulty is not to start forward, but back for a foot or so in your tracks. Then go ahead, and there will seldom be any trouble. Skidding bothers me very little. Even on wet asphalt my car will stand sudden and violent brake application without misbehaving. I seldom try it, however. But on macadam which has been frozen and has thawed out about half an inch, my experience teaches me to drive with extreme caution. I think this is the worst possible road condition for any car. If, however, you are forced to the side, and find one wheel on wet ice and the other in the slime, then, indeed, you have attained the impossible and found a condition that is worse yet. An intelligent car can manage it just the same, if given its time. Well packed snow or dry ice is as easy as the same road in warm weather. Soft snow demands very careful steering.

TIRES.

Tires naturally follow traction. In my opinion they should be pumped up extra hard. It is safe to do so, as they do not heat up the same as in summer. The car steers easier and steadier, and traction is improved. I do not know whether it is easier or harder to puncture such a tire. I've heard both sides maintained. But I do know that on winter roads nails and tacks are covered up and harmless, or uncovered and particularly deadly. Wet rubber cuts very easily. When a rubber workman wishes to cut his material he always wets his tool. Hence these troublesome wind bags of ours should get extra attention. Frequent inspections at every stop and while running should be made. It's easy to tell that a front tire is flat, for the car tends strongly and constantly to turn to the flat side, that wheel being for the time some inches less in diameter. But one may run a long time on a flat driver and not know it. It seems foolish to advise a man to look at the bottom of his wheel to see if his tire is all right, but I know a man whose rim cut an $80 shoe into an utterly hopeless condition because when examining it while running he looked only at the top.

By inspecting at every stop I have been able to add to my collection of penetrating possibilities many specimens whose intentions were thus happily frustrated. And I always squirt a little rubber cement into the hole. Even without vulcanization it will keep out water, and water in the fabric is ruination. This is an equally good procedure in warm weather. I think that a shoe that has been punctured through the fabric should go back to the manufacturer at once, if it is possible. I always pull a string through the punctures when I send the shoe back. I do not know whether it helps the repair man any. A bill for such service has never been sent to me.

Tires sometimes play funny tricks. Several times I would find one or two, or even all four, flat in the morning. Examination revealed no punctures. When pumped up they seemed all right. Even the valves perfectly tight. After several such experiences I discovered that it only happened after very cold nights. This, I take it, contracts some part of the valve so that it leaks. When pumping, the compressed air heats the valve to tightness again, and, of course, while running there is no trouble. I think this is the explanation of the trouble which was described in a recent issue (February 21) of this paper. The reason Mr. Davis can find no leaks when his tube is blown up and placed under water is that the very process of blowing up has cured the leak, as indicated above. Certainly it must be some generally acting cause, or it would not affect five tubes at once.

EXPANSION AND CONTRACTION.

Of frame and running gear there is not much to say. I think, however, that metal when thoroughly chilled is much more brittle than normally. Such few breaks as I have experienced have always come in bitter weather. Nuts loosen up in the intervening warm spells, and must have attention. This I believe is due to the longitudinal contraction of the bolt in the extreme cold. This compresses the parts upon which bolt head and nut engage. In the subsequent expansion with a warm spell this compression does not keep pace with the bolt, and the nut is left free to back off, if not cotter pinned. Even if a castellated nut is pinned it is generally possible under these circumstances to turn it up another slot, and that one slot may be the difference between rattle and quiet. Bolts are sometimes broken by this contraction. Only recently an acquaintance of mine started his single cylinder motor after a bitter cold snap, and the first explosion drove the pis-

ton rod through the crank case and caused a few similar trifling damages. Examination revealed a broken bolt in the crank pin bearing. Coincidence perhaps. But that motor was running perfectly just before the cold wave, and the damage was done on the first explosion afterward.

BODIES.

Cold weather makes one important difference to bodies. Their paint and varnish suffer to a very great degree if water (especially if it is muddy) is allowed to freeze upon them. This is not always preventable, even by prompt cleaning, but is entirely so if the body is gone over once in a while with waste dampened with kerosene. Oil does not in my experience harm the varnish, and some elbow grease will remove it before the summer's dust causes it to become a nuisance.

LAMPS.

My oil lamps work just as well in cold weather as in summer, and need no extra care. So do the gas lamps, but there being so much more heat generated in them, for the sake of my lens mirrors, I take pains to leave the fronts open when I light them and raise the flames slowly. When all condensed moisture has evaporated it is safe to close them and give them a full head of pressure. My generator is filled with a mixture of wood alcohol one part, water three parts, and has never frozen. In summer I use a one to six mixture of the same ingredients. It works better than plain water, especially in non-clogging of burner tips. Why, I do not know.

Ignition is but little affected by reduced temperature. In make and break mechanisms those parts which are wholly or in part spring actuated may lag through stiffness of lubricant. This may cause a few missed explosions at first, but the trouble vanishes as the motor warms up. If it is so bad as to prevent starting, a few drops of gasoline will set things right. In high tension systems commutator springs may be embarrassed in the same way. Same remedy.

MOTOR STARTING.

Starting the motor may become a strenuous undertaking from other causes. I use an 800 degree fire test oil in my cylinders and crank case all the year round. On cold mornings it is like vaseline or butter, and it is all I want to do to move the pistons. These and the main bearings I loosen up with gasoline delivered from an ordinary squirt can. The extreme accessibility of my motor makes it a quick and easy job. When the motor is free I expect it to start on the first or second compression. It generally does, and on the magneto at that. If not, I try once on the battery. If, as very rarely happens, I am again unsuccessful, I insert the nozzle of my gasoline can into a spring covered hole in the inlet pipe and inject a few drops. Then, off she goes. After this séance, which, all told, may last five minutes, I expect the motor to start on the first or second compression all day, even if standing idle two or three hours. My expectation is justified. I can't say as much for some air coolers which I have frequent opportunity to observe. Air cooled motors seem to cool down to zero in ten minutes' idleness in cold weather. Then they are balky. I may be mistaken, and if so I hope to be corrected; but I've seen it take an hour to start a motor which had been idle but fifteen minutes. The batteries were O. K., and it ran all right after the first few explosions. The job was to get those explosions.

My carburetor is jacketed and heated by a by-pass from the exhaust. Practically it works at a nearly even temperature winter and summer. If the air is very cold and wet it does not vaporize all the gasoline, and some, in liquid form, remains in the inlet pipe. This is noticeable in no way until the car strikes some considerable grade, when No. 1 cylinder, which is nearest the carburetor, misses for several revolutions and black smoke comes from the muffler. As the front of the car rises to the grade the gasoline in the inlet pipe runs back to the mixing chamber, and the excessively rich mixture resulting is not attenuated in the inlet pipe enough to ignite until it passes the first cylinder. This is a curiosity rather than a trouble. All in all, I don't know that I've got a carburetor. I couldn't say as much for my first.

LUBRICATION.

To my mind the most important thing to be considered in cold weather running is lubrication. The design of this system in the car's economy makes all the difference between success and failure. In my car each cylinder has its own pressure cup, the pressure coming from the exhaust, which is led from the cylinder itself through the base of the cup to the top. There are no valves but the piston itself. These cups are but an inch or so from the motor, and, like it, run hot. There is practically no tubing. The action is automatic and positive, and can be accurately regulated. It is dependable. The oil reaches the piston during its stroke up and down, and for part of the up stroke is squirted into the channel of the piston rod, whence it is rocked through oil holes to the wrist and crank pin. From these three sources it goes to maintain the level in the crank case, where it is splashed into channels through which it runs to spouts from which it drops upon the main and cam shaft bearings and two to one gears. Under these latter is a standpipe which takes care of a possible excess. This system needs attention only in regard to the supply in the cups, and works when the engine does, without regard to outside temperature. The rest of the car is lubricated with graphite and grease, and needs as much and no more care in warm as in cold weather. Unless such a system is yours, I know of just one way you can avoid inconvenience and disaster: keep your barn warm. I'd do it anyhow, if I could. It's a cure for many ills besides those of lubrication. Lighter oils than one uses in summer help in one way, but must be used with greater liberality. Expense and a dirty car are the result. The question of winter lubrication is bigger than the cooling problem, and, with the growing use of the car in winter, it must receive more attention from the designers. I know of several excellent cars which cannot go on the road in cold weather, though their lubricating systems leave nothing to be desired in warm. Long piping is the main reason Tubes of too small lumen is another. To run, a car must be oiled. It's hard to overdo and easy to underdo it. Too much means waste and dirt, but too little means disaster.

COOLING.

Finally, the cooling system. I've said all I have to say about air cooling. It's good in summer, but too good in winter. I prefer water. I have had no experience with anti-freeze mixtures. My cars can be drained to the last drop. If yours cannot, I should advise redesigning until they can. It is a good feature in any weather. It means a free, easy circulation and no air pockets. Water is cheap, and it is easy to handle a hose. If by good luck you are able to attach the other end of that hose to a hot water faucet, almost all the troubles of cold weather motoring fade away like mist. In my car there is but one point in the circulation where freezing is likely to occur in under three hours' standing. This is the one point where the piping is below the sills. Only once has this frozen so the water would not circulate. I have slipped a small rubber tube over the drain cock of the pump, in order to lead the water clear of the frame. Starting the motor and directing a stream from this tube upon the spot thawed it at once.

As I described in the "Doctors' Number," the circulation of this car is double. Thermo-siphon from tank to jackets to tank. Forced from tank to pump to radiator to tank. The maker, who is proud of the winter ability of his car, advises the removal of pump, piping and radiator in winter, so dispensing with the secondary circulation and relying on the primary alone. Now, I thought I knew more than this man who assisted at the birth of the modern automobile, and this piece of foolishness on my part led to an experience which I would have declared impossible had I not had personal knowledge of it.

I had a small operation to perform at an old Revolutionary road house on the water's edge some 9 or 10 miles to the south of us. For 6 or 8 miles the road runs in a general north and south line over salt meadows. A good macadam road bed. It was one of the two days this winter when our thermometers have touched zero, and the wind was high and from the north. I put the machine under the hotel shed and covered the radiator with a horse blanket. Was in the house about an hour. When starting for home I was very careful, owing to the extreme cold. I opened all drain cocks. They all bled. I started the motor

on the first compression. The radiator grew warm all over at once. Everything O. K., I made a quick, comfortable trip over the meadows, exposed to the full force of the strong north wind. Reached home, alighted, took my usual tour of inspection, placed my bare hand on the radiator, on top where it should be hottest. It was stone cold. Investigation showed it was frozen solid. I hurried to a public garage which is warm, turned a stream of cold water on the radiator, and soon discovered damages to the extent of but one small leak. Pump and everything else in apple pie order. I follow the maker's advice now. A tank of water diminishes a third in one day's running. On very cold days it does not boil at all.

This was all true of my first car, which had natural circulation and could be drained perfectly. But the lubrication gave me trouble. The engine was oiled by splash, and it worked all right if there was oil enough, but the pump, which was satisfactory enough in warm weather, would not work at all in cold, and every 15 or 20 miles I had to stop and squirt oil into the crank case with a gun.

CONCLUSIONS.

Such are the results of my experience. I think that winter work is harder on the car than summer. But if you want to run in cold weather do so, and get the fun out of it to pay for the slightly increased effort. I have to run, and I expect my car to give as good service as in summer, and am willing to pay the price. As a matter of fact, I think that unless a car is ideally housed, it deteriorates less while in winter commission than if idle.

No one is more fond of fussing about an automobile than I. But I confess working over it in a cold barn goes against the grain. All cars need attention all the time, and even to the enthusiast there comes a temptation to slight it in the winter.

As compared with horses, the winter car is a success. I've been towed (not this winter), but never on account of road conditions, and once I towed a team and truck up an asphalt hill slippery with sleet. On the other hand, I've had to shovel through drifts those same horses would have hardly noticed.

The Items of Cost and Convenience.

By Dr. C. E. Ferguson.

I have used my auto every day not only this winter, but every winter since I started to use the horseless carriage. I am now wearing out my second car, a ———, which is notoriously expensive on account of its inaccessibility. As an example, I had a stud worth 75 cents put in last month, and the time amounted to $13, making $13.75 all told.

For the last three years I have kept an accurate account of expense and distance covered. I keep the car in a shed at the rear of my lot, so do not have to pay for storage, and am able to use my car at all times of the night. And it is very convenient at 2 or 3 a. m., when you have a mile or so to go. I can cover the ground in about one-third the time I could with a horse, judging from experience. I therefore have a great deal more time in which to read, or rest, etc. I also find that, as I am consequently in my office more hours in the day, I get and can attend to a great many more emergency cases than I could if using a horse.

As regards cost, I will append a table, showing the cost for one year when the car was new, and the cost with the same care after two years' use. Also a table of costs with a later model of the same make. I travel about 6,500 miles each year; not by guesswork but by odometer.

Under the head repairs is included everything, such as oil cans, tools, bolts, side curtains, spark plugs, etc. Also cleaning, painting and varnishing. My car is always kept in the best of condition. In fact my old car ran better the day I sold it than when I bought it. Will here append a table showing total running expense for each year since 1900:

1901	$175.50
1902	222.00
1903	211.25
1904	173.00
1905	191.95

As regards use in cold weather no trouble will be experienced if a solution of calcium chloride is used for cooling purposes. If the chemically pure chloride is used very little rusting results. The oil cup or tank should be filled each day with just enough oil to last for that day. And the oil should be heated before filling the cup if the car is kept in a cold place. By heating the oil it will flow correctly until the engine gets warm.

In London a motor omnibus driver was recently fined 10 shillings for driving at 16 miles per hour. The defense presented testimony that the motors were fitted with governors making it impossible to go at more than 12 miles per hour, but a public carriage office inspector said that eight out of nine buses inspected were fitted with mechanical contrivances which counteracted the governors (accelerators?). It was also shown that the governors could be tampered with, as a notice was posted at the omnibus company's works threatening dismissal to any driver who did it.

YEAR 1900-1901. NEW CAR, 1900 MODEL. CAR TWO MONTHS OLD.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Gasoline	$3.00	$3.50	$3.00	$2.00	$4.00	$5.50	$4.50	$2.50	$5.00	$3.50	$3.50	$4.00
Tires	....	2.00	5.00	....	1.00	2.00	8.00	10.00	1.00	....	1.00	4.00
Repairs	2.25	5.50	2.00	6.00	6.00	17.25	7.50	10.00	20.00	8.50	....	3.00
Batteries	....	1.00	....	2.00	....	....	1.00	....	....	2.00	2.00	....
Totals	$5.25	$12.00	$10.00	$10.00	$11.00	$24.75	$21.00	$22.50	$26.00	$14.00	$6.50	$11.00

SAME CAR. 1903.

Gasoline	$3.00	$3.00	$3.50	$5.00	$4.00	$2.50	$6.00	$4.50	$4.00	$2.00	$8.00	$3.00
Tires	4.00	5.00	5.00	1.00	1.00	1.00	15.00	3.50	12.50	3.00	....	1.00
Repairs	5.00	3.00	7.00	9.00	11.00	14.00	..	9.00	6.50	12.00	19.50	7.25
Batteries	1.00	....	....	2.00	....	....	2.00	....	2.00	....	....	1.00
Totals	$13.00	$11.00	$15.50	$17.00	$16.00	$17.50	$23.00	$17.00	$25.00	$17.00	$27.50	$12.25

Total cost year 1901, $175.50
Total cost, 1903, $211.25.

NEW CAR, 1904 MODEL.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Gasoline	$6.50	$3.00	$2.00	$3.00	$8.50	$3.00	$3.50	$4.00	$6.50	$5.00	$6.00	$4.75
Tires	....	....	....	12.00	....	13.50	....	3.00	....	1.00	2.00	2.50
Repairs	23.00	10.25	15.00	13.00	2.25	1.25	13.25	5.25	10.50	2.00	.75	11.75
Batteries	....	....	1.00	....	1.00	....	....	....	2.00	....	1.00	....
Totals	$29.50	$13.25	$18.00	$28.00	$11.75	$17.75	$16.75	$12.25	$19.00	$8.00	$9.75	$19.00

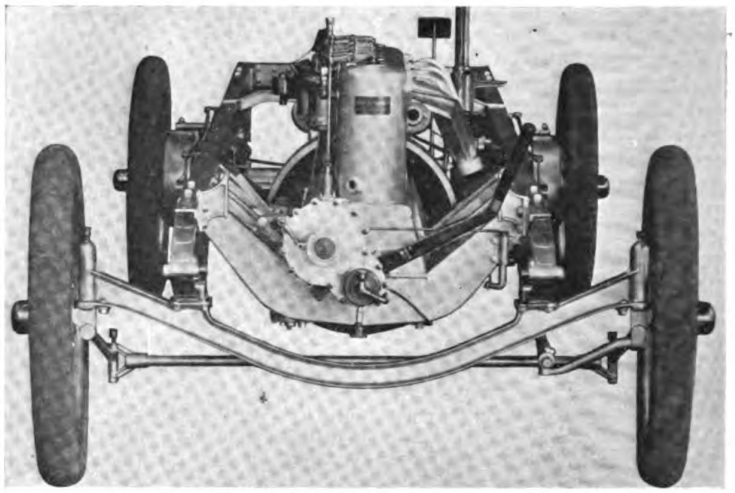
Total for year 1904, $173.

NEW VEHICLES AND PARTS.

The Northern 1906 Four Cylinder Touring Car.

The Northern Motor Car Company, of Detroit, have this year added a four cylinder car to their line, which heretofore consisted of a single cylinder runabout and a double opposed cylinder touring car. The new four cylinder car is of quite original design, its most striking features being the following: The service brakes and clutch are operated by compressed air; all four cylinders and the upper half of the crank chamber are a single casting; there are no side control levers; the motor is started by a ratchet lever with an automatic spark retarding contrivance; the enclosed cam gears are used as a circulating pump.

The chief specifications of the car are as follows: Motor, four cylinders in one piece, vertical and water cooled, 4½ inch bore by 5 inch stroke, rated at 30 horse power; jump spark ignition from storage battery; shaft drive with only one universal joint; three speed and reverse sliding gear on the rear axle; 112 inch wheel base; 54 inch tread; 32 inch wheels with 4 inch tires; side entrance tonneau body accommodating five passengers. The weight of the car is 2,250 pounds.



FRONT VIEW OF NORTHERN CHASSIS.

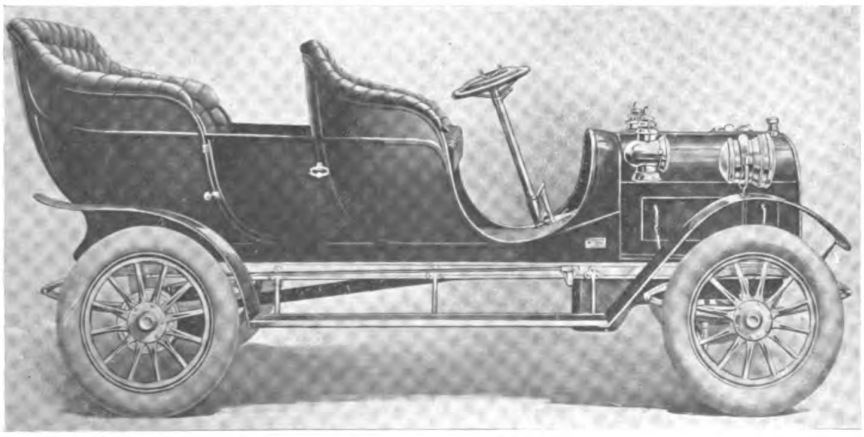
MOTOR CONSTRUCTION.

The one piece casting forming the four cylinders is of gray iron, and the cylinders, before being machined, are heated to a dull red and galvanized inside and out, including the inside of the water jackets. This prevents the inside of the jackets from rusting, removes all undue strains in the metal (as the heating and subsequent cooling effectively anneals the casting) and fixes any loose particles of grit or sand which may remain after cleaning, preventing them from lodging in the pipes, radiator or pump, though little sand is likely to remain, as every casting is thoroughly pickled in fluorhydric acid, which is claimed to dissolve the sand, and thus remove it. After each operation the castings are tested under hydraulic pressure, and it has been found that the galvanizing process is very effective in closing the pores of the metal, making perfectly tight water jackets.

The multiple cylinder casting is first planed along the base, making a flat surface, which is then bolted against the vertical surface of a large jig and the whole clamped to a double boring mill, which bores two alternate cylinders in one operation. The table is then shifted and the other two cylinders are bored. This method insures accuracy in the distances between the bores and in the perpendicularity of the bores to the base. After all the holes have been drilled and tapped the cylinders are tested under 40 pounds hydraulic pressure. They are then placed in a special jig, with their base against a flat plate and located accurately by dowel pins. The jig is then clamped to a Heald grinding machine and the bores are finished to the exact size. During this process all loose grit and emery is removed by two suction pipes, which are placed in the openings in the heads over the valves. On each side of the crank case upper half are two hand holes extending the entire length of the case. The lower half is of aluminum, and is cast to form not only the supporting arms, but a continuous pan, the outer edge of which is lipped and rests on the frame. At the rear this base casting extends backward and forms a flywheel shield. On the right side of the engine the pan is formed into two communicating oil reservoirs, each with a cork float and an outlet into the crank case. The latter is divided into two parts by a central web supporting the middle bearing. On the cover of the oil reservoir is a gauge showing the amount of oil in the tank. Between the upper and lower halves of the case is placed a fibre gasket.

The gray iron pistons have a slightly concaved head and carry three step jointed, eccentric, pinned rings above the piston pin. These rings are ground on the outside, after being cut open, and are fitted to the slots by grinding on a magnetic chuck grinder. An oil groove is cut around the centre of the piston and carries oil into the hollow wrist pin. This pin is of carbon steel, hollow, case hardened and ground. The connecting rods are I section manganese bronze castings, bronze bushed at the upper end, split on one side and cap screw clamped, the sleeve being prevented from rotating by a small set screw on the opposite side. The lower bushing is divided, and the cap is hinged and held by a bolt with a flat sided head and two lock nuts. A fibre liner is used. The crank shaft is a carbon steel drop forging, finished all over, with integral flywheel flange. The shaft is drilled hollow from end to end for the air to pass through to operate the clutch. It runs in three divided babbitt bearings set up with a fibre shim.

The cam shaft with its eight cams is of carbon steel, case hardened and offset one-eighth inch from the centre line of the push rods, to reduce the side thrust in opening the valves. Similarly the crank shaft is offset three-quarter inch from the centre plane of the cylinders, to reduce the side thrust on the cylinder walls. The valves being in the heads, long, thin push rods, with rollers at their lower ends, are used to operate the rocker arms on top. To prevents its turning, the rod is fitted with a key which slides in a groove or spline in the steel guides. The two adjacent guides

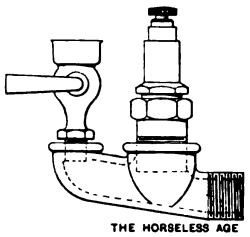


NORTHERN FOUR CYLINDER TOURING CAR.

are held by a bronze yoke and single nut on a stud from the crank case. The upper end of the rod is a five-sixteenth inch cold rolled piece, hexagonal near the bottom, to facilitate screwing it into the lower end of the rod. On top of the engine casting are bosses carrying a pivot pin for the valve rocker arms, one end of which presses down on top of the valve stem, and the other end is thimbled and fits loosely over the upper end of the push rods. Short conical helix springs are used on both valves, and held by a cupped washer and pin through the valve stems. The valves are set into cast iron valve cages which fit into the top of the cylinder casting, and are made tight by copper-asbestos gaskets at top and bottom. The valve heads are of cast iron, with stems of steel pressed into the head and riveted. The spark plugs are placed in the side near the top, in a pipe with an elbow, as shown in the drawing.

CIRCULATION SYSTEM.

Water enters the jacket (which extends the entire length of the cylinders) at the bottom in front and leaves on top in the rear. The cam gears are of Parsons bronze with six pitch stub teeth, are encased in a bronze housing and form the water circulating pump, giving the usual circulation from the radiator through the engine jacket and back again. The front end of the engine shaft extends forward under and in front of the radiator, and the gears and case, forming the pump, are assembled as a unit and then slipped over the end of the engine shaft. The gear on the engine shaft has a long hub, which fits over a key in the engine shaft, and has a bearing



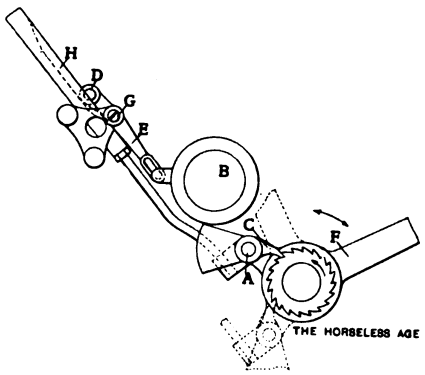
SPARK PLUG FITTING.

in the pump casing. The cam shaft gear is on a small shaft of its own, the rear end of which carries a Woodruff key fitting into a keyway in a sleeve on the end of the cam shaft, to make a permanent coupling. The water enters the case at one side, and passes between the gears and out at the other side to the engine jacket. On each side of the small gear is cut a groove which catches any water leaking by the side of the gears, and allows it to return through an opening in the case on the suction side, so that there is no tendency for this leakage to pass out through the stuffing boxes. This has been found to operate so successfully that there is practically no leakage, even with stuffing boxes adjusted loose.

IGNITION.

The jump spark is produced by storage batteries carried under the tonneau seat, and a quadruple coil on the dash. The timer is of the Lacoste roller type, ball bearing, and placed on the front end of the cam shaft extension, and the plugs are not inserted directly into the cylinders, but into an elbow shaped tube, as shown in the drawing. This protects them from oil, and the narrow openings and bent tube apparently do not in the least detract from the certainty of the ignition. The carburetor is of the float feed type, with centre nozzle and auxiliary air inlet of special design, which has been found to work well on the engine. The 16 gallon galvanized iron gasoline tank is fastened to the body under the front seat.

The exhaust pipe is a single rolled iron casting connected by an iron pipe to the large double muffler. The exhaust passes into one section of the muffler and through into a second. Each of these is practically



SAFETY STARTER.

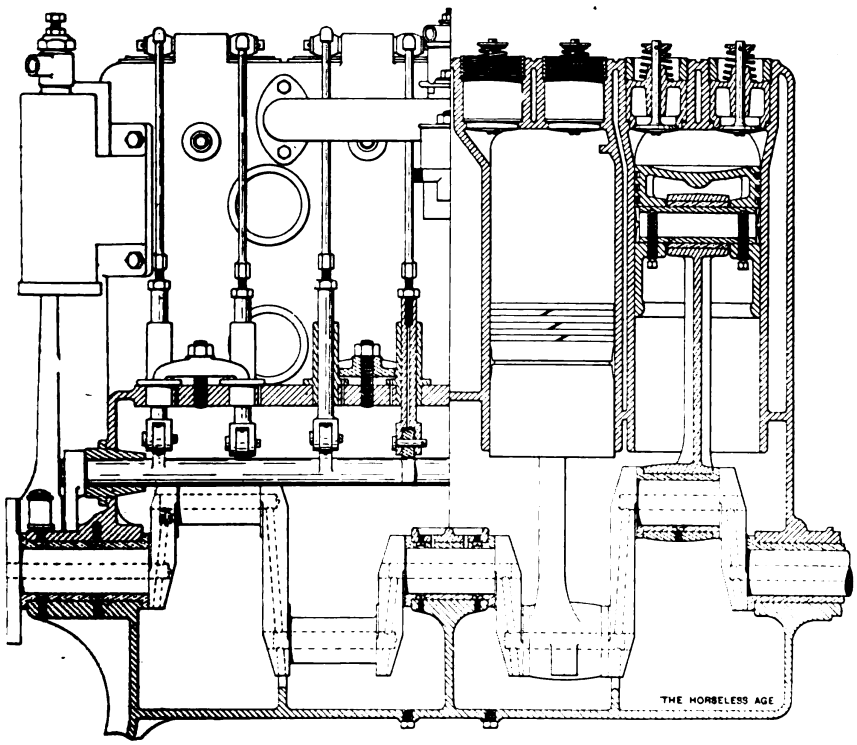
a hollow cylinder of 5 inches diameter by about 40 inches in length, which gives an enormous volume, compared to the usual type.

STARTING DEVICE.

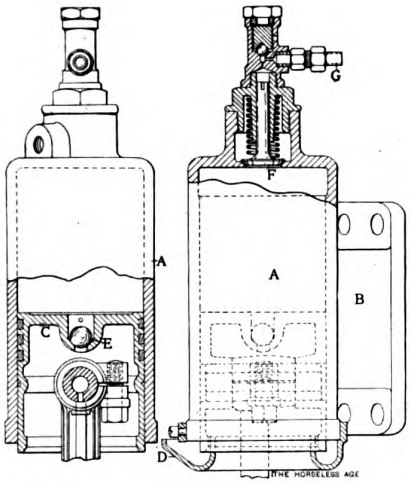
The starting device is unique. It consists of a lever pivoted on the shaft, and a ratchet and pawl so connected that pulling the lever through an arc of about 90 degrees throws the engine over. The lever is so arranged that before taking its grip on the shaft it retards the spark, making a back kick impossible. An illustration of the mechanism is shown in the accompanying drawing. Lever F, pivoted on the engine shaft, carries at its end the weighted pawl C, which is pivoted at A. When the lever is thrown over to the left the pivot centre of the pawl C moves into a position below the ratchet, and consequently a pull on the lever to the right now throws over the engine, and the pawl disengages. At the stationary point G is pivoted the two armed lever D E, the slotted end of which rotates the timer, and the other end of which carries a steel roller, which works in a slot on the back of a flattened rod connected to the end of the starting handle. This rod rolls on two small steel wheels carried on a triangular frame, also pivoted at G. As the starting handle is moved to get its grip it pulls downward on the flattened rod so that the part H of the slot in its back raises lever D, the other end E of which throws the timer over to a retarded position.

AIR PUMP.

The air control system comprises a plunge pump on the rear of the engine casting, operated by a channel section

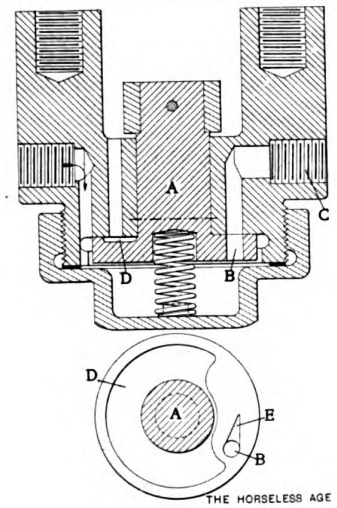


NORTHERN MOTOR.



AIR PUMP.

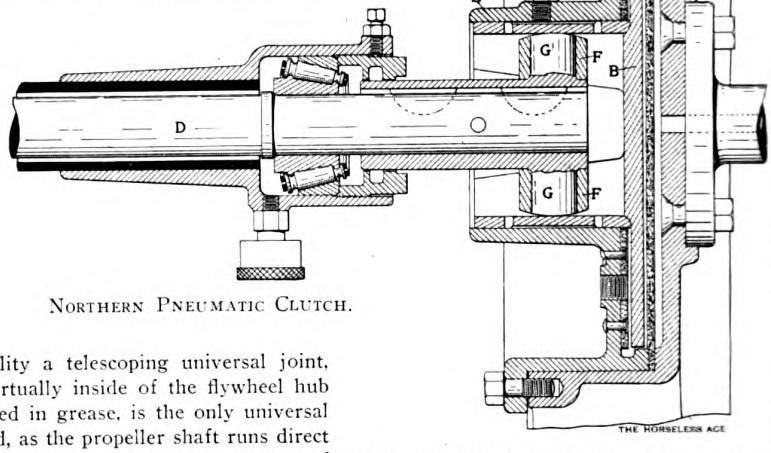
bronze connecting rod from a small crank on the rear end of the cam shaft, as shown in the drawing. The cylinder A is secured to the engine casting by cap screws, through flange B, and the piston C is practically like a gas engine piston, of 2¼ inch diameter and 3 inch stroke. The piston is fitted with three regular eccentric rings above the hollow pin. At the bottom of the cylinder is a cup shaped piece D containing felt saturated in oil, into which the bottom edge of the piston dips. The oil is carried up the walls by means of an oil groove cut around the piston, and into the hollow piston pin and to the bearing. The surplus then passes down through a hole in the connecting rod to the crank end. The ball inlet valve E is located in the head of the piston. The air is forced through a regular poppet valve F in the cylinder head through a pipe G to two three-way disc valves, one of which controls the air brakes and the other of which connects by a pipe to the engine shaft, the end of the pipe running in a sleeve about 3 inches long, which, with the oil, makes a tight joint. The air passes through the hollow shaft and operates the clutch. By a connection to the pump cylinder near the bottom of the stroke a feeding pressure of about 1 pound per square inch is derived for the gasoline tank under the front seat.



AIR VALVE.

THE CLUTCH.

The pneumatic clutch is contained in the flywheel, and consists of a leather disc A of about 11 inches diameter, which is made fast all around its edge to a drum on the inside of the flywheel, so that it turns with the wheel. Back of it is a small chamber into which the air enters, and the leather is bulged out in a similar way to a diaphragm valve. It presses against a steel plate B, which is forced over against a leather ring C fastened rigidly to the flywheel. Thus the steel plate B is pinched between the two leather plates and made to turn with the flywheel. This steel plate drives the propeller shaft D. Its hub E has two longitudinal slots cut in it, into which fit squared blocks F F on the ends of two pins G G projecting from the end of the propeller shaft. This combination, which is in reality a telescoping universal joint, and is virtually inside of the flywheel hub and packed in grease, is the only universal joint used, as the propeller shaft runs direct into the transmission case, which is part of the rear axle casting. The flywheel has fan shaped spokes, and is the only fan used to draw air through the radiator.

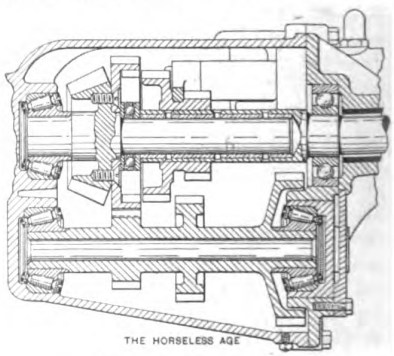


NORTHERN PNEUMATIC CLUTCH.

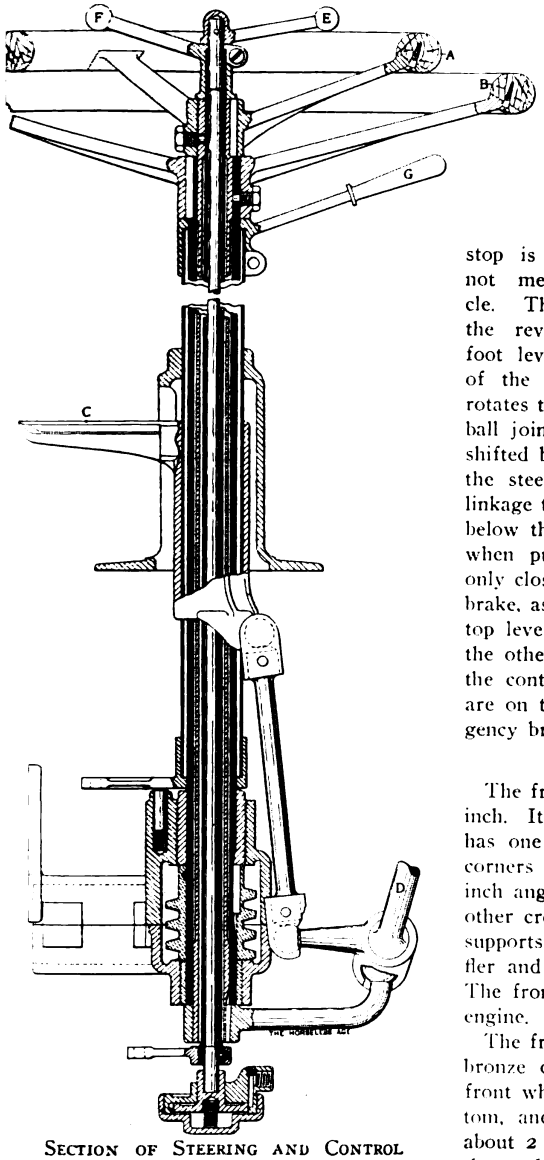
The clutch is controlled by means of a small lever on top of the steering wheel, which controls a three-way air valve, shown in the cut. By moving the lever the central piece A of the valve is rotated so that the hole B in it coincides with an opening C to the clutch. Air enters the valve at the opposite side and passing down fills the chamber at the bottom around the spring and passes out through B and C to the clutch, when the lever is moved to A, so that the hole B no longer registers with the outlet. When in this position the air already in the clutch is allowed to escape, as the inner end of the opening C is now over an annular depression D, and this annular groove communicates with the atmosphere. The slot E is provided to gradually allow the air to pass to the clutch, before the passage B exactly registers with C. This prevents the clutch from gripping suddenly, as would be the case if the full pressure were admitted at once. No pressure tank is used, the pump connecting directly with this clutch valve and with another similar valve which admits the air pressure to a small cylinder which controls the rear wheel brakes. The brake cylinder is shown in the drawing. This brake is applied by moving the throttle lever just under the wheel to its extreme backward position. By this arrangement the first motion in applying the air brake throttles the engine, but the clutch must be disengaged separately, as it is not interconnected with either brake. When air is admitted to the little cylinder the plunger moves along to apply the outside contracting, belting faced steel bands upon the rear hub drums. These drums are pressed steel, bolted through the spokes and hub flanges. When the air pressure is released the plunger returns under the action of the stiff spring shown. The inside expanding bands of similar construction are operated by a foot pedal. Steel rods are used to pull the brakes.

CHANGE GEAR.

The change gear case is cast integral with the middle portion of the rear axle casing. The lay shaft is below the main, squared shaft, on which a double sliding pinion moves. This square shaft is hollow and



CHANGE SPEED GEAR.



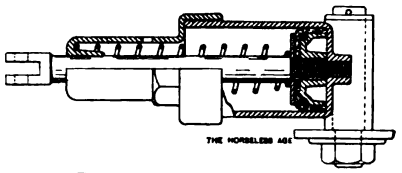
SECTION OF STEERING AND CONTROL COLUMN.

fitted with a bronze bushing forced into it, forming the bearing for the shaft, which carries the bevel pinion and the internal gear. This long bushing maintains the alignment, and is oiled by holes through the squared shaft. The drawing illustrates the gear arrangement. When the sliding gear pair is moved to the left one of them meshes with the internal, and the whole gear is locked, giving the high speed or direct drive. The three gears below are all integral and bored out hollow, as shown. These gears run on two Timken bearings, one at each end. Moving the pair to the right, so the larger gear meshes with the middle one on the lower shaft, gives the intermediate speed, and moving it still further to the right, so that the middle one meshes with the large gear on the lower shaft, gives the low speed. The gear shifting rod is held at each speed by a spring pressed pin which fits into a slot. This gear shifting rod carries on an arm an idler gear (not shown), which is wide enough to mesh with both of the extreme right hand gears at once. When the rod is in the proper position for reverse, and at no other time, the retaining pin comes opposite a slot in the casing, and the rod can be rotated slightly, which rolls this idler gear into mesh with the other two, thus reversing the motion. A stop is arranged so that the idler cannot mesh deeper than its pitch circle. The rotating of this shaft giving the reverse is accomplished by a small foot lever which projects from the base of the steering column, as shown. This rotates the shifting gear rod by means of a ball jointed linkage. The other gears are shifted by the small hand wheel on top of the steering wheel through a sleeve and linkage to the gear shifting rod. The lever below the wheel controls the throttle, and when pulled into a reverse position not only closes the throttle but applies the air brake, as previously described. Of the two top levers the left controls the timer and the other the air valve to the clutch. All the control devices, giving seven motions, are on the column, as shown. The emergency brake pedal is ratchet retained.

RUNNING GEAR.

The frame is made of angle steel, 2x3x¼ inch. Its side members are straight, and it has one cross member at the rear. The corners are stiffened by pieces of 6x6x⅜ inch angle iron riveted to the frame. Another cross member of 1½x1½ inch angle supports the forward end of the long muffler and stiffens the middle of the frame. The front end is sufficiently braced by the engine.

The front axle is an I section manganese bronze casting of Lemoine pattern. The front wheels are set in slightly at the bottom, and the steering heads are also set about 2 degrees from the vertical, so that the tendency is to run straight ahead when free. The central part of the rear axle is a ribbed aluminum casting forming part of the change gear case. The axle casings are 3½ inch Shelby steel tubes with three-sixteenth inch walls. These tubes are ground to size and are fitted into the middle housings by a 6 ton hydraulic press. They are not fastened in any other way. The live axle shafts are of 1½ inch carbon steel and run in Timken roller bearings. The wheels are straight, key and nut retained. No truss rod is used.



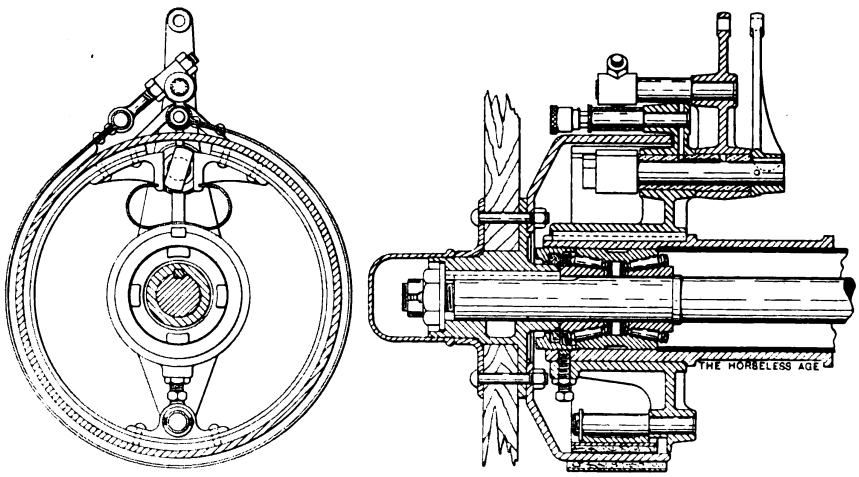
POWER BRAKE CYLINDER.

The same sized full elliptic springs are used at both the front and rear. They are 2 inches wide by 36 inches long, placed on top of the axle and under the frame. The rear spring supporting saddle is offset to rest on the rear axle as close as possible to the supporting bearing of the wheel.

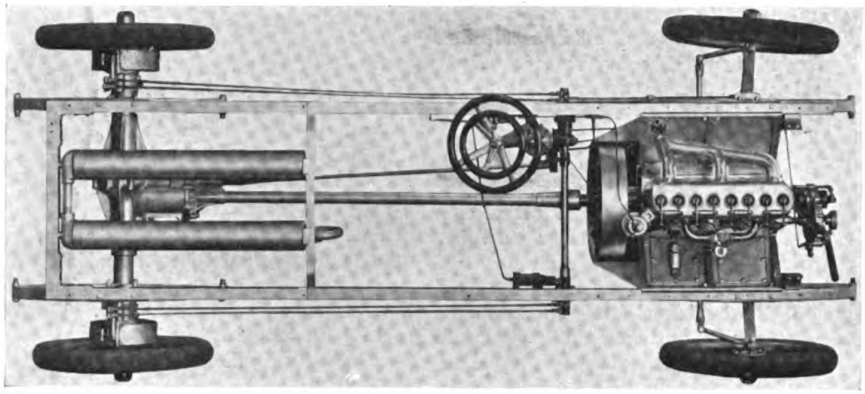
CONTROL.

The entire control system is arranged on the steering column, which is on the left side. There are no side levers on the car. The wheel was placed on the left after careful study of the subject. The three forward speeds are controlled by a small hand wheel A just above the steering wheel B, and the reverse by a small foot lever C projecting from the base of the steering column. Both wheel and lever act on a single gear shifting rod D, which runs back to the change speed gears. Above the gear shift wheel on the right is a small spark control lever E, and on the left a similar one, F, which controls the air to the clutch. Just below and on the right of the column is a short lever G, the forward motion of which opens the throttle, and the backward motion of which closes it until the neutral point is reached, when further motion applies the air brakes. The emergency foot brakes on the rear wheels are applied by a pedal. All brakes and gear shifts are independent of the clutch.

A look at the plan view of the chassis will show it to be of clean-cut appearance,



NORTHERN INTERNAL AND EXTERNAL HUB BRAKES.



PLAN OF NORTHERN CHASSIS.

unobstructed by cables, tubes and rods, this being one of the few machines in which the driving shaft runs direct from inside the flywheel to the rear axle. The location of the headlights on top of each of the front metal fenders is also an innovation, but one backed by good reasons, as with the lamps in this raised position the road is better illuminated and the disagreeable long shadows are eliminated. Being directly over the wheel, the lamps light the wheel track and also indicate the true width of the car, making it easier for passing vehicles to judge their distance; they are out of the way when cranking, and more protected from mud and accidental injury by collision with barn doors or walls. The fender is made very rigid.

1906 Haynes Cars.

The Haynes Automobile Company, of Kokomo, Ind., produce two models for 1906. Model R is a large 50 horse power touring car, and Model O a smaller, 30 horse power car, built along similar lines. All important parts are nickel steel, which was first used by Mr. Haynes in his axles as early as 1899. Roller bearings are used throughout the construction, in preference to ball bearings, the only ball bearing in the car being that of the radiator fan. The engine shaft runs on special adjustable roller bearings of Mr. Haynes' invention. The driving bevel pinion is a particular feature, having steel rolls instead of teeth. The clutch is of the contracting band type, and is also distinctive. The usual type of pressed steel frame is employed, but is reinforced from the front for two-thirds of its length by a bent wood sill which fits closely into the pressed steel frame.

The following general description of Model R also covers the smaller machine, except for deviations which will be mentioned. This 50 horse power touring car has a four cylinder vertical engine of 5⅛ inches bore by 6 inches stroke. The crank case of the engine forms the support and rests directly upon the frame; no sub-frame is used. A three speed sliding gear transmission of the usual type is used, which embodies a special feature in that by an arrangement of pawls inside of one of the gears, it is rendered impossible to strip a gear when changing from a higher to a lower speed. The drive is by propeller shaft to the divided rear axle. The wheel base is 108 inches, and the tread 56 inches; the wheels are 34x4½ inches both in front and rear. The seating capacity is five, although there is room for two extra seats, if desired. The car weighs complete 2,750 pounds.

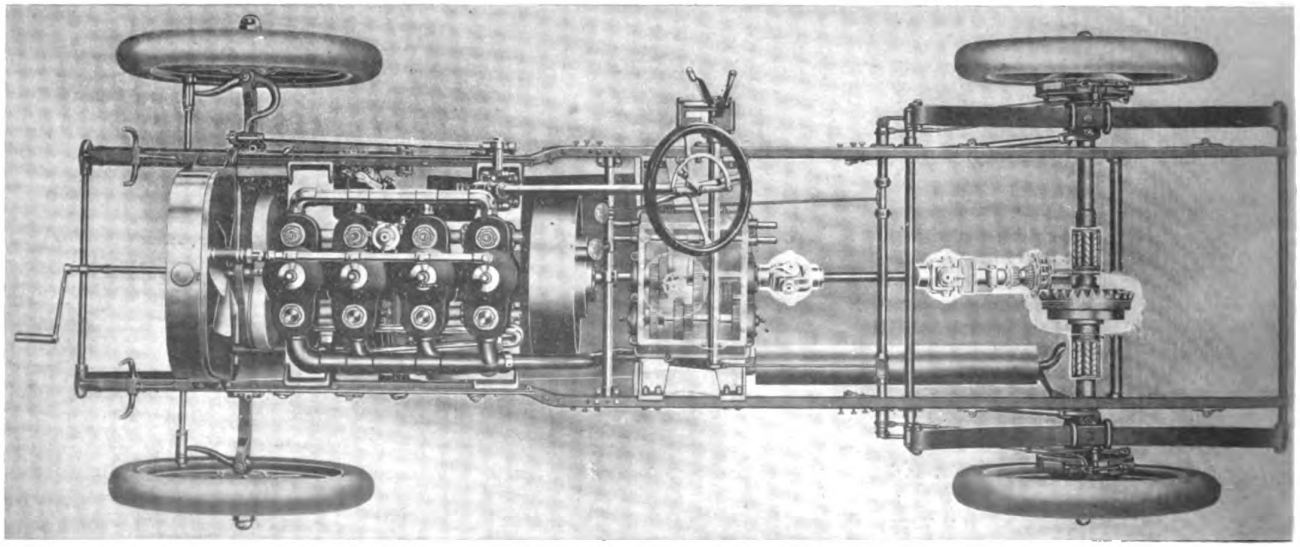
The smaller model has a 30 horse power engine, 4¼x5 inches, with the cylinders cast in pairs, but in other respects practically the same as the 50 horse power engine. It is fitted with 32 inch wheels and 4 inch tires. The wheel base is 97 inches, and weight 2,250 pounds.

BODY.

The bodies of these cars are specially constructed of aluminum castings, backed by wood. The tonneau on the larger car is very roomy, the rear seat being 54 inches wide. Only a partial division is placed between the two front seats. The dash is made of pressed aluminum with curved top. The sheet metal hood is without slats, hinged at the top, and each side doubles and folds back. The usual running boards, brass edged and covered with rubber, are supported on two drop forged steel hangers. The fenders are metal; the front having a large flare and fitting close to the frame; the rear fender is horizontal above the wheel.

MOTOR CONSTRUCTION.

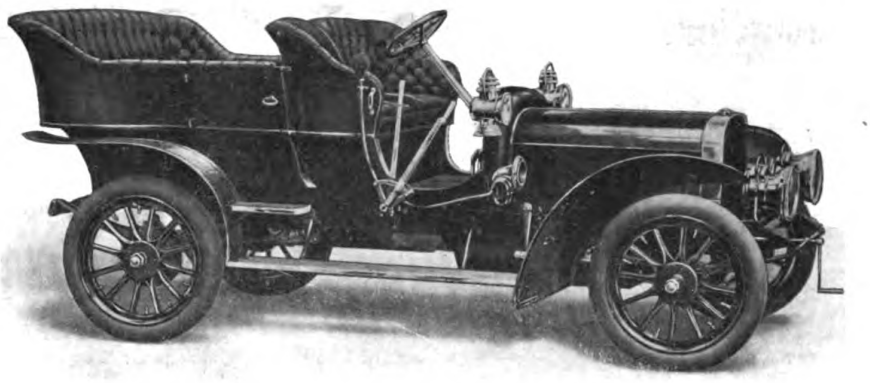
The individual cylinders are the usual gray iron castings, with valve chambers on opposite sides and the water jackets integral. These jackets carry an unusually large body of water, which extends completely around the valve chambers and stems. The exhaust pipes are cap screwed to the left side of the engine, and joined by a union to the pipe which leads to the muffler. This muffler is so constructed that one jet of gas is made to oppose another, and thus reduce the velocity and noise. The brass inlet pipes on the right side of the engine support the Schebler carburetor, which is used on all models. Over the valve chambers are brass screw caps, the spark plugs being screwed into those over the inlet valve. These caps are ground to



PLAN OF CHASSIS OF HAYNES TOURING CAR.

fit, and no gaskets are used. The valves are of nickel steel, in one piece, with very long stems. The usual type of spring is employed and retained by a washer and a notched key through the stem of the valve. The valve lifting rods are of steel, and carry hardened steel rollers at the bottom, the axes of which are flattened at the ends and run in slots in the bronze guides to prevent the rods from turning. The guides are screwed into the aluminum housing which holds the cam shaft in place and is cap screwed to the outside of the case so that it can be quickly removed and the cam shaft taken out. These shafts are made of carbon steel, with the hardened steel cams pinned and brazed in position. At the centre of the cam shaft are mitre gears which drive the vertical timer shaft. These shafts are supported in six white bronze bearings.

The crank case, of the usual two part construction, is cast of aluminum. The upper half supports the bearings and forms arms of large channel section, which rest directly on the frame and support the weight of the engine; the lower half of the case is a dust and oil pan, which may be easily removed, facilitating access to the main bearings and connecting rod ends. The crank shaft is a high carbon steel drop forging, and runs on special adjustable roller bearings. The rollers do not run on the shaft itself, but on a hardened steel sleeve over the shaft. The series of rolls are carried in a cage, and are surrounded by a hardened steel sleeve, which is cut open diagonally; the outside of this sleeve is tapered, and is surrounded by another tapered sleeve fitted in such a way that it can be forced over the hardened split sleeve by a screw collar at the end, and thus reduce the diameter of the circle in which the rollers run. By this means a quick adjustment for wear is provided. Five of these bearings are used on the engine shaft, giving a total bearing length of 19 inches. The connecting rods are I section drop forgings, adjustable at both top and bottom; the top bearing is a bronze sleeve split at one side and retained by a bolt and nut. At the lower end the cap is held by studs from the rod and cottered lock nuts; this bearing is a divided babbitt box flanged at both ends. The pistons are very long, with flat heads, and carry three sets of triple rings in slots above the pin; another single ring passes directly over the end of the wrist pin, to hold it in place. In each slot there are one broad ring (seven-sixteenth inch in width by one-eighth inch in thickness) at the bottom and two narrow rings (each seven-thirty-second inch wide by one-eighth inch thick) over the broad one. The openings of the upper rings are on the opposite side from that of the under ring, and the latter, by its expansion, is in close contact with their under side, and thus prevents any gas which may have leaked through their joints from passing underneath to the other side; thus each piston carries ten rings. This arrangement insures a good fit and holds compression well. The cam shaft gears are a combination of bronze and fibre, and mesh with a steel gear on the forward end of the engine shaft; they are entirely encased in aluminum and run in oil. The 22 inch flywheel with cast fan blades is keyed on the tapered end of the crank shaft by a large Woodruff key.



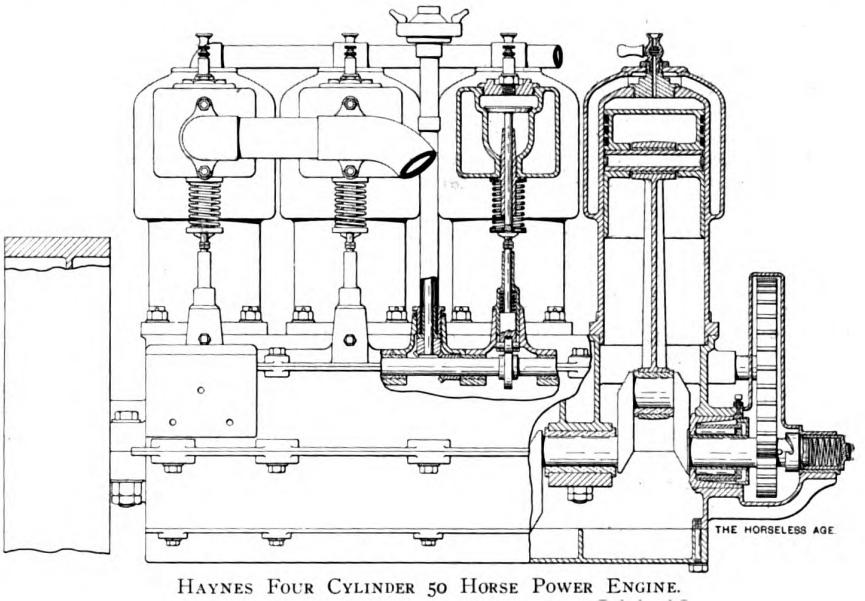
HAYNES 50 HORSE POWER TOURING CAR.

COOLING.

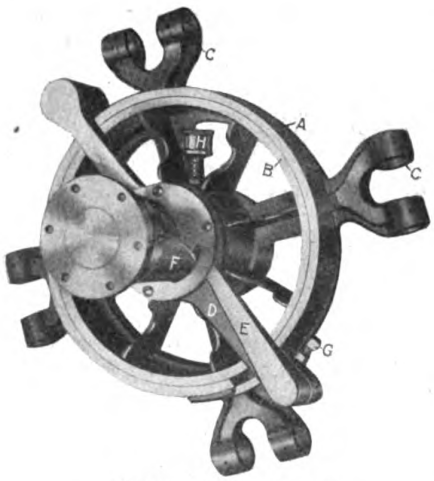
On the left side of the engine is an auxiliary shaft, driven by enclosed aluminum spur gears from the middle of the cam shaft. At the forward end of this shaft is a rotary bronze pump, consisting of an outside cylinder, in which rotates a smaller eccentric cylinder with vanes sliding in radial slots on opposite sides. These vanes are spring pressed against the inside walls. A place is cut out for this pump on the forward supporting arm of the engine, and a semi-flexible coupling is inserted in the shaft between the pump and the driving gear. The usual system of circulation is employed, viz., from the radiator through the pump to the lower part of the cylinder jackets on the exhaust side, and out at the top to the radiator, which is of the cellular type. A ball bearing aluminum bladed fan is mounted on a bracket at the rear of the radiator, and is driven by a flat leather belt from a pulley on the exhaust cam shaft.

LUBRICATION.

A McCanna force feed oiler, with separate plungers to each feed pipe, is mounted on the rear supporting arm of the engine at the left hand side, and gear driven from the rear end of the pump shaft. No sight feeds are used on the dash, but bleeder tests are arranged on the oil case for each feed pipe. There are five leads, one to each cylinder, and the fifth to the top of the aluminum case over the gears which drive the pump shaft. The oil which enters at this point supplies the crank case, which has splash lubrication. The bottom of this case is divided by three small partitions into four compartments. At the bottom of each are two drain cocks, one being connected to a short standpipe on the inside, for testing the oil level in the case, and the other being intended for draining the case. The cam shafts and main bearings are taken care of by the splash, the main bearings, being rollers, of course requiring but very little oil. The ends of the connecting rods are drilled with oil holes, and receive oil by dipping



HAYNES FOUR CYLINDER 50 HORSE POWER ENGINE.



HAYNES BAND CLUTCH.

in the basin. The hollow wrist pins scrape their oil from the cylinder walls.

IGNITION.

Ignition is by jump spark from a storage battery located under the rear seat. A quadruple vibrating coil is located on the dash, and the wires lead through insulating tubes in the dashboard to long fibre tubes supported on top of the engine, and thence to the timer and plugs. This timer is of the Lacoste type, and runs on ball bearings at the upper end of the vertical shaft above mentioned.

CLUTCH.

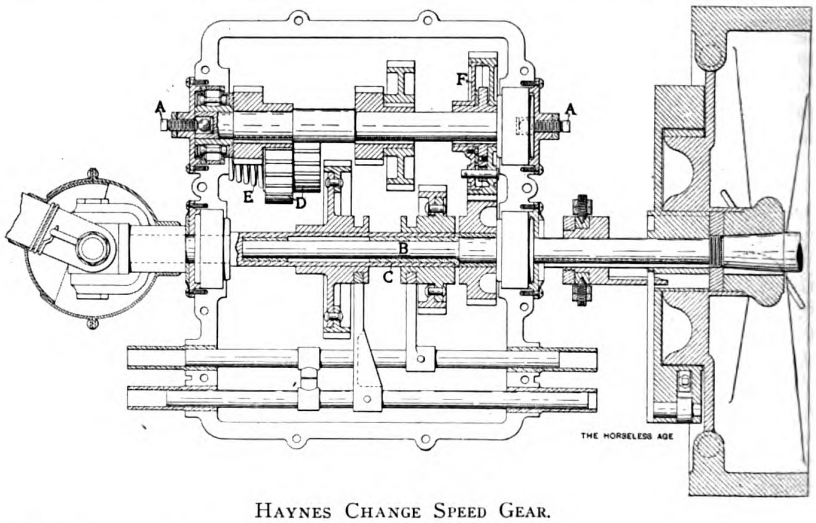
In the accompanying photo is shown a view of the contracting band clutch. The band A of this clutch is steel, and the drum B is a bronze casting with integral forked arms C C, which are driven by lugs on the outside of the flywheel, which fit between the forked arm ends. Between the lugs and the forked ends heavy coiled springs are interposed, which effectively relieve the strain if the power is suddenly applied. This drum is 10¼ inches in diameter and has a 1⅞ inch face; its hub is turned to a bearing for the end of the crank shaft. The loose steel band A enclosing this drum is diagonally split, one end being attached to an arm D extending from its hub, and the other end to a lever E, which contracts the band on the drum when moved by a cam F controlled by a foot pedal. As the drum is driven by the flywheel and the hub of the contracting band is keyed to the transmission shaft, the power of the engine can be gradually applied as the band is contracted, and the car started smoothly and without a sudden jump. This metal to metal clutch is extremely smooth in its action, and has a long life. It can be instantly adjusted by tightening or loosening a single set screw G, which can be reached by raising one of the footboards. The clutch hub is fitted with a grease cup H. The spring connection between the clutch arms and the flywheel lugs provides flexibility.

TRANSMISSION.

The three speed and reverse sliding gear transmission runs on the same special adjustable roller bearings as used in the engine. The divided case is of aluminum, the under side carrying the four supporting arms, while the top is removable, leaving the shafts and bearings in place. This top is fitted with a large circular cover held by a hand wheel clamp. As in the case of the engine, the arms rest directly on the side frame members. The shaft and gears are all made of nickel steel.

The end play of the lay shaft is taken up by a set screw A and lock nut, which abuts against the hardened steel ball which bears on a hardened steel washer against the end of the shaft. The clutch shaft B is tapered and extends for about 11 inches inside of the hollow square shaft C, upon which two shifting gears slide; it runs in two bronze bushings, separated about 3⅝ inches, one at each end. The sliding gears are rims riveted to the hubs, and are moved by the usual forked arms from two round gear shifting rods on one side, which slide in bronze bushings. The idler D for the reverse is a double gear, held out of contact with its gear on the lay shaft by a helical spring E, and is pushed into mesh and held by the side of the sliding gear as it engages with it. When the sliding gear is disengaged the idler is pushed out of contact by the spring and remains stationary. The feature of this transmission, however, is a three prong ratchet and pawl inside of the first gear, F, on the lay shaft, the action of which is very similar to a coaster brake, and allows the car, if on any speed but the high, to coast whenever its speed would drive the gear faster than the engine would drive it. This device relieves the gears and driving mechanism of the tremendous strain thrown upon them by carelessly shifting from a high speed into a lower before the car has slowed down to a corresponding speed. With this arrangement it is impossible to strip a gear in passing from a high to a lower speed; but this is in a measure offset by the loss of the use of the engine as a brake on any but the high gear, which is the usual direct drive. The hub of this gear is separate and keyed to the lay shaft. This hub has a flanged rim carrying three ratchet teeth, which are engaged by three flat spring pressed pawls carried by the gear. Whenever the hub, which is practically part of the lay shaft, is rotating faster than the engine is driving the gear, the teeth leave the pawls, but when the gear and its pawls start to go faster than the hub the pawls engage. To prevent the noise of the pawls dropping into the ratchet when the hub is moving faster than the gear, a thin plate with a camlike edge engages pins in the pawls and holds them out of contact. This plate is between the cover and the hub flange, and by friction is either retarded or advanced as far as will be allowed by a pin from the gear cover working in a slot in the plate. All gears are of 1¼ inch face, and run in an oil bath.

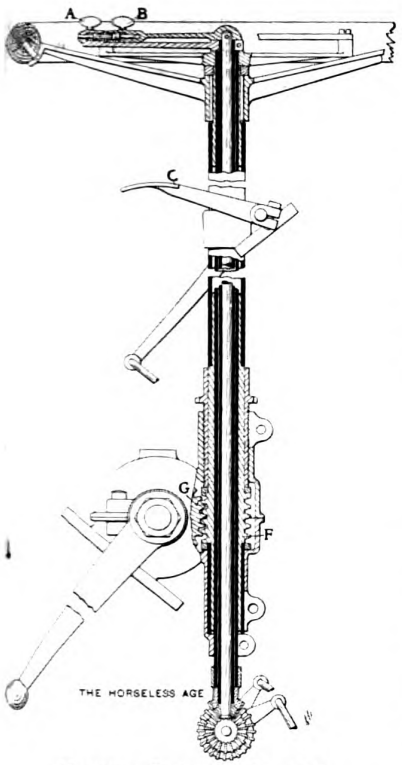
The drive is by shaft through two universal joints of special construction, the rear one of which is telescoping. These joints consist of two drop forged steel forks with broad, flat inner faces. A square steel block is closely fitted between these forks and is held in position by pins passing through the block and forks. The flat inner faces of the forks transmit the driving torque to the block, and very little, if any, strain is thrown upon the pins. Both the forks and blocks are case hardened. This makes a joint with very large bearing surfaces. It is encased in an oil tight housing and packed in grease. The driving shaft is of special steel, 1¼ inches in diameter, and encased in a tube. The bearings of this shaft and throughout the rear axle are Hyatt rollers.



HAYNES CHANGE SPEED GEAR.

ROLLER PINION AND REAR AXLE.

A short shaft extends from the rear universal joint and carries at its end the driving pinion, which has hardened steel rollers instead of teeth. This pinion shaft is supported at the forward end by double Timken roller bearings, and at the rear end by a plain bearing. The teeth on the bevel gear are somewhat sprocket shaped, to mesh with the rollers. It is claimed by the makers that after 6,000 miles running the



HAYNES STEERING COLUMN.

rolls and teeth were barely polished. The bevel pinion's rollers and pins are hardened. The live axle consists of a 1½ inch shaft of nickel steel, encased in steel tubes. One wheel is keyed to the outer end of this steel shaft, the other to a close fitting steel sleeve over the shaft. This construction will be made clear by a study of the accompanying drawing.

FRONT AXLE AND STEERING GEAR.

The front axle is of the approved I beam construction, and is forged of nickel steel in a single piece, the spring saddles and ends being integral. The steering arms and wheel spindles are also forged in one piece. The steering links and connections all have adjustable ball and socket joints. The cross link is in front of the axle. The front wheels run on Timken roller bearings. The steering gear is of the worm and sector type, both the worm F and the sector G being made of bronze; the sector is set in eccentric bearings for taking up the wear. The housing is a bronze casting rigidly supported on the rear engine supporting arm.

CONTROL AND BRAKES.

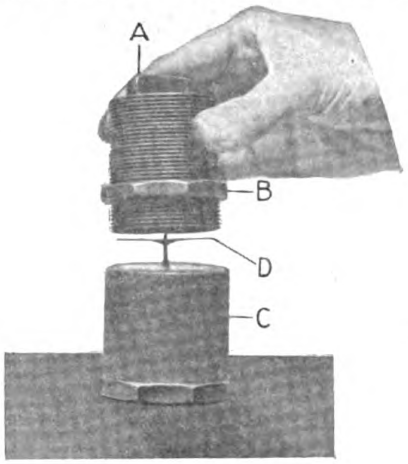
The spark and throttle levers A and B are placed on a stationary notched arc on the steering wheel. A small accelerator pedal, the motion of which is independent of the wheel setting, projects from the dashboard. Of the two foot pedals, the left operates the clutch, while the right one, C, controls the rear wheel contracting band brakes, which are metal to metal. On the right of the car is the shifting gear lever, working in an H slot on the selective principle, and also a pull lever working on a ratchet quadrant, which controls the emergency brake, which is a steel band expending inside the rear wheel drums. Both of these brakes disengage the clutch. The connections to these brakes are by flexible cable.

The Philadelphia Grease Cup.

This cup, made by the Philadelphia Lubricator and Manufacturing Company, 1525 Land Title Building, Philadelphia, is specially adapted for use on automobiles. The feeding force is compressed air, for which is claimed a truly automatic action, with reliability in operation and economy in time, attention and lubricant. One feature about this cup that makes it desirable for automobile service is that it can be filled and "set" at any time most convenient, and when the machinery starts (whether right after filling or days thereafter) the cup at once begins its action. When the journal stops the cup stops feeding without further attention, there being no spring or other mechanism to release.

In operation the lower part of the cup C is filled with grease; the upper part A is screwed down into the part C one-fourth of its length and secured with the lock nut B, the cup then having what is called the first set. The disc D is so connected that it moves freely without friction, turns with the part A and keeps the grease level in the cup without exerting any pressure thereon other than its own weight, which is comparatively small. In screwing down the upper part into the grease the enclosed air is compressed sufficiently to feed the grease for a considerable time, varying according to the nature of the place and condition of the journal, after which a turn of the part A every day or two suffices to maintain the feed until the cup is empty.

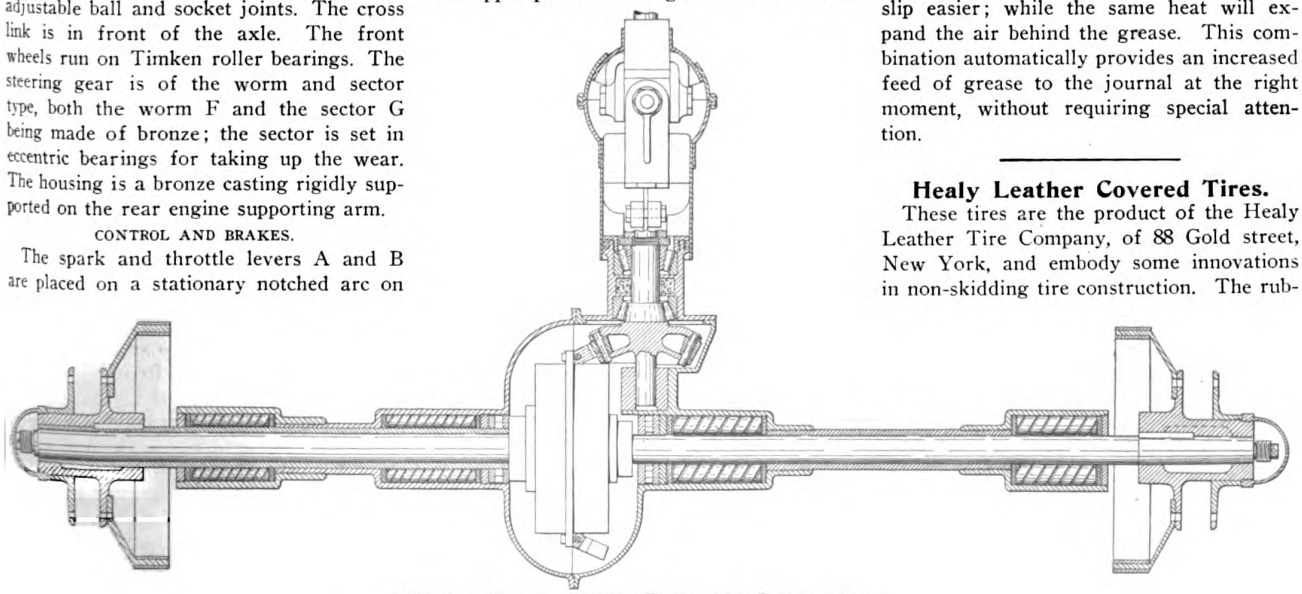
In the bottom of the cup is a funnel which draws the grease by an easy incline to the centre. The neck of this funnel is perforated, so that when the part A is screwed all the way down and the disc D rests on the top of the funnel, thus sealing it from the air pressure, the grease around the funnel will continue to feed by pressure through the perforations to the central outlet, leaving in the funnel a surplus of grease that cannot be fed out by pressure, but must be drawn out by gravity or heat, or a combination of both, the object being that if from any cause the cup cannot be at once refilled, the surplus grease in the funnel will be amply sufficient to properly lubricate the journal until the refilling is done. Should heat generate, it will follow up the funnel in the cup, thus making a warm incline down which the grease will slip easier; while the same heat will expand the air behind the grease. This combination automatically provides an increased feed of grease to the journal at the right moment, without requiring special attention.



THE PHILADELPHIA GREASE CUP.

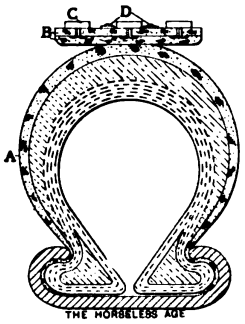
Healy Leather Covered Tires.

These tires are the product of the Healy Leather Tire Company, of 88 Gold street, New York, and embody some innovations in non-skidding tire construction. The rub-



HAYNES ROLLER PINION DRIVE AND REAR AXLE.

ber shoe is entirely covered by a piece of leather A, clinching under the rim, which is claimed to prevent any peeling, rim cutting or blow-outs, and to prolong the life of the tire. To this cover are fastened, by means of copper rivets D, two flat leather strips B, forming the tread of the tire and which contain steel buttons C, similar in appear-

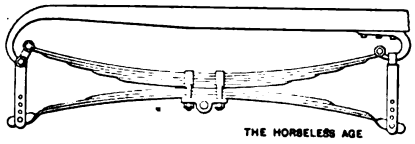


HEALY LEATHER COVERED TIRES.

ance to those generally used in anti-skid tires. The construction, however, is quite different, for the buttons are only contained in the upper half of the tread, and therefore do not touch the rubber nor injure it by conducting to it the heat produced by friction when going at a fast pace. Another important feature of the Healy covering is said to be that it can be applied to an old and practically useless tire of any make, making it almost equal to new.

The Napoleon Counteracting Auto Spring.

The Oil Tempering Spring Company, of Chicopee Falls, Mass., have placed upon the market a spring under the above name, which consists actually of two semi-elliptic springs placed together with their short leaves and having their adjacent ends con-



NAPOLEON SPRING.

nected by adjustable links. It is obvious that such an arrangement tends to prevent the breaking of the main leaf of the main spring. The design is due to Napoleon St. Francis, manager of the company, and a patent on it has been applied for.

New Book.

We have received a copy of the Handbook of the Automobile, by Chas. E. Duryea, published by the American Motor League, New York. It contains chapters on the selection and care of cars, and is specially written for the benefit of amateurs. Practically no illustrations are used. The book is written in plain, direct style, and is free from unnecessary technicalities. It is bound in cloth, of convenient size for the pocket, and contains 135 pages of text.

OUR FOREIGN EXCHANGES.

Motor Buses in Berlin.

The first service of motor omnibuses to be established in the German capital runs through the heart of the city and is owned by the Berliner Allgemeine Omnibus-Gesellschaft, which formerly conducted it by horse traction. The line was opened only a few weeks ago, and already the Gesellschaft has applied for permission to run similar buses over seven other important lines. So rapid a conversion of its system was certainly never contemplated originally by the omnibus company, but the directors found themselves suddenly confronted with a powerful competitor in the Grosse Berliner Strassenbahn-Gesellschaft, which proposes to supplement and consolidate its existing system of electric cars by motor omnibuses, and therefore decided to get the advantage of a start on the steel railway company.

Agreement Between the A. C. G. B. and I. and the Motor Union.

A couple of years ago the Automobile Club of Great Britain and Ireland founded the Motor Union, for all those motorists of the United Kingdom who wished to enjoy the benefits of membership in a strong body of automobilists, but who did not care for the social features of the club. Since that time the Motor Union has become a very large organization, with a membership extending throughout the British Isles, and troubles have occasionally arisen regarding the relationship of the club to the union. An attempt has now been made to settle these troubles once for all by entering into an agreement according to which the relations of the two bodies will be regulated by a standing joint committee consisting of five members nominated by each, with the chairman, while the secretaries of the club and of the union will be joint secretaries of this committee.

The club will contribute every year to the union such a sum as may be determined by the committee of the club on the recommendation of the joint committee, and the club will also make a yearly grant to the Legal and Legislative Defense Fund of the union. Every member of the club will be a full member of the union, and on every member the club will pay to the union a yearly capitation grant. The union will uphold and assist the club in any disciplinary measures which the club may think desirable for dealing with the conduct of automobilists as such, and the club will refer cases of prosecution to the union and shall support its action. The union will uphold the authority of the club in all matters affecting trials and competitions of mechanically propelled vehicles, and the club undertakes that the members of the union shall in open trials and competitions have the same right to compete and on the same terms as the members of the club, if these can be secured. In order to secure the efficient organization of all motorists, all agreements with provincial and local clubs or any other organization of motorists, for affiliation to and membership of the union and for affiliation to the club, will be negotiated by the union in the names of both bodies. This arrangement, however, will not limit the right of the Automobile Club to make independent supplementary agreements with the national clubs of Scotland and Ireland on any matters which are not assigned to the union or the joint committee. The present agreement may be terminated by either party on giving six months' notice, to expire at the end of any year subsequent to 1906.

Regulation of Automobiles in France.

In consequence of the number of automobile accidents in France, the Home Office and the Ministry of Public Works have decided to submit to the Conseil d'Etat a new scheme for the regulation of motor cars and their drivers. The chief feature of the proposed regulations relates to the drivers, who will be placed under certain restrictions as to qualification and age, according to the horse power of the machine. Each applicant must also produce a certificate from a doctor to the effect that he is not suffering from any disease that might make it dangerous for the public safety that he should be intrusted with the conduct of an automobile. Each motor car must show, where it can be easily seen, a plate bearing the name and address of the constructor and the type and power of the engine, and another plate showing the name of the owner and the number assigned to him by the licensing authority. This latter number must be shown in front and at the back of the machine, and be visible both by day and night. Infringements of the rules are punishable by fine or imprisonment, and also by the withdrawal of the certificates of the offending drivers.

British Exhibits at Canadian Shows.

Recently a delegate for the two automobile shows to be held in Canada this spring visited England to induce English firms to exhibit. As a result quite a number of English cars will be shown at these Canadian exhibitions, but the only way to secure the exhibits was to purchase them outright.

A strike is on at the Bollée automobile factory in Le Mans, France. Every day, at the usual hour for beginning work, the strikers parade with red flags before the doors of the works and sing "L'Internationale," with accompaniment of trumpet and drum.

...MMUNICATIONS

Garage Practice.

HORSELESS AGE:

...as much interested in your editorial ...operative garages. Theoretically the ...rative scheme looks good, but some- ...he American people don't seem to ...indly to it. The evils you speak of, ...arging and incompetence, certainly ...st, but a great deal of what might be ...ered incompetence is simply bad ...ement. In almost every large repair ...here are some good men who can ...nywhere or on any machine, and if ...nan thoroughly understands his busi- ...nd the handling of men he can so ...is men that each one is fitted for the ... do not believe in charging the same ...or all machinists' work done on a ... some get more pay than others, but ... each man's time goes in at the same ...r hour, whether he gets 30, 35 or 40 ...er hour, and I have known lots of ...where the helper's and washer's time ...arged for at the same rate per hour ... of the highest paid machinist. An- ...thing that doesn't seem right is to ... the regular rate per hour where a ...s his machine given general repairs ...complete overhauling, as it usually ...everal days and sometimes weeks. ...e are lots of owners who don't know ... mechanic when they see one, and I ...requently known them to send for ... the helpers or the washer, thinking ...ere getting the best man in the shop, ...he put on a lot of wise looks when ...cely knew a spark plug from a ton- ...oor latch.

...t seems strange to me is that, with ...ge number of cars sold on the Pa- ...oast, so few parts are carried in ...y the agencies. It is a serious mis- ...nd causes much inconvenience to ... who are on the Coast for a limited ...r pleasure. O. V. H.

...ainst Retaliative Measures.

HORSELESS AGE:

... enclosed clipping from the *Farm* ..., of Philadelphia, shows that the ...gn is still active. In a communica- ... your paper one of your subscribers ...s a campaign of retaliation by insist- ...t the laws regulating horse driven ...s be enforced; that they carry lights, ...de tires, etc. It does not seem to ...iter that this kind of a campaign ... be the best thing under the circum- ... It seems to me that as automo- ...are in the minority so far as num- ...e concerned, the best campaign would ... insist that our own people observe ...vs and go out of their way to favor ...er side. In other words, "more flies ...ght by molasses than vinegar."

THE HORSELESS AGE has always been on this side of the question, but I think the great importance of the matter has not been brought home to operators as it should have been, and as it certainly will be if our reckless drivers are not kept within bounds by some means or other.

FRANK R. MILLER.

An English Method of Cylinder Finishing.

Editor HORSELESS AGE:

The accompanying photo shows a cylinder grinding and polishing machine used in the Napier Works for grinding and polishing. The main point in connection with this arrangement is that the cylinders are polished and ground while subjected to the action of heat; this is a small matter, but a very important one, for the idea is to grind and polish the cylinders when under the conditions they will be in actual usage.

In the left hand corner of the photo are cylinders A waiting to be ground and polished. B is a tank filled with water and heated to the boiling point by burner C, which will be noticed protruding from under the tank. D is a circulating pump, which drives the hot water through pipe E to the water jacket of the cylinder F, which is secured in position on the machine, ready for being ground and polished. G is a pipe that leads the hot water back to the tank. When the machine is in operation the water in the tank is heated to the boiling point, is pumped along the pipe to the bottom of the water jacket, and is then led back into the tank, being kept in constant circulation, and the temperature of the cylinder being thus maintained at the boiling point.

Referring now more particularly to the machine itself, the arm H is set eccentrically to, but takes a path concentric with, the walls of the cylinder. There is a revolving shaft inside this arm carrying the polishing wheel, which revolves with a peripheral speed of 3,700 feet per minute. The arm itself traverses slowly round the walls, and at the same time is automatically fed into the cylinders.

Emery wheels are not used for polishing the cylinders, as particles of emery are apt to become embodied in the walls of the cylinder, which would be bad for the piston. "Corundum" wheels are used with the very best results. [What becomes of the particles of "corundum"?—ED.]

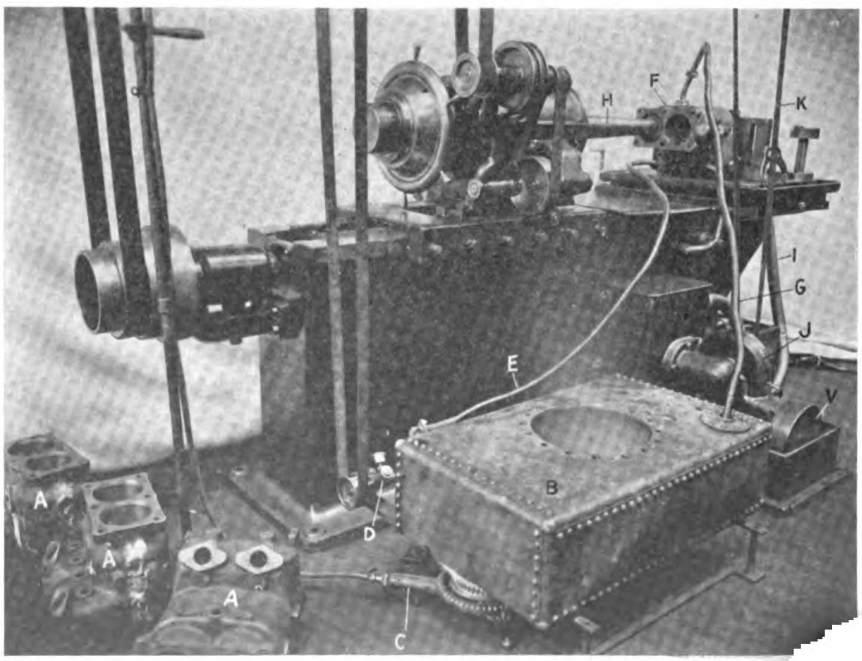
Leading from the top of the cylinder to the fan J is a pipe I. The fan is driven by the belt K at great speed and sucks all the particles of dust and metal that are given off in the process of polishing out of the cylinder. This is important, as, unless these particles are cleared away as formed, the result is not nearly as good. The air and dust delivered from the fan are led to a water bath L, so that dust is not allowed to float about the shop and thus be harmful to other machinery and the men. The general haziness of the middle of the photograph is caused by steam rising from the water bath.

S. F. EDGE.

Spark Plugs in Series—Recharging Storage Batteries from House Lighting.

Editor HORSELESS AGE:

I was rather surprised to read the statement recently in THE HORSELESS AGE that it was not good practice to use one coil to spark a double opposed gasoline engine. My first car, purchased in 1901, had a double opposed engine and two spark coils, and one or the other of these coils would al-



NAPIER CYLINDER GRINDING METHOD.

ways give a weaker spark than the other, and cause some trouble when the plugs were more or less covered with soot. Each of these coils was grounded on one side of the secondary to the engine frame, and one day when some distance from home one of these ground wires broke and was too short to splice again, so I simply cut that coil out and by removing the other ground wire had sufficient insulated cable to connect one coil in series with the two plugs. That engine never ran better than it did after that change, and while I had intended to repair the wiring on my return home, the results indicated that it was best to let well enough alone. That engine was operated on one coil until last spring, when I disposed of it. My present car has a double opposed engine, and shortly after receiving it I changed its ignition system so that one coil would spark both cylinders. I have noted that with good spark plugs, thus operated in series, it is not necessary to clean the porcelains or lava ends. Mine have been used for months without any care, and rarely miss an explosion, and when they do, it is due to weak battery or poor mixture.

After using all of the various makes of dry cells on the market, and having the usual luck with them, I at last purchased a six volt storage battery, and my troubles are at an end, so far as a supply of current is concerned. My home is lighted with electricity, and when the battery begins to show signs of weakness I attach it in series with a 32 candle power lamp and leave it in the circuit overnight. As it may puzzle some to know which wire to connect to each pole of the battery, I will state a simple rule or experiment that will always enable one to put the battery correctly in circuit. If you cut one of the wires leading to an electric lamp and dip the ends into a vessel of water, many bubbles will be seen to form about one terminal and few about the other; now connect the wire showing the most bubbles to the pole of the battery marked N and the other wire to the pole marked P, and the lamp will not burn as brightly as before, showing that some of the energy is being forced into the storage cell. Of course, it is understood that storage cells can only be thus charged by direct current lighting systems.

ALBERT BARNES, M. M. E.

Low Tension and High Tension Magnetos.

Editor HORSELESS AGE:

Will you kindly inform me through the columns of your paper the difference in the wiring of the armature of a low tension and a high tension magneto? Generally speaking, what is the difference between a high and low tension magneto? Does a high tension magneto generate a high tension current? Would a low tension magneto be changed to a high tension one if a commutator and distributer was added?

R. T. ALCUTT.

[All so called high tension magnetos generate a low tension current in their armature winding, which is then transformed into a high tension current by means of a coil. In the Simms-Bosch high tension magneto the coil is placed right on the armature, the regular armature winding serving as the primary, and a secondary, fine wire winding being wound on top of it. With all other high tension magnetos a plain coil is used—that is, one without vibrator. The armature winding, primary of the coil and interrupter are connected in circuit, and the secondary of the coil is connected through the high tension distributer to the plugs. The winding of a high tension and low tension magneto armature is practically the same, and by adding to a low tension magneto an interrupter, a half speed shaft with high tension distributer, and a condenser, you have a high tension magneto, which is used in connection with a single plain coil.—ED.]

Tire Repair Articles.

Editor HORSELESS AGE:

Will you kindly publish the following questions in your magazine, to be answered by either you or your readers?

1. What experience have you had, if any, with tire vulcanizers of the type advertised to be suitable for use by owners or those not equipped with full facilities for tire repairing? In your judgment would they be a satisfactory proposition? I refer, of course, to the small appliance for repairing small cuts in the shoe, inner tube, etc.

2. What is your opinion of the "acid cure" preparations advertised for vulcanizing without heat? Has anyone had experience with this sort of thing? H. R. S.

Wear and Tear Due to Hill Climbing.

Editor HORSELESS AGE:

I have driven a light automobile for three years, and have traveled many miles in a section of New York State where the grades run as high as 22 per cent., and where long grades of 15 per cent are not uncommon, but I have never been able to decide whether, for an automobile that is properly designed and managed, hill climbing is more injurious than running on the level. Suppose a certain car that is adequately cooled under all circumstances can develop 10 horse power, and is able when using its full power to run 30 miles an hour on the high speed on the level, and when using its full power can run 10 miles an hour on its low speed on a certain hill. Suppose such a car, having the throttle and spark so set as to run 20 miles an hour on the high speed on the level, climbs a hill where it makes a little less than 7 miles an hour on the low speed, with the spark somewhat retarded and the throttle unchanged. Under such circumstances I should think the car would receive less injury in climbing the hill at 7 miles an hour than in running 20 miles an hour on the level; for the retarding of the spark on hill would tend to relieve the engine, a the larger number of revolutions per m ute of tires and wheels and the increa jolting due to the higher speed on the le would cause additional wear. Furthermc if the driver would resist his desire to vance the spark and open the throttle, I not see how the automobile would rece unusual wear however steep the climbed, unless the speed of the engine came greatly reduced. Excepting for wear on the low speed mechanism, I sho think a car would receive greater inj from being run to its limit on the level t on a hill.

Is the low speed mechanism from point of view of hill climbing the weak member of the up to date car? Wh grades are very steep is the slide or friction transmission better than the pla tary for a light runabout? What ha shaft drive and chains to do with this pr lem? Is the chief injury in hill climbi due to engine racing? Is there any di culty in designing a water cooled car that it will not overheat on long hill With good roads are not tires injured le in a given time on hills than on the lev if in both cases the same amount of pow is used? Need there be an essential diffe ence in wear and tear in climbing a 10 p cent. and a 20 per cent. hill if the engi has power enough? Where are the chi strains in hill climbing? R. P. ST. JOHN.

[Such comparisons as you ask for a absolutely impossible, as the wear on t different parts is different under the diffe ent conditions, and there is no way of sur ming them up. For instance, when runnir on the high gear there is no wear on t change speed gear at all, but owing to t higher speed the springs, frame, wheels a other supporting parts are subjected extra stresses, and we do not see how the different things can be balanced again each other, or compared in any manne Of course, it is obvious that with the sam engine speed and throttle and ignition se ting the wear on the engine and runnir gear is less when driving on the low ge up a hill than when driving on the hig gear on the level. We believe that yo example does not furnish a fair comparis between the wear and tear due to drivi up hills and on the level respectively. T average man will hardly drive his car its limit on the level; on the contrary, t motor will mostly be run on part throttle in other words, light. In climbing a hill, c the other hand, the motor is often pull down to a very low speed, when eve part of it is subjected to exceptional stre es. The chains and driving gears, mor over, are also loaded much beyond t normal.

If the engine has plenty of power an the transmission parts are sufficient strong, hill climbing ought not to occasio any unusual wear.

The change speed and driving gears a probably the weakest members of up

ars so far as hill climbing is con-
. Which is the best type of change
gear for hilly country has not yet
ecided. The type of drive used is of
isequence. There is no difficulty in
; the cooling facilities sufficient for
rst possible case of hill climbing. It
ractically twice the effort to move
p a 20 per cent. grade as up a 10 per
rade, and as the driving force has to
ismitted by the tires, they are nat-
submitted to greater stresses on the
grade. Where the chief strains are
climbing depends somewhat on the
of the car, but in general they are
parts which transmit the power—
shaft, clutch, change gear, drive
hains and wheels.—ED.]

Cars for Country Use.

HORSELESS AGE:

e often wondered why manufactur-
sted on using such small wheels and
the body of the car so near the
That may do very well in cities,
the country, where the roads are
in the Southern States, it is an im-
ty to run a car with only 6 to 8
learance under the differential and
w parts of the frame. Extended
touring can never be popular in this
(Mississippi) until cars are built
ger wheels. Only recently I saw
l known cars with the rear axles
isted and bent by coming in con-
h large stones and other obstruc-
the roads. To meet the conditions
roads I have recently constructed
ars, with 34 inch wheels fitted with
solid rubber tires, and supplied
horse power engines of the double
type. By the use of side springs
long I have secured a very easy
r and a very flexible gear. These
not weigh over 1,100 pounds, and
n of the large engine power can
igh gear all of the time, as their
speed is only 15 miles per hour.
of the new cars on the market
scard their 28 inch bicycle wheels,
a carriage wheel of some reason-
ht, they would come nearer meet-
ieeds of the people of the country
who desire a moderate priced car
le construction.

ALBERT BARNES, M. M. E.

A Mistake Corrected.

ORSELESS AGE:

in your issue of March 28 a
of my article "Winter Driving
orily Solved," I wish to state
e was a mistake in the last para-
the article, to which my critic
iz., that the distance covered in
irs, which was given as 38 miles,
18 miles. As to the number of
le, it was not stated that the car
1 stopped that number of times,
nany as three calls were made
ne stop. Fifteen of the 18 miles
was made on country roads where the "mile in fifteen minutes" ordinance of our town does not apply. I hope that this explanation may be satisfactory to "M. D." The greater part of the drive was in two long runs, and, beside, it is well known that the time consumed in stopping and starting a car is only a fraction of that required for stopping and starting with a horse and buggy. The mistake in the article had escaped my notice until my atention was called to it by "M. D.'s" letter. It may also be pointed out that unnecessary social prolongation of professional calls greatly reduces the amount of work that may be accomplished in a given time, and seriously upsets the advantages of the more rapid vehicle. ALFRED C. SMITH, M. D.

Distance and Efficiency Test.

The board of governors of the A. C. A., at a meeting on March 27, decided to hold an automobile test for distance and efficiency, allowing 2 gallons of gasoline to each car. This will be the first of a series of tests now being arranged by the club for the coming season.

A system of award is to be devised whereby points will be allowed for the weight of car, piston displacement, distance traveled, efficiency shown and other such factors as may be deemed advisable. The committee on policy submitted a report outlining plans for testing the comparative efficiency of alcohol motors, carburetors, dust preventives and other automobile parts.

An effort will be made to give all competing machines an equal chance to show their good points, the main object of the competition being to determine the varying efficiency of the different makes of motor cars. Cars of any size and horse power may enter the competition, but the large cars will not be unduly handicapped by the smaller ones, because weight and piston displacement will be taken into consideration. The competition is open to all stock cars in the world.

Every car will carry an impartial technical observer, who will submit a detailed report. These expert reports, it is thought, will be of unusual value.

In order to stimulate an interest in the competition the club has decided to award prizes as follows: First prize, a gold cup valued at $500; second prize, a silver cup valued at $100; third prize, a medal. Certificates of efficiency will also in all probability be awarded.

The special committee in charge of the competition consists of Dr. Schuyler Skaats Wheeler, Charles G. Curtis and George F. Chamberlin. They are now at work formulating the rules and conditions governing the contest, and will also decide upon the place and date.

The contest will be held the first or second week in May. The cars will start from the clubhouse, and be driven up to Pelham Parkway and along the shore road. The 2 gallons of gasoline will not take the cars very far, and they will be strung out all along the line as the gasoline gives out. It will not, therefore, be necessary to go out in the country to hold the contest.

New York Registrations.

During the first three months of the year 1,580 cars, 180 of which are of foreign construction, were registered in New York State. In March alone 806 new machines were entered in the lists at Albany, as against 453 for the preceding month. Of these 742 were American built cars, while 64 were imported machines. In New Jersey there were 322 registrations for March, giving a total of 15,203 machines. In Massachusetts the March registrations were 371, giving a total of 12,208 automobiles. Though New Jersey has issued more licenses than Massachusetts, there are many more automobiles in the latter State, which does not require tourists to register. The Pennsylvania total registration is 3,168. New York State easily leads all, with a total registration to March 31 of 25,452 automobiles.

Of American machines the leaders in registration for the month are Cadillac, 62; Packard, 42; Autocar, 35; Pope (all makes), 34; Maxwell, 33; Franklin, 32; Locomobile, 29; Winton, 29; Rainier, 26; White, 26; Oldsmobile, 21; Peerless, 19; Stevens-Duryea, 19; E. V. C. (electric), 19; Ford, 18; Reo, 18; Pierce, 18; Royal, 18; Thomas, 15, and Rambler, 13. Among imported cars the Panhard leads with 9 registrations, the Fiat has 7, Martini and Berliet each 5, Rochet-Schneider, Renault, Mercedes and Decauville, each 4, and Clement, De Dietrich, Mors and Hotchkiss, each 3. Eighteen foreign makes are represented in the month's registrations.

Three Cylinder Patent Litigation in France.

An official of a prominent French manufacturer building three cylinder cars writes us asking us for the earliest copy of THE HORSELESS AGE containing a description of a three cylinder gasoline motor, with cranks at 120 degrees, and to state whether such motors were not already in common use in this country prior to 1901, and by which firms. He informs us that an inventor, "one of the sort who discover the sun in broad daylight," decided to take out a French patent in 1901 on a three cylinder motor, with cranks at 120 degrees, in spite of the fact that such motors were already known and exploited at that time. This inventor is now threatening our correspondent's firm with suit.

The Society of Motor Manufacturers and Traders (of Great Britain) have decided to hold two shows next season in the Olympia (London) building, one for pleasure cars and the other for commercial vehicles, the first to be held in November, 1906. and the second, April, 1907.

COMMERCIAL APPLICATIONS

Commercial Vehicles in Buffalo.

There is an excellent outlook for commercial vehicle business at Buffalo the coming season. Business men are waking up to its possibilities and are giving the question serious attention.

The cars in use have generally given satisfaction in regular transfer and delivery work in all kinds of weather the past winter. Some of the trucks were kept in constant service under the most adverse conditions, covering their routes regularly, without intermission, during the recent heavy snow fall.

In this connection it is interesting to note that the big 5 ton electric truck that has been operated several months by the National Battery Company made its regular trips daily through the deep snow, carrying full loads, without the use of chains to prevent slipping. This truck is fitted with 7 inch solid rubber tires, and with a 5 ton load can cover a distance of 2½ miles in twelve minutes, it is claimed. This company has also had a smaller truck in constant service during the past five months.

The local department stores have not yet substituted motor driven delivery wagons for the horse drawn vehicles. Wm. Hengerer Company made a beginning at Christmas time by renting a half ton wagon to relieve the strain of heavy Christmas traffic in connection with suburban deliveries, and we are informed that it gave very satisfactory results. It made three trips daily, and the experiment tended to prove that motor trucks can be used advantageously for light delivery service.

This trial is of special interest to Buffalonians, in view of the fact that some tentative efforts to use light delivery motor trucks have been made heretofore by J. N. Adam & Co., Anderson, Meldrum & Anderson, and the H. A. Meldrum Company. It appears that in each of these instances small vehicles of light capacity were used, and as the cars were not especiallly adapted to the work required of them the results were more or less unsatisfactory.

The Adams Express Company now has nineteen electric trucks in regular service in Buffalo, two new trucks having been installed in December. W. G. Moore, E. E., who has charge of the garage, says that since the company has operated its own plant and furnished its own power for charging the batteries the trucks have been kept in efficient working order at a comparatively small cost. With the exception of one small, closed wagon used for special deliveries, these cars are all of the same type used by the company in other cities, viz., 2,500 pounds capacity. One of these cars is estimated to take the place of five single horses. Since the company has generated its own current the cost of power for each wagon has been reduced to about $6 per month.

The Larkin Soap Company has several gasoline trucks in regular use, besides the electric motor trucks adopted last year, and has obtained good service from them. This concern has found it advisable to establish its own garage, and finds it economical to employ competent help, both in the garage and to drive the trucks. John Larkin, Jr., who has supervision of this part of the company's interests, is an enthusiastic student of the problem of commercial motor development, and is taking special pains to compile reliable figures relating to the cost of up-keep, from the company's experience. He has devised a simple card system for the purpose of obtaining accurate data regarding the actual work done by each truck and its cost of maintenance. The cards are about the size of an ordinary business card, and are ruled uniformly with spaces on one side to record the amount and cost of supplies or repairs charged to the car, and on the other side spaces for the driver's name, the route to be covered by him, the time he leaves the barn and the time he returns, with space to note the cause and length of any unusual delay. Drivers are given a card every time they leave on a trip, one for each trip, and are required to turn the card in, properly filled out upon each return. This system also shows the comparative efficiency of the driver, as indicated by the time occupied in making trips, repairs charged to the account of his truck, etc.

Mr. Larkin attributes the satisfactory experience of his company to the careful selection of trucks adapted to the work to be done, and the efficient provisions made for keeping the cars in first class condition at the company's own garage. They have also made it a point to employ only reliable men, who have been carefully instructed in their duties. He estimates that each of his trucks gives the equivalent in service of at least two teams.

Mr. Larkin recently sent a letter of inquiry to users of commercial motor trucks in various parts of the country asking for information regarding their experience as to the utility and economy of the motor truck for commercial purposes. Out of 135 replies more than 125 were favorable, only five expressing themselves adverse to the use of the motor truck.

Among the local business houses now experimenting with motor vehicles, besides the larger concerns already mentioned, are: W. H. Walker & Co. (shoes), the Hard Manufacturing Company (metallic bedsteads), Keystone Transfer Company (draying), A. W. Case & Sons Manufacturing Company (plumbers' supplies), Buffalo *Times* (newspaper delivery). John K. Walker, of W. H. Walker & Co., has given the closest attention to every detail in connection with the gasoline truck which the firm has had in constant service since last June. It is a two cylinder, 20 horse power, air cooled truck. During the first five months it traveled 2,998 miles, at an average cost of about 2 1-6th cents per mi for fuel and repairs. The figures in det are as follows:

	Month.	Fiv Mont
Fire insurance, $2,500; $55 per annum	$4.58	$22.
Liability insurance, $2,500; $62.50 per annum	5.21	26.
Garage	10.00	50.
Other expense (except labor), fuel, supplies, repairs, etc.	12.98	64.
Total	$32.77	$162.

Average expense per month, less storage a insurance, $12.98.

Buffalo is undoubtedly somewhat behi other cities of its size in the adoption motor vehicles for commercial purpos Although the city's smooth roadways, wi few heavy grades, are especially adapted the economical use of motor trucks, a notwithstanding the large number of plea ure cars in use, the business portion of t community has been slow to substitute t motor for horse power. A man who unde stands the situation thoroughly summed up as follows:

"More trucks would probably be seen Buffalo's streets had the earlier so call business cars been more ruggedly built. T idea of readily converting a pleasure c into a business car was a pleasing one the average business man buying his fir pleasure car, but it was a mistaken on Just as soon as the business interests a satisfied that they can buy trucks that w stand up and do the work required of the motor trucks will be bought, but the shor comings of the first arrivals made the bus ness interests exceedingly careful.

"Business wagons for delivery purpos must be built for the work they are d signed to do; even for the solicitor, docto or person requiring a car for the drudge of routine daily calls, the car should be special car, simple, strong and reliable, a for the harder service involved in the dai delivery of goods an especially strong, sim ple car is needed.

"Strong it must be, because it must car heavy loads at high speeds (that is, hig speeds as compared with horses). It mu be simple, because it will not be placed the hands of an expert mechanic."

The Motor Vehicle Garage Compa have announced their intention to erect a fit out a garage in the heart of the whol sale district of the city, for the exclusi care of electric commercial vehicles, in a ticipation of a considerable demand for su service in the near future.

Stage Lines from Urbana, Ohio

The Jenkins Auto and Transit Co pany, Urbana, Ohio, will establish tw more automobile stage lines this sprin one to King's Creek, Kennard, Ming and North Lewisburg, and the other Westville and St. Paris. The line to M tual and Mechanicsburg will be operate as last year. A two hours' schedule least will be maintained, and the servi

will be more frequent, if the business warrants it. These lines are through a rich farming country where the railroad gives only one train each way daily. By means of the auto buses passengers will be able to connect with trolley cars for Dayton, Springfield, Columbus and other points. A garage will be equipped at Urbana and a general livery business transacted.

Three Buses for Winchendon Stage Line.

The members of the new Winchendon (Mass.) Auto Transit Company are: John P. Bartlett, president; Chas. A. Andrews, general manager; Harry O. McColly and Fred. H. Brunell, stockholders. They have ordered two eighteen passenger buses and one twelve passenger bus for use between Winchendon Springs, Winchendon, Waterville and Glenallen, a distance of 3 miles on good roads. A 5 cent fare will be charged between each village. It is possible that a fourth bus may be bought to run to Lake Monomonack and Baldwinville by way of Dennison Lakes.

Sightseeing Vehicles in Denver.

The Denver Omnibus and Cab Company, who operate an automobile sightseeing business in Denver, have ordered six twenty passenger electric vehicles, which will be added to their present equipment of four vehicles, three of which have a capacity of twenty passengers and one of forty passengers. The seats on the forty passenger vehicle are now being terraced. Twenty-five thousand passengers were carried in these four vehicles from May 1, 1905, to January 1, 1906. Business has been transacted all winter, but at small profit.

The Negro Auto Bus Line.

The Union Transportation Company, of Nashville, Tenn., which is also known as the "Jim Crow" automobile line, are no longer dependent on the plant of their competitor, the Nashville Street Railway Company, for electric current to charge their new electric buses. A dynamo and generating apparatus of sufficient power are being installed, and President Preston Taylor says fourteen buses will be placed in commission at once. The company have built a park known as Greenwood, 3 miles out of town on the Lebanon Pike, to which place a regular schedule will be maintained.

An automobile stage line is being planned between Goldfield and Palmetto, Cal. The run can be made in four hours on a good road.

The Allegheny County commissioners have decided to buy the automobile conveyance for the Pittsburg morgue, as suggested by Coroner Armstrong.

An automobile stage line is to be established between Los Angeles and Downey, Cal.

Colonel Laidlaw, of Paso Robles, Cal., is arranging for an automobile stage line from that town to the San Joaquin country.

Charles Floyd, of Manchester, N. H., has bought a Thomas car to help him in his canvass for the nomination for Governor of New Hampshire.

F. E. Gillette, of Tonopah, Nev., has purchased eight Heine-Velox automobiles, which he will use as passenger carriers on the desert.

The Aply Transfer Company, of White Lake, Sullivan County, N. Y., proposes to establish an automobile line between Milford, Pa., and Port Jervis, N. Y.

Jones & Puckett, Murfreesboro, Tenn., are planning for an automobile stage and mail line to Woodbury, 19 miles. Similar lines from Paris, Tenn., to nearby towns are being planned.

The proprietor of the Fairmont Hotel on Nob Hill, San Francisco, wants to buy a hill climbing automobile omnibus which will make a minimum speed of 15 miles per hour carrying ten people on the steep grades leading up to the hotel.

Perhaps farmers will feel differently toward the automobile when they use the machines to go to market. There are some good auto truck wagons made now, and some time the price of them may descend within reach.—*American Cultivator.*

Sidney Newell, of Stockton, is planning to establish an automobile passenger and freight line between Milton, Angels Camp and the Big Trees, Cal. He has also under consideration the establishment of a line between Angels Camp and Stockton.

The Fitchburg (Mass.) Transit Company will operate two sixteen passenger automobile buses to Ashby the coming summer, the same as last year. The distance is 9 miles over a straight road with no hard grades. A 25 cent fare each way is charged.

It is reported that the Ontario and Western Railroad is about to build an automobile road from Liberty to White Lake in Sullivan County, N. Y. Eight machines are to be employed for carrying passengers from Liberty to the various summer resorts in the neighborhood.

The St. Louis Automobile Service Company has been organized with a capital of $5,000 to operate a bus line from the terminus of the Broadway trolley line to the Field Club grounds, 3½ miles, and probably to other points in St. Louis County. Two fourteen passenger buses have been ordered, and a twenty minute schedule will be maintained. By June 1 buses will be run as far as Spanish Lake.

The sightseeing automobile will make its appearance at St. Paul, Minn., this spring. An order has been placed for a twenty passenger vehicle for use in Como Park, and the Commercial Club is planning to buy several vehicles for sightseeing service in all parts of the city and suburbs.

An auto bus line is promised between Hollywood and Toluca, Cal.

The Milwaukee Auto Transit Company has been incorporated for the purpose of operating an automobile stage line between Milwaukee and several inland lake resorts the coming season.

The Maysville-Flemingsburg Company, Lexington, Ky., have begun the operation of an automobile bus line between Lexington and Richmond, 27 miles. A line between Lexington and Nicholasville will be started soon. This company is now operating a line between Maysville and Flemingsburg.

The Rochester (N. Y.) Civil Service Board has appointed Harry S. Woodworth, president of the Rochester Automobile Club; John A. Barhite, vice president of the club, and Joseph E. Mandery, a former vice president, a committee of three to judge the candidates for chauffeurs for the two electric police patrol wagons purchased by the city. The test will be held April 15.

February Exports and Imports.

The value of the exports of automobiles and parts from the United States for February, 1906, amounted to $332,713, as against $280,137 for the same month last year, thus showing an increase of $52,576. The value of the exports for the eight months ending February 28, 1906, amounted to $1,771,313, as against $1,402,775 for the corresponding period last year, and $1,141,371 for the corresponding period of the year before. The distribution of exports among the different countries was as follows:

	Feb., 1906.	Eight Months Ending Feb. 28, 1906.
United Kingdom	$49,035	$471,017
France	9,495	123,191
Germany	4,505	35,329
Italy	69,116	131,210
Other Europe	22,655	89,252
British North America	34,507	284,623
Mexico	21,331	166,510
West Indies and Bermuda	105,535	210,428
South America	7,551	49,041
British East Indies	4,215	28,364
British Australasia	1,481	118,846
Other Asia and Oceania	1,164	30,910
Africa	695	20,875
Other countries	1,428	11,717
Totals	$332,713	$1,771,313

Forty-eight automobiles, valued at $160,787, and automobile parts valued at $30,765, were imported during February. For the eight months ending February 28, 1906, 664 automobiles, valued at $2,430,165, were imported. Automobile parts, valued at $235,570, were imported during the same period, as against values of $50,582 and $10,662 for automobile parts imported during the corresponding periods last year and the year before.

LEGISLATIVE and LEGAL

Automobilists Retaliating.

TRENTON, N. J.—A measure that appears to be a retaliatory bill against horse owners, on account of the drastic Frelinghuysen automobile bill, was introduced in the New Jersey General Assembly last week by Mr. Perkins, of the Judiciary Committee, which has charge of the automobile bill in the House. This bill provides that two lamps, one on either side, shall be used on all vehicles on public highways from one hour after sunset to one hour before sunrise. It is understood that this is the first of a series of retaliatory measures that will be urged upon the Legislature should the Frelinghuysen bill be pressed through in an unamended form.

Senator Frelinghuysen has prepared a new substitute bill, striking out many of the radical features of the old measure, and which is said to be acceptable to autoists.

Damages for a Frightened Horse.

NEW YORK CITY.—Reginald Rives was awarded a verdict of $250 against St. John Wood in the City Court on March 27 for injuries sustained by one of the plaintiff's horses which was run into by the defendant's automobile on the East Drive in Central Park. The horse was one of the leaders on the Pioneer coach. While the injuries appeared to be slight at first, the horse shortly afterward developed symptoms indicating nervous prostration. Chas. H. Wilson, a coaching expert, said that he had driven the horse after the accident, and found it hard to drive, as he said, "It seemed to be always thinking of the auto and was as timid as a woman." Rives had to sell the horse at a loss of $250 on the purchase price.

Senate Committee Hearing on Sims Bill.

WASHINGTON, D. C.—The Sims bill regulating the use of automobiles in the District of Columbia, which passed the House of Representatives on March 12, will probably be subjected to considerable amendment before it is reported to the Senate. The Senate District Committee held a hearing on the bill last Friday, at which much opposition to its provisions developed.

J. M. Stoddard, of the Cook & Stoddard Company, was the principal speaker, urging that some of the features of the bill be eliminated before it should be put to final passage. Senator Gallinger, who had been making some practical experiments with a motor car to test the practicability of the measure, also presented facts to show that automobiling under such a statute would be practically prohibited.

Mr. Stoddard described two classes of offenders against the speed regulations, which he thought it was desirable to reach through legislation. These were the wealthy, reckless driver, who pays his fine and forgets it in five minutes, and the daredevil chauffeur who seeks to make his operation of the machine spectacular. These two classes he declared represented about 10 per cent. of automobile owners or operators, while the other 90 per cent. were careful and needed no such legislation as that proposed.

The main provisions of the Sims bill are the limiting of speed within the fire limits of the city of Washington to 12 miles an hour, slowing up at street car crossings to 8 miles an hour, checking the run to 6 miles an hour at the intersections of all avenues and streets in the crowded parts of the city, and a maximum of 4 miles at certain points where pedestrian traffic is large.

Mr. Stoddard argued that the slowing down of a heavy car from 12 miles to 6 on Pennsylvania and other avenues meant the destruction of the car. He declared that obedience to the provisions of the bill meant in practice the running of all cars at 8 miles an hour.

The Sims bill is a brief document and is an enabling act to guide the municipal authorities in framing a set of regulations to govern the police. Its penalties are of the picturesque kind, and Mr. Stoddard especially attacked the cumulative fine and imprisonment features, claiming that the withdrawal of permit to operate from the rich driver and the reckless chauffeur would be twice as effective as fine and imprisonment.

It is understood here that the imprisonment feature and the cumulative fines will be cut out of the bill by the Senate District Commitee.

The New Virginia Law.

RICHMOND, Va.—Secretary of the Commonwealth Eggleston is having the automobile law recently enacted by the General Assembly printed for distribution. The law goes into effect June 13 next, but is simply permissive in that it provides that counties, cities, towns and villages may enact measures in accordance with its terms. Four miles an hour is the limit of speed in the built up portions of cities, towns and villages, around curves and bends, over rises and acclivities, at all prominent crossroads and at crowded places on the highways. Elsewhere 12 miles an hour is allowed. Drivers must keep a careful look ahead for the approach of horseback riders or vehicles drawn by horses or other animals, and he shall immediately slow up and stop if signalled to.

The penalty for violation is a fine of not less than $10 nor more than $100, or imprisonment for not less than five or more than thirty days, or both. In case any damage is wrought by a machine it may be seized anywhere in the State. Upon second conviction the automobilist's registration certificate will be cancelled and another not issued thereafter. Any person who witnesses a violation of the law may arrest the offender.

An Ontario Automobile Bill.

TORONTO, Ont.—Herbert Lennox has introduced an automobile bill providing for a registration fee of $10 for a motor vehicle of 10 horse power or less and $15 when above. A permit must be issued by the Provincial Secretary and be conspicuously exposed. The maximum speed limit in cities and villages is fixed at 10 miles an hour and 15 miles an hour in the open country. Municipal councils are given the right to limit the highways, and should an autoist cause injury and fail to give his name and address it will cause permanent cancellation of his permit. For first offense autoists would be fined $25; $50 for a second; $100 for a third, with costs in each case, and for a third offense he might be imprisoned.

Creditors File Bankruptcy Petition.

LONG ISLAND CITY.—A petition in involuntary bankruptcy was filed against the Vehicle Equipment Company, of this city, in the United States Court for the Second District March 28. The petitioning creditors are Kerr, Page & Cooper, Geo. Endicott and Smith & Mabley, with claims ranging from $195 to $869. Chas. O. Dewey, of Brooklyn, was appointed receiver, and filed a bond for $10,000. The officers and stockholders of the company were cited to appear April 6 to show cause why the company should not be declared a bankrupt.

When the petition was filed a reorganization of the company was in progress, and it was proposed to change the name to the General Vehicle Company. The Vehicle Equipment Company was originally incorporated under New Jersey laws in December, 1900, with a capital stock of $400,000, and was reorganized under New York laws in July, 1903, and the capital stock has been increased to $3,000,000, of which $2,000,000 is common stock and $1,000,000 preferred stock. There is also a bond issue of $1,000,000. Robert McA. Lloyd was president, Hector H. Havemeyer vice president and Arthur H. Havemeyer secretary. They are sons of William F. Havemeyer, the sugar refiner. As we go to press we learn that reorganization as the General Vehicle Company has been decided upon, and the business will be carried on as heretofore.

New York Automobile Bills.

ALBANY, N. Y.—The L'Hommedieu bill prescribing a tax of $1 per 500 pounds weight upon motor vehicles was reported last week, with some minor amendments, by the Senate Committee on Taxation and Retrenchment. The Assembly Ways and Means Committee will give a hearing this week Wednesday on the Stanley bill creat-

ing a State motor vehicle commission, which is favored by Jefferson De Mont Thompson, chairman of the racing committee of the A. A. A.

At a conference held here March 29 representatives of the principal automobile clubs decided that they should support the L'Hommedieu bill. The clubs want the existing law in regard to penalties changed so that all fines collected for violating any ordinance or speed regulation shall be paid into the State Treasury to be used for highway improvement purposes.

The clubs will support an amendment compelling the automobile association to print a list of all automobiles, with the name and number of the machine opposite, to be posted in conspicuous places, so that it will not be necessary to go to the Secretary of State every time information concerning an automobile and its owner is wanted.

The New Ohio Automobile Law.

COLUMBUS, Ohio.—The Ohio Legislature, which adjourned Monday, passed the automobile bill framed by Mr. Sawicki, the Senate acting on it at a night session Saturday. The Bowers bill, requiring county registration, came up in the House early last week for passage, but was postponed so the members might choose between the two. The Sawicki bill was decided upon. An effort was made to reduce the speed limit to 8 miles, but this was defeated. The auto men succeeded in passing an amendment providing that all fees and licenses should go to the fund for good roads. The principal provisions of the bill are as follows:

Registration with the Secretary of State, fee $5 for first 30 horse power, $3 for each additional 10 horse power. Dealers must register one of each type of car handled; duplicates, 50 cents each.

Speed must be "reasonable" and never so great as to be "dangerous." In business districts, 10 miles an hour. In approaching sharp curves, crossing bridges, descending sharp grades, 4 miles. All local speed regulations are invalidated. No local laws shall be passed more stringent than State laws unless they apply equally to all other vehicles. In no village may an ordinance be passed limiting speed to less than 6 miles. Local authorities have the right, however, to exclude autos entirely from cemeteries or drives provided particularly for horses. Power is also given to regulate speed in any degree in parks and on parkways.

When local laws more stringent than State laws are in force, at corporation line a sign must be conspicuously displayed: "Slow down to .... miles." Similar signs must be displayed in parks, on parkways and streets where change of speed is required.

If the driver of a restive horse raises his hand the auto must come to a stop to give the horse a reasonable time to get past. Caution must be used in passing a restive horse from the rear.

Autos must carry two white lights and one red visible from rear. License tag must be visible. Lights from one hour after sundown to within one hour of sunrise. Effective brakes and bell or horn must also be provided.

Chauffeurs (for hire) must pay $2 fee for registration and receive tag to wear whenever driving, which tag may not be loaned. This rule does not apply to owner driving his own machine.

Vehicles properly licensed in other States may pass through Ohio without paying the Ohio license. Penalties are as follows:

A person owning or operating an auto which he does not register may be punished as follows: First offense, not more than $100 fine; second, not less than $50 nor more than $100, or thirty days' imprisonment, or both; third, $100 to $150, or thirty days, or both.

Violation of any other provision: First offense, $25; second, $25 to $50; third, $50 to $100, or ten days' imprisonment, or both.

The law goes into effect June 1, 1906.

Good Roads Appropriations.

COLUMBUS.—The Finance Committee was persuaded by the friends of good roads in preparing the second general appropriation bill to increase by $50,000 the appropriation for 1907 $50,000 in excess of that allowed for 1906, making it $200,000, to make an appropriation of $200,000 for State aid in 1907, an increase of $50,000 over the sum allowed for 1906. This passed the House, but the Senate Finance Committee switched the additional $50,000 to the State Agricultural Department to build a grand stand on the State Fair Grounds, and the House concurred in the change. The total for the two years is thus $300,000. The State Highway Commission was given an appropriation to fit up offices in the Judiciary Building on the State Capitol grounds. Both houses passed the Hayes bill, making slight changes in the good roads law required in order that the appropriation for 1906 might be immediately available.

NEW ORLEANS.—Mayor Behrman, of New Orleans, has declined to sign the city ordinance prohibiting the fast driving of automobiles. He fails to see the necessity for the measure, as there have been no accidents in that town.

ALBANY, N. Y.—Senator Gardner has introduced a bill which will permit the English Lloyds insurance companies to solicit business in this State, because domestic companies do not insure automobiles which may be used all over the world.

ANNAPOLIS, Md.—The Hastings bill provides that in Dorchester County, where Tuesdays and Saturdays are market days, automobiles shall not be allowed the use of the roads. A physician hurrying to the bedside of a patient is alone exempt.

BOSTON.—The Massachusetts Highway Commission has suspended the automobile license of Earle G. Greenleaf, Cambridge, until July 1, on account of reckless driving. This is the first case brought by the Massachusetts Automobile Owners' Association, of which Francis Hurtibus is the counsel.

Fatal Accident at New Rochelle, N. Y.

Mrs. Betty Kuchler, aged seventy years, and her sister, Miss Albina Stein, aged seventy-three years, were run over by an automobile and killed on Main street, New Rochelle, last Sunday evening while walking home from church. The automobile was driven away rapidly after the accident, those in it not stopping to see what injury had been done. A crowd of men and boys chased the vehicle, but it was soon out of sight. Several people in the crowd succeeded in reading the number, which was New York license No. 24,984, and in this way traced the machine to its owner, John C. Rodgers, Jr., of 10 St. Nicholas place, New York, a son of John C. Rodgers, the Subway contractor.

Witnesses say the the machine was going at the rate of about 30 miles an hour. It was driven by John Johnston, of White Plains, a chauffeur employed by young Rodgers. In the car at the time of the accident were Mr. and Mrs. Rodgers, Jr., Mr. and Mrs. C. W. Collins and George McNabb. Johnston gave himself up to the New Rochelle authorities Monday morning and was held for the grand jury under $10,000 Tuesday morning at White Plains.

The accused chauffeur says that he saw two wagons just ahead of him coming in the opposite direction near the foot of a steep hill at the bottom of which is a railroad bridge. As the drivers of the wagons saw the automobile approaching they pulled to one side to make room, and Johnston says he put on speed to get a start on the hill. As he did so, he claims, the women stepped out from behind one of the wagons, and he ran them down before he had time to stop. He claims the accident was entirely unavoidable.

Coroner's Decision in Craig Fatality.

In the inquest into the cause of the death of Mrs. Jane Craig, in an automobile accident in the Bronx (New York city) on March 9, the coroner's jury, at the hearing on April 3, found "that the said Jane Craig came to her death on the 9th day of March, 1906, at Fordham Hospital, from compound fracture frontal bone, extending to base; cerebral hemorrhage, caused in an automobile accident, caused by an error of judgment on the part of the chauffeur of the Welch car, Mr. Fred S. Welch, and we exonerate both prisoners."

The prisoners referred to were Fred S. Welch, who was driving the car which was said to have collided with that in which Mrs. Craig was riding, and Alexander T. Cummings, the chauffeur of the wrecked car.

MINOR MENTION

An automobile and motor show will be held in Auditorium Hall, New Orleans, May 14 to 19.

George Arbuckle is making a trip through Mexico in the interests of the Winton Motor Carriage Company.

The Morris Auto Company, Saginaw, Mich., have increased their capital stock from $12,000 to $25,000.

The Murillo Manufacturing Company is planning to establish an automobile factory and garage at Marion, Ind.

F. E. Dayton, of Hartford, has been appointed the manager of the Chicago branch of the Electric Vehicle Company.

Clarence B. Brokaw delivered a lecture at the A. C. A. March 27 on "Ignition: Magnetos, Dynamos and Batteries."

The Muncie Auto Parts Company, Muncie, Ind., will occupy a new factory, 217 North Walnut street, in that city.

Frank Lake, an American dentist of Guadalajara, Mexico, has leased a building for the manufacture of automobiles.

Every automobile in Cincinnati has been invited to enter the mechanical parade April 9 during the clean streets convention.

The garage of the Thompson-Schoeffel Company, 26 Plymouth avenue, Rochester, N. Y., was destroyed by fire March 23, with a loss of $75,000.

The Bennett-Bird Company are building a two story garage at 1470 Michigan avenue, Chicago, which they expect to occupy May 1. They handle the Corbin and Dolan cars.

The Pittsburg automobile dealers have organized with the following officers: President, W. M. Murray; vice president, W. A. Richwine; secretary and treasurer, Arthur L. Banker.

Bert Morley, for three years past sales manager of the parts department of the Briscoe Manufacturing Company, of Detroit, is now representing Hayden Eames, of Cleveland.

President John Farson and Secretary Sidney S. Gorham, of the A. A. A., spoke at the annual dinner of the Peoria (Ill.) Automobile Club March 26.

Richard Bacon, Jr., for the past two years manager of the Chicago branch of the Studebaker Automobile Company, is now with the Pardee-Johnson-Hamell Company, 1220 Michigan avenue.

Aron Asen, a Yiddish blacksmith, of New York's lower east side, has started a sightseeing automobile for the purpose of showing the fashionable districts to the east siders at 25 cents a head.

The White Sewing Machine Company have filed an application for a permit for the erection of their new plant at Cleveland. The building will cover 20,000 square feet, and will cost $250,000. The contractors agree to have the building ready by August 1.

The village of Eden on Mt. Desert Island, Me., has again barred motor cars from its limits.

Fire destroyed one of the shops at the plant of the Whitlock Coil Pipe Company, Hartford, Conn., March 25. Loss, $25,000. Insured.

The C. H. Blomstrom Motor Company, Detroit, have completed an addition to their factory, affording 20,000 square feet of additional floor space.

The Stevens-Duryea automobile factory at Chicopee Falls, Mass., have declared for an open shop, as the result of the strike recently declared in the attempt to unionize their polishing department.

The increase in the price of gasoline by the Standard Oil Company went into effect March 29. Automobile gasoline, which has been selling in bulk for 12 cents per gallon, now sells for 13 cents.

J. W. McAlman, for some time past the manager of the Locomobile branch in Boston, is now manager of the Electric Vehicle Company's branch in that city, W. W. Burke having been transferred to New York.

Philip W. Blake has resigned as purchasing agent of the Corbin Motor Vehicle Corporation to become assistant manager of the American Electric Novelty and Manufacturing Works, New York city.

An automobile hill climbing contest will be held at Wilkesbarre, Pa., in connection with the centennial jubilee May 10-12. The course will be a mountain road known as Giant Despair, where the average grades are 24 per cent.

Sixteen automobiles have been blacklisted by the military authorities of the Presidio, San Francisco, and are not permitted to enter the gates of the enclosure. This is due to the failure of the automobilists to observe the rules.

The Automobile Cover and Top Manufacturing Company is moving into larger quarters at 154 East Fifty-seventh street, New York city, where 20,000 square feet of floor space will be available. W. Irvine Fickling and Geo. R. Spinning have purchased the interest of Percy Owen and Robert E. Fulton.

Inspector Murray, of the Bureau of Combustibles, of New York city, recently closed Hartog's garage, 304 West Fifty-fourth street, and ordered all cars and gasoline to be removed within five days from William Schreiber's garage, 308 West Fifty-ninth street, because they had not complied with the regulations.

E. O. Gowing, of Linewood avenue and Simpson road, Ardmore, Pa., was killed and his wife mortally injured in an automobile smash-up in Penn street, Haverford, Monday afternoon. The automobile ran into a rope that had been stretched across the street in front of a building operation. Mr. Gowing was startled and turned the steering wheel sharply. This caused the vehicle to swerve, and it crashed into a telegraph pole, overturned and crushed Mr. and Mrs. Gowing beneath it.

It is planned to have a garage in the new church the First Presbyterian congregation will erect in Cincinnati. The garage will be for the exclusive use of the church members.

The Tacoma (Wash.) Automobile Club has declared vigorously against fast driving. The following officers have been elected: President, W. W. Pickerill; vice president, W. O. Williams; secretary, Dell Young; treasurer, A. G. Prichard.

Coroner Cameron, of Cincinnati, has exonerated John W. Tarbill, of that city, from any blame for causing the death of a gypsy woman, who was killed by an automobile that he was driving. The coroner found that the machine was within the speed limit, and every effort was made to save the deceased.

We have received from the New Hampshire Bureau of Labor the second special report of the summer boarding business and resorts of New Hampshire. It contains much information of interest to automobilists, as well as two excellent road maps of the regions about Lake Sunapee and Lake Winnipesaukee.

Policeman John Dillon, of the New York police department, known as the "auto cop," because he has been very alert in checking speed violations in the Bronx, was thrown headlong from a wheel while chasing an automobile on March 28. The fall broke his left kneecap, and he will probably never be able to ride a wheel again.

The Ohio State Automobile Association was organized at Columbus, March 24, with the following officers: President, Mr. Scholes, of Cleveland; vice presidents, Mr. Baker, of Cleveland; A. Auble, of Akron; F. E. Avery, of Columbus; Mr. Duttonhoffer, of Cincinnati; secretary and treasurer, R. H. Cox, of Cincinnati.

Jefferson De Mont Thompson, the new chairman of the A. A. A. racing board, believes that the National Guard or Federal troops should be employed to police the course at the next Vanderbilt Cup race. He makes use of the argument that the United States Government exercises police control over the international yacht races.

The New York salesrooms of the Welch Motor Car Company, Broadway and Sixty-second street, were opened last Saturday afternoon, when about 400 people visited the rooms, which were handsomely decorated. An orchestra furnished music, and refreshments were served. Burgoyne Hamilton is the New York manager.

At the monthly meeting of the committee of management of the American Motor Car Manufacturers' Association, held March 30 at Chicago, a resolution was adopted favoring the holding of dealers' automobile shows, both in New York and Chicago, to be managed exclusively by the dealers' associations in those cities. The place for holding the open air show in the fall will be decided on at the regular meeting of the association April 20.

Agency and Garage Notes.

D. Grow, Marysville, Cal., will open ıge this spring.

l Behrendt will erect a garage at Bill-Mont., this spring.

A. Eastman will erect a garage at ›mowoc, Wis., this spring.

ter Glenny, West Chester, Pa., will ı garage and repair shop this spring.

or & Sibley have opened the Mission e at 757 West Seventh street, River-Cal.

J. Bergman will build a garage at and Fifteenth streets, Portland, Ore., ıring.

Minot Machine Shop and Repair ıny, Minot, N. Dak., are erecting a which will be ready for business by 20.

anch garage is being fitted up at Che- and Utica streets, Buffalo, N. Y., by . Polson, proprietor of the Utica Automobile Station.

Linscott Motor Company, 163 Co- ı avenue, Boston, has leased the en- ıilding at 41 Stanhope street to ac- ›date additional business.

newly incorporated Oliver Electric ː Company, 1737 Twelfth street, Cleveland, Ohio, will operate a gar- clusively for electric vehicles.

J. Price has succeeded L. D. Fisher ıager of the Joliet Auto and Garage ny, 100 Cass street, Joliet, Ill. They the Knox, Buick, Cadillac and Win- s.

Pond Auto Station, Plymouth and t streets, Worcester, Mass., was March 24. They handle the Pope- , Pope-Hartford, Pope-Tribune and ı cars.

Motor Vehicle Garage Company, lain street, Buffalo, N. Y., is mak- tensive alterations and additions to ıge for the care and repair of both and gasoline cars.

rmanent injunction has been issued ıing the Chicago municipal authori- ›m interfering with the erection of r Stoddard-Dayton garage, Fortieth nd Grand Boulevard.

Euclid Auto Exchange, Cleveland, ›f which W. A. Mayer and W. H. are the proprietors, have recently a building at 5017 Euclid avenue, hey will handle the Compound cars nduct a general garage and livery s.

ırage Versus Tailor Shop.

EWOOD, N. J.—J. William Van Wart, town, has been summoned to appear Vice Chancellor Garrison, of Jersey › show cause why an injunction not be issued restraining him from ıg a garage at 44 Palisade avenue. L. Kenny says that the odor of the is driving customers away from his tailoring establishment next door.

New Incorporations.

C. A. Coey & Co., Chicago.—Capital, $5,000; dealing in automobiles. Incorporators, Benjamin Levering, G. N. Beckford and A. A. Boone.

Coey Automobile Livery Company, Chicago.—Capital $2,500; renting automobiles. Incorporators, Benjamin Levering, G. N. Beckford and A. A. Boone.

Darracq Motor Car Company, Boston, Mass.—Capital, $25,000; to deal in automobiles. Incorporators, A. A. Hastings and F. W. Clark, both of Boston.

Acme Automobile Company Waterford, N. Y.—Capital, $1,000. Directors, F. W. Kavanaugh, Waterford; D. M. McDermott Troy; E. P. Chapman, Jr., Albany.

Chicago Automobile Club Auxiliary Association, Chicago.—Capital, $150,000; maintaining a clubhouse. Incorporators, John Farson, Ira M. Cobe, Sidney S. Gorham.

Tileston Pickard Company, Chicago.—Capital, $30,000; manufacturing atuomobiles. Incorporators, Charles F. Tehune, Jeremiah B. O'Connell and William C. Asay.

Holdrege Automobile Company, Holdrege, Neb.—Capital, $10,000; to deal in automobiles and accessories. Incorporators, W. H. Paddock, A. F. Larson and W. A. Shreck.

Phillips Motor Car Company, Los Angeles, Cal.—Capital stock, $25,000 and $400 paid in. Directors, L. E. Phillips, Anna B. Phillips L. A. Phillips and R. W. Phillips.

Wakeman Motor Company, New York City.—Capital, $100,000. Incorporators, Harry G. Wakeman, Haskell C. Billings and John C. Billings, all of New York city.

Washington Automobile Company, Chicago.—Capital, $10,000; manufacturing and repairing automobiles. Incorporators, Albert J. Brockman, Wilbur J. Wilkins, Leona Barth.

St. Louis Automobile Service Company, St. Louis, Mo.—Capital, $5,000; to operate motor stage lines. Incorporators, Lee Meriweather, Robert J. Bowman and Frank S. Reel.

Charles Gate Engineering Company, East Orange, N. J.—Capital, $5,000; to manufacture automobiles, motor cars, etc. Incorporators, A. R. Bangs, H. A. Bangs, H. B. Hollings, G. H. Bauman and H. H. Puking, all of East Orange.

Berkshire Cycle and Automobile Company, North Adams, Mass.—Capital, $5,000. Incorporators, Walter Parker, Anson Williams and Milton L. Fero. Object, to buy, sell and repair bicycles and automobiles.

John S. Mathews Motor Company, Portland, Ore.—Capital stock, $100,000; to manufacture and sell motors, water wheels, etc. Incorporators, John S. Mathews, W. P. Evans, W. C. Minnis and Clarence Penland.

Oliver Electric Vehicle Company, 1737 Twelfth street, N. E., Cleveland, Ohio.—Capital, $10,000 ($7,000 paid in). President, W. O. De Mars; vice president, A. M. Barnes; secretary and treasurer, W. M. Fitch; directors, the officers and O. P. De Mars and R. G. Fitch. Object, to operate a garage for electric vehicles.

New Agencies.

Shreveport, La.—Foster Carter, Maxwell cars.

Detroit.—J. P. Schneider, Stevens-Duryea cars.

Worcester, Mass.—A. E. Flint, Compound cars.

Lawrence, Mass.—Charles A. Frank, Compound cars.

Springfield, Mass.—Woodward & Reopell, Crawford cars.

Reno, Nev.—Carter & McKenzie, Dorris cars (State of Nevada).

Toledo.—Cooney Automobile Company, for Aerocar automobiles.

Buffalo, N. Y.—Babcock Electric Carriage Company, National cars.

Cleveland, Ohio.—Euclid Auto Exchange, Compound cars of E. H. V. Company, Middletown, Conn.

Boston, Mass.—Concord Motor Company, of Concord, Compound cars (Boston and northeastern Massachusetts).

Chicago.—Aerocar Company, of Detroit, at 347 Wabash avenue.

Chicago, Ill.—Geyler & Levy, 390 Wabash avenue, Lozier cars (general Western agency).

Chicago, Ill.—C. P. Warner & Co., 1220 Michigan avenue, Crawford cars (Illinois, Wisconsin and Indiana).

Joliet, Ill.—The Steinhart & Jenson Auto Company, 631 Jefferson street, Rambler & Holsman cars (Grundy and La Salle counties).

Trade Literature Received.

Garvin Machine Company, New York.—1906 catalogue, 214 pages.

Acme Motor Car Company, Reading, Pa.—Catalogue of 1906 models.

Four Wheel Drive Wagon Company, Milwaukee, Wis.—Catalogue of their trucks.

Fischer & Kuehner, Providence, R. I.—Folder describing the Providence motor.

Neustadt Automobile and Supply Company, St. Louis, Mo.—1906 catalogue, 112 pages.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet entitled "Luxury."

P. M. Hotchkin, 4021 Lake avenue, Chicago, Ill.—Catalogue of the Hotchkin anti-jolt device.

The Forest City Motor Car Company, Massillon, Ohio.—Folder descriptive of Jewell Model B runabout.

The Levens & Dyer Manufacturing Company, Providence, R. I.—Circular describing Friend's new dry vapor carburetor.

Gisholt Machine Company, Madison, Wis.—Leaflet describing the Gisholt 30 inch vertical boring mill; also power moving device for the rapid traversing of turret slide on Gisholt lathes.

The Hess-Bright Manufacturing Company, 245 North Broad Street, Philadelphia.—Card illustrating ball bearings for automobile change gear, as used in the Daimler (Coventry) 18-28 horse power 1905 car.

Patents Issued March 6, 1906.

814,132. Clutch Mechanism.—Henry S. Hele-Shaw, Liverpool, England. Filed December 16, 1903. Serial No. 185,444.

814,133. Starting, Stopping, Speed Controlling and Reversing Gear.—Henry S. Hele-Shaw, Liverpool, England. Filed December 16, 1903. Renewed January 9, 1906. Serial No. 295,321.

814,164. Resilient Vehicle Tire.—John F. Rau, Chicago, Ill., assignor of one-half to John F. Cordes, Chicago, Ill. Filed September 19, 1904. Serial No. 224,993.

814,171. Buffer for Use on Motor Vehicles.—Frederick R. Simms, London, England. Filed September 26, 1905. Serial No. 280,200.

814,268. Power Transmitting Mechanism.—Alexander T. Brown, Syracuse, N. Y., assignor to the Brown-Lipe Gear Company, Syracuse, N. Y., a copartnership. Filed December 7, 1905. Serial No. 290,685.

814,479. Resilient Vehicle Wheel.—John W. Roddy, Washington, D. C. Filed October 21, 1905. Serial No. 283,755.

814,580. Vehicle Wheel.—George H. Williams, Los Angeles, Cal. Filed August 31, 1905. Serial No. 276,489.

814,586. Safety Steering Mechanism for Automobile Carriages.—Emile D. Cahen, Paris, France, assignor to Société Anonyme d'Electricité et d'Automobiles Mors, Paris, France. Filed June 15, 1905. Serial No. 265,364.

Patents Issued March 13, 1906.

814,737. Tire.—Benjamin C. Seaton, St. Louis, Mo. Filed May 26, 1905.

814,780. Vehicle.—Charles C. Grosshauser, Shakopee, Minn. Filed April 28, 1905.

814,823. Vehicle Body.—Harry E. Bradner, Lansing, Mich. Filed August 7, 1905.

814,824. Vehicle Body.—Harry E. Bradner, Lansing, Mich. Filed August 7, 1905.

814,905. Speed Indicator.—Charles O. Ericson, Helmetta, N. J. Filed March 24, 1905.

814,930. Vehicle Fender or Obstruction Remover for Road Vehicles.—Pedro Arrieta y Sanz, Pamplona, Spain. Filed October 9, 1903.

814,964. Motor Cutter.—Frank P. Jordan, New York, N. Y. Filed June 13, 1905.

814,991. Automobile Engine Suspension.—Alfred C. Stewart, Los Angeles, Cal. Filed March 1, 1905.

815,045. Automobile.—Charles Schmidt, Cleveland, Ohio. Filed October 9, 1905.

815,108. Speed Indicator.—Ernest J. Loring, Somerville, Mass. Filed August 16, 1905.

815,137. Safety Starting Mechanism for Motors.—Adolphus H. Beecher, Mason City, Ia. Filed October 24, 1904.

815,279. Vehicle Tire.—Henry C. Folger, West Somerville, Mass. Filed May 19, 1905.

815,303. Recording Apparatus for Motor Vehicles.—David Mason, New York, N. Y. Original application filed August 25, 1903. Divided and this application filed November 21, 1903.

815,319. Tire Case.—Howard R. Teel, Medford, Mass. Continuation of application filed November 6, 1905. This application filed January 6, 1906.

Patents Issued March 20, 1906.

815,360. Device for Recharging the Storage Batteries of Automobiles.—Lamar Lyndon, New York, N. Y. Filed May 4, 1904. Renewed March 23, 1905.

815,386. Change Speed Gearing.—Eugen Soller, Basel, and Friedrich Hottinger, Berne, Switzerland. Filed April 29, 1904.

815,430. Pneumatic Tired Wheel.—Thomas B. Jeffery, Kenosha, Wis. Filed November 21, 1904.

815,572. Vehicle Tire.—John K. Williams, Akron, Ohio. Filed September 5, 1905.

815,573. Vehicle Wheel.—Charles C. Wilson, Dayton, Ohio. Filed November 1, 1905.

815,708. Speed Indicator.—Gustav Ihle, Berlin, Germany. Filed May 13, 1905.

815,712. Carburetor for Explosive Engines.—John H. Johnston, Paris, France. Filed June 24, 1905.

815,734. Grease Cup.—Thomas E. Peters, Moberly, Mo. Filed November 23, 1905.

815,735. Automobile.—François Pilain, Lyons, France. Filed August 15, 1905.

815,909. Friction Clutch.—Talbot C. Dexter, Pearl River, N. Y. Filed August 29, 1905.

815,910. Automobile Sleighing Attachment.—Christopher C. Dolan, Lockport, N. Y. Filed June 13, 1905.

815,918. Frame for Motor Propelled Vehicles.—George H. Jones, Philadelphia, Pa. Filed July 14, 1905.

Patents Issued March 27, 1906.

816,006. Tire Valve.—Charles E. Duryea, Reading, Pa. Filed April 3, 1905.

816,013. Storm Shield for Vehicles.—Matthew R. Hull, Connersville, Ind. Filed September 8, 1905.

816,047. Valve Mechanism for Gas Engines.—Cassius M. Smith and Solon B. Welcome, Los Angeles, Cal. Filed January 12, 1905.

816,062. Gas Engine.—Ira S. Barnett, Louisville, Ky. Filed February 6, 1904.

816,182. Tire Armor.—Homer E. Prouty, Genoa, Ill. Filed June 26, 1905.

816,250. Motor Vehicle.—Charles M. J. Petiet, Villeneuve-la-Garenne, France. Filed January 10, 1905.

816,282. Motor Vehicle Running Gear.—Ralph B. Vaughn, Kingston, Pa. Filed October 2, 1905.

816,354. Vehicle Tire Tool.—Charles McCarthy and Millroy M. Phenice, Columbus, Ohio. Filed March 18, 1905.

816,396. Bearing Spring for Motor Vehicles.—Thomas G. Stevens, Greenhithe, England. Filed December 17, 1904.

816,397. Vehicle Heater.—John F. Swengel and Dennis Byrne, Jr., Clyde, Kan. Filed April 18, 1905.

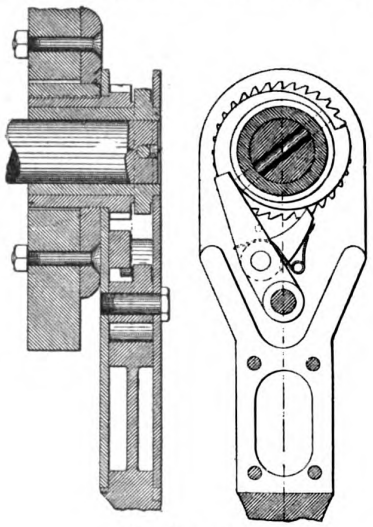
816,472. Sparking Ignition Mechanism.—John F. Johnson, Chester, Pa. Filed October 19, 1904.

816,477. Carburetor.—George W. Kellogg, Rochester, N. Y. Filed February 3, 1905.

Review of Specifications.

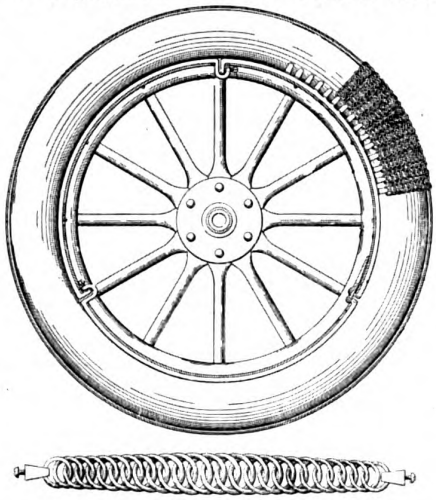
811,928. Safety Starting Device for Gas Engines.—Alvin S. Johnson, of Minneapolis, Minn. February 6, 1906. Filed May 14, 1904.

The starting crank is provided with a pawl adapted to engage with a cam disc fast upon the end of crank shaft when the starting crank is turned. A click is pivoted on the pawl and normally held in engagement with the teeth of a stationary ratchet wheel by a spring, which also draws the click and pawl together and holds the latter on the cam surface. The click is pivoted on the pawl at a



No. 811,928.

point intermediate to its pivot and the end that engages the shoulder of the cam disc, and the ratchet teeth are so formed that when the crank is turned toward the right to revolve the crank shaft and start the engine the click will slide over the ratchet teeth. If the crank shaft starts backward and transmits its movement to the crank, the pressure on the pawl will be transmitted to the click, and as it cannot move backward over the ratchet teeth it will throw the pawl out of engagement with the shoulder with which it may be in contact, and the crank shaft can then be revolved backward without affecting the hand crank or endangering the limbs of the operator.



No. 811,732.

811,732. Armor for Pneumatic Tires.—A. A. Moore, of Detroit, Mich. February 6, 1906. Filed February 5, 1905.

The armor is made of a multiplicity of independent chains peculiarly formed and closely woven and extending transversely of the tire, each chain being attached at each end by adjusting screws to the wheel rim or to detachable bands secured thereto. The chains are formed of two sets of links so interwoven as to make a flat chain in which the interstices between the links are very small, and thus when these chains are secured as described, extending transversely of the tire with their edges in contact, an almost impenetrable armor is formed. The central portion of the chain, which extends across the face or tread of the tire, is formed straight or with parallel edges, so that as the tire is flattened by the weight at its point of contact with the ground the chains will lie closely in contact across that portion, and the end portions of each chain, which extend radially inward at each side of the tire, are tapered slightly to conform to radial lines drawn from the axis of the wheel, and thus lie in contact with each other at their edges throughout their lengths. The chains are formed very strong, and being securely attached they form a continuous shield inclosing the tire to effectually prevent its coming off, splitting, tearing, or exploding, and the armor being formed of entirely separate and independent chains does not hinder the tire from yielding freely and forms a roughened traction tread to prevent the wheel from slipping or skidding. To prevent the chains from wearing the tire and also to insure the tire against becoming punctured by a spike or other sharp instrument which might be forced through the chains, a strip of leather or other suitable material is laid on the tread of the tire, and to this strip are secured transverse flexible metal plates upon its outer surface beneath the chains.

811,630. Bearing.—Charles Glover, of New Britain, Conn. February 6, 1906. Filed October 10, 1905.

This bearing is of the annular ball type, the feature of novelty being trough shaped pieces of sheet metal for separating the balls. In assembling the balls are all put between the bearing ring and shaft ring, and then the separators are placed between the balls one at a time. Being formed of spring metal they will readily slip in place, but may be as easily removed.

In connection with a recent accident to the Count de Sonis, whose automobile overturned while touring in Algiers, it is reported many natives who passed by and saw the count and his mechanic pinned under the machine refused to give any help.