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The Cadillac has always been the car that does things. Whether the test be that of endurance or power, or one of severity of road service, this wonderful machine has never been found wanting. It knows no balk, no hesitancy, no delay-always ready, with energy to spare.

By this dependability of service, coupled with unusual economy of maintenance, the Cadillac has made such phenomenal advancement that its factory is now the largest of its kind in the world.

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conspicuous for its individual merit. Among them is a wonderful mechanical feed lubricator which supplies oil to the motor in quantities which vary according to the speed of the engine, when properly adjusted, always feeding enough, never too much or too little. The new rocker joint on the front spring allows the car to pass over obstacles several inches in height without transmitting any material jar to the car, insuring a maximum of riding comfort and a minimum liability to breakage.

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We want to tell you more about the Cadillac by sending you a free copy of our interesting Booklet N. A postal request brings it, together with address of nearest dealer. The 1906 models include:


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NEW YORK, JANUARY 13, 1906



Water Toboganning in the West.


The Air-Cooled Franklin Framed in the Walls of a Wyoming Canyon.


Reo "Mountaineer" Among the Hills and Sage Brush of Central Oregon.


The Packard Proceeding Cautiously Through a Grand Western Gorge.


The First Car to Cross the Continent Resting in the Desert Sands.


The Winton Undermoing a Severe Tire Test.

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## NEW YORK, SATURDAY, JANUARY 13, 1906.

The Editor is al ways glad to receive for examination illustrated
articles on subjects ot timely interest. If the photographs are articles on subjects of timely interest. If the photographs are
sharp, the articles short, and the facts authentic, the contributions
fait will reeeive speciar attention.

## FUTURE OF DIRECT-CURRENT TRACTION

The controversy as to the relative merits of direct and alternating current traction, particularly with reference to steam railroads, shows no signs of abating. It was aroused by the fact that two great railroad systems which enter the same New York terminus, and use the same suburban and terminal tracks for a distance of several miles, are employing two different types of motor, one direct-current and the other single-phase alternating current. The controversy is wider than that of merely the two railroads concerned, for it includes the two largest electrical manufacturing concerns in the world; one the General Electric Company, which is furnishing the direct-current equipment, both for power stations, lines, and rolling stock; and the other the Westinghouse Company, which is furnishing the single-phase alternating equipment for the New Haven lines from Stamford to their junction with the New York Central system at Woodlawn. The alternat-ing-current advocates have expressed surprise that such an important installation as that of the New York Cen: tral terminal lines should have been equipped with the direct current, arguing that it is approaching the stage at which it will not compare in economy, particularly for long-distance work, with the more convenient and flexible alternating current.
It is stoutly maintained by the direct-current advocates, that it has by no means reached its final stage of development, as proved by the fact that recently tests and results of 1,500 -volt direct-current railway motors have become available, and that there are rumors of a 700 -mile direct-current transmission. It is urged that 500 to 600 volts is merely a stepping stone to more efficient pressures, which are sure to be used. A correspondent of one of the contemporary journals devoted to street railways, claims that it is now practically possible to furnish reliable direct-current railway apparatus for a voltage of from 1,000 to 1,200 pressure; and that with proper designing of the mag netic circuit in the motors, and the placing and insulation of the controlling apparatus, there is no reason why the advantages of high voltage should not be realized under the direct-current system, as they now are in the alternating system.

## designing the steam turbine.

It is seldom that, in the development of a new art the public is taken into the confidence of the designer, and treated to such a luminous exposition of the principles that govern both design and construction, as is given in a paper recently road by Mr. E. M. Speakman before the Institution of Engineers and Shipbuilders in Scotland, on the Dimensions of the Marine Steam Turbine. Although there have been many papers read on the general subject of the steam turbine, we doubt if there is any approaching this paper in the completeness of the ascertained data that it contains. In the nature of things, turbine design was, in the earlier stages, and in some respect is yet, largely empirical; and hence, results that have been established in the day-by-day working of the marine steam turbine are, just now, of extreme value. Limitations of space prevent us from giving this paper, which is published in full in the current issue of the Supplement, more than brief review in these columns.
Turbine efficiency and propeller efficiency must be considered separately, and also together, because it may be found that the use of revolutions somewhat below the maximum obtainable will increase the combined efficiency; while on the other hand to obtain certain advantages in weight and space, this efficiency may be slightly sacrificed at the highest speed. Roughly speaking, the weight of the turbines will vary in versely as the square of the revolutions. The minimum size of propeller required to avoid cavitation must be calculated at the beginning of any design, as it is almost impossible to assume certain revolutions, and
later on to design a propeller to suit. Cavitation is partly the result of attempting to obtain too much work per square foot of blade area, and partly of excessive peripheral speed. It has been found by bitter experience that there is a narrow limit to the ten sional pressure possible on the water, beyond which propeller efficiency drops very rapidly. This pressure is approximately from 10 pounds to 12 pounds per square inch at the depth of 12 inches below the surface. The speed of the tips of the blades of turbinedriven propeliers varies from the enormous velocity of 12,400 feet per minute in the British torpedo-boat destroyer "Viper" of 36 knots speed, whose screws were 3 feet 4 inches in diameter, down to 8,125 feet per minute on the "Carmania," whose screws are 14 feet in diameter. The percentage of slip has varied from 28 per cent in the "Viper" down to 14 per cent in the Channel steamship "Viking." In the large ocean-going vessels, the slip is from 16 to 20 per cent.
Although the laws governing the best velocity of steam and blades are similar to those for water turbines, some modification is necessary in practice, and the best ratio of blade speed to steam speed is still a matter of opinion. This ratio has varied in Parsons turbines from 0.25 to 0.85 of $V s$ where $V t$ represents blade velocity of mean diameter, and $V s$ steam speed due to expansion across the row in question. The steam consumption must be accurately known in order to proportion these ratios correctly. With these results before us, we are not surprised to hear Mr. Speak man say that the best blading arrangement, scientifical y and commercially, is the result of much theory and practice, and that this data being based on long and cost ly experiments is naturally withheld from publication With regard to speed of turbine blades, we are told that blade speed is governed to some extent by blade height; and that the speed should be so modified that this may be at least three per cent of the mean diameter to reduce the proportion of clearance losses.
Leakage over the tips of the blades is, perhaps, not so detrimental on account of actual leakage loss as in its superheating effect on the steam between the row past which it leaks and the last row, which seriously af fects the fluid efficiency. That the turbine is not suited to slow vessels is due to the fact that the propeller controls the speed of revolution, and to the fact that there is a necessary proportion between the blade height and the diameter. In slow cargo steamers, though the revolutions may be high enough, the power required is not sufficient to enable a sufficient blade height to be adopted for the prevention of undue leakage. The ratio of blade height to mean diameter should not be less than 3 per cent or more than 15 per cent because in the first case leakage will be excessive, and in the latter the bending moment on the blades becomes too great. The trouble with the stripping of the blades may be set down to bad workmanship, defective blade material, whipping of turbine spindles (due to bad design or bad balancing), and to excessive cylinder distortion due to temperature. This last is the most fruitful cause, and is a serious one, being due entirely to poor design. Great care must be taken in proportioning the cylinders; for under wide ranges of temperature, when the turbine is working there may be a fall from 400 deg. to 100 deg. F. in a distance of 6 or 8 feet. The radial expansion, therefore, is greater at one end than the other. Hence, ample clearance must be allowed. This clearance will vary from $3 / 16$ of an inch for a 1 -inch blade to $1 / 2$ an inch for a 10 -inch blade, and $3 / 4$ of an inch for a 30 -inch blade.
Finally, on the question of the performance of turbines as compared with reciprocating engines for ma rine work, both the Admiralty and the British rail road companies that employ Channel steamers have been able to test similar ships under the same conditions and secure most reliable data. In the earlier trials of the cruiser "Amethyst," it was shown that only below 55 to 60 per cent of its full speed does the consumption of the turbine exceed that of the piston engines. In later trials of the "Amethyst," after the steam piping had been altered so as to permit the auxiliary exhaust steam to pass through the main lowpressure turbines, the low-speed consumption of the "Amethyst" was brought down below that of her sister ships for all speeds to 10 knots an hour, which is about 45 per cent of her full speed.

## THE AUTOMOBILE IN 1906.

The annual automobile exhibition in New York city, for the year 1906, marks a distinct advance on its pre decessors on every point of comparison. In respect of magnitude, it is sufficient to say that two of the largest buildings in this city are required to afford sufficient space for the exhibition of the automobiles and their accessories. In order to separate the exhibits into two distinct groups, the Licensed Association of Auto mobile Manufacturers confinedotheir display to Madison Square Garden, showing only cars which are licensed under the Selden patent, while the Automobile Club of America houses its display in the handsome new armory of the Sixty-ninth Regiment, the entries in this show being confined strictly to cars that are un-
licensed. Not only is the display far larger than any that has preceded it, but the buildings themselves have been decorated and arranged on a plan which renders the effect extremely handsome. Elsewhere in the pres ent issue we have illustrated and described individual cars, that represent the present progress in the art of automobile manufacture; and it is, therefore, our purpose in the present article merely to outline what might be called the type touring car, as evolved during the past ten years of the development of the industry in the United States.
The standard car, then, at the opening of the year 1906, is a four-cylinder touring car of 24 to 28 horse power, weighing from 2,000 to 2,200 pounds, or a 30 to 35 horse-power machine, weighing from 2,200 to 2,400 pounds. The four-cylinder motor is housed in a bon net at the front, and the power is transmitted through a three-speed, sliding-gear transmission by shaft-drive and bevel gears to a live rear axle. The wheels are distinctly larger, being 32 to 34 inches in diameter, with large tires 4 or $41 / 2$ inches in diameter. Our standard car shows marked improvement in the arrangements for lubrication of the engines, a continuous circulation being secured by some form of mechanical forced-feed oiler, the oil passing through sight-feed glasses carried at the front of the machine on the dashboard. The familiar leather-lined cone-clutch has given place to a multiple-disk clutch, and as the disks run continually in oil, there is a certain amount of slip when the disks are first compressed, so that the clutch takes hold without jar or jerk. This renders it possible to start a car on the nigh speed from a standstill.
Although the majority of the cars still make use of cooling water and a centrifugal circulating pump, there is evidence that the air-cooled motor may ultimately become the prevailing type, even for the high-powered car. Two makers exhibit this year six-cylinder, aircooled motors. They were encouraged to take this step by the good results that have been obtained by aircooled motors in the various reliability and economy runs that have been held during the past year. Another make secures its cooling effects by permitting the cylinders themselves to revolve; but practically all of the others make use of fans, one of the few exceptions being that of a light four-cylinder runabout, one of which performed the feat of crossing the continent. There is no question that the air-cooled car has falsified the predictions of failure which have been made freely in the past; and the good results secured are to be attributed to a careful study of conditions and well-thought-out design. The powerful air-cooled car is distinctly an American production, and the fact that it has won its way to successful recognition among the higher-powered machines is a subject of congratulation to those who would like to see the United States contribute more fully than it yet has done to the development of the perfect automobile.
Although the four-cylinder, four-cycle motor is the standard type to-day, the two-cycle motor is making distinct progress. One of the oldest manufacturers in the United States has worked on the problem with such success that he has brought out a two-cylinder 25 -horse-power touring car which weighs only 1,700 pounds. If certain inherent disadvantages of the twocycle motor, such as the small range of speed, and the difficulty of keeping the crankcase tight, can be overcome, there are certain manifest advantages, in the way of lighter weight and greater simplicity, that will tend to make this type a favorite. It is quite possible that the future motor will be of the two-cycle, four-cylinder, mechanically air-cooled type; such a motor, except for the air-cooling feature, is shown in the exbibition. That this type can work successfully in the larger sizes would seem to be proved by the fact that a western railroad, which has been very active in the introduction of gasoline motor cars on its system, has recently received a four-cylinder, air-cooled, two-cycle motor of 200 horse-power for one of its new cars. The abolition of the valves, the circulating water pump and radiator, and the reduction of weight per horse-power in the motor, would mark a decided step in advance in respect of the weight, cost, simplicity, and convenience of operation of the automobile.

But to return to our typical car; we note that it is fitted with spring-separated ball bearings in the transmission and the wheels, with the choice of roller bearings for the rear axle, wheels, and countershaft. Ball bearings have been in use now for two seasons, and may be considered as standard practice. We note that one car shows roller bearings on the ends of the engine crankshaft. The greater ease and smoothness of running are attributed to shock-absorbers, re-bound-checking devices, and pneumatic tires of large diameter. Although our type car does not carry them, we observed that inventors have been busy endeavoring to find some device which will permit of the use of solid tires on the road wheels, without losing the shock-absorbing and high tractive efficiency of the pneumatic tire.

The standard car depends for ignition upon the jump spark, with high-tension magneto or storage battery; although we noted in the exhibit several
cases of low-tension magneto ignition. The valves are mechanically operated and are interchangeable, two sets being used, one on each side of the motor. The type car may carry either cellular radiators or those of the finned tube pattern, while some of the cars use flattened tubes provided with radiating fins. The type car carries two separate brakes, one of the expanding ring type, the other a band brake, actiyg within and on the outside of a drum on the rear wheel. The band brake, worked by a pedal, is for ordinary use, and the expanding ring brake, which is applied by the hand, is used for emergency. Finally, we note that the engine is controlled by separate spark and throttle levers, mounted on stationary sectors in the steering wheel.
It is a matter of congratulation that the industry has now grown to such proportions that the manufacturers are enabled to turn out a standard car which is at once superior in construction and lower in price.

## PROGRESS WITH THE ELECTRIC AUTOMOBILE. <br> \section*{Although King Gasoline has gone on rapidly con}

 quering the world, the beggar maid, Electricity, is soon coming to her own. She has been hard at work for the past several years doing more and more of the world's drudgery, and, according to present indications she will yet have the honor of moving a considerable percentage of its pleasure vehicles as well.The improvements that have been made in electric au tomobiles are of two kinds, namely, those in the vehicle and motor, and those in the battery. One class is quite as important as the other and the changes made during the last few years have been almost as great in the one as in the other. The result is that the modern electric vehicle for pleasure purposes can now be constructed to consume only about 50 watt-hours per ton mile at a speed of 15 miles an hour, where some years ago it used nearly three times as much; and reliable batteries delivering 15 to 18 watt-hours per pound can be had, as against the 8 or 9 watt-hours of usual practice. Thus it will be seen that vehicle and batteries have improved 100 per cent. That this is not merely theoretical improvement is seen from the fact that an electric stanhope having a guaranteed mileage of 85 on a charge, is now on the market, and larger, longdistance pleasure vehicles are being rapidly perfected. In France last fall several "raides electriques" were made to show what can now be done with ordinary stock vehicles. The most notable of these was the run from Paris to Trouville (about 130 miles) on one charge. Even more worthy of notice was a trip in this country from Cleveland to Erie ( 100 miles) over ordinary country roads some of which were sandy and which included several steep hills. A trip suich as this on one charge makes the possibility of the practical electric touring car seem within grasp. With the highcapacity batteries and the improved motors and methods of power-transmission, the discharge rate of the battery is lowered with respect to the capacity, which results in lengthened life, so that a year of service can be assured before the replacement of the positive plates becomes necessary. A set of negative plates will usually outlast two sets of positives, and the upkeep of the battery can usually be placed at a fixed sum per annum.
Regarding types of storage battery other than the lead-lead type, there has been no great advancement of late. The lead-zinc battery, if ever perfected, will doubtless be the ideal battery, as the light weight of such a battery ( 25 watt hours per pound) coupled with its high voltage ( 2.5 volts) and heavy rate of discharge possible make it just what is needed for automobile work. The Edison battery is practically perfect in the last-named respect, as a heavy discharge does not affect the capacity. Bulk-for-bulk, too, the Edison battery is lighter than those of the lead type. Its low voltage ( 1.25 volts), howeve:-, makes more cells necessary, and it suffers such a serious loss of capacity under the effect of cold as to make it impractical. The results of an interesting series of tests of this battery by a wellknown foreign electrochemist were published recently in the Supplement. Despite the defect mentioned, this expert believes that batteries of the Edison, or nickeliron, type will in a few years drive the lead battery from the field.
The method of power transmission found to be the most efficient is a single motor with individual chain drive from a countershaft to the rear wheels. On heavy vehicles two motors are generally used, but the chain drive replaces the old-time spur gear. With two motors the battery cells can always be connected in series, and none can be discharged more than others. But if a connection breaks the vehicle is stalled until a repair is effected. The low-voltage battery (12 to 24 cells) is largely used for light vehicles and even some of the largest machines are now so equipped. Its advantage is a smaller number of cells; its disadvantage, inefficiency in charging from 110 -volt circuits, as energy is lost through a rheostat.
In the business and commercial vehicle line, for city work, the electric still reigns supreme. Hansom cabs, coupés, delivery wagons, and trucks are daily increasing in numbers. Besides their readiness in all weathers they do not emit smoke or the odor of half-
burned gasoline-a nuisance that has become so great as to be the subject of legislation and police interfer ence in London. The speed of the passenger-carrying ylectrics is as great as that of the corresponding gaso fine car for city work, and they have all the advantages, without the liability to breakdown of the latter
Among novelties in the electric vehicle line may be mentioned an electric tractor, or fore-carriage, which can be used with various bodies, and a trolley arrange ment by which an electric automobile can be run by current from the street railway trolley wire, and at the same time recharge the batteries, when following the track.

## INCREASING DEMAND FOR THE MISSISSIPPI PEARL.

If the truth were known about many of the pearls that we see nowadays, we would discover that a fair share of them, even among the expensive ones, came from the Mississippi River or its tributaries. Pearl hunting in these localities has become an established business, and regular pearl prospectors are examining rivers and creeks, with a view to locating beds of mollusks that may contain valuables. Attention to the rare pearls to be found in these streams was first called about twenty years ago, when large numbers oî pearl-producing mollusks were found in a small creek in Dane Countẏ, Wisconsin. The farmers began searching the beds of streams with such success that thousands of pink, purple, and blue-tinted treasures were sold, bringing in a profit of many thousands of dollars. The excitement that prevailed at that time gradually died down, but enthusiasm has broken out again in localities bordering on the Mississippi.
There is a fascination about the business that smacks strongly of speculation, for a man may find any time a gem that may mean a fortune. The men who live this outdoor life are rugged and healthy, and each carries a tin box, which in one season may become the receptacle for holding thousands of dollars' worth of large and small pearls. The pearl hunters have learned to be experts in valuing their finds, and few gems sell at small prices. Generally they are sent East to lapidaries to be valued, and they are sold at once, for the pearl hunter knows that he does well to avoid the "middleman," who is sent out by eastern firms to gather the "finds." Some pearls are sold for a thousand dollars, and a necklace twenty-eight inches in length, made of small Mississippi pearls for the great singer Nordica, who desired a souvenir of Minneapolis, cost two thousand dollars.
Pearl hurting is an exact science, and the successful hunters are skilled in the business. Usually the prospector has a boat, which he allows to drift with the tide. Behind this is fastened a long pole, to which is attached hundreds of lines with bait on the ends. The mollusks close their mouths over these with tenacity, and as they are hauled in as soon as the lines are filled, many bushels are obtained daily. This is the easiest part of the process. The next operation is to open them, which if done with an oyster knife is so laborious it lives long in the memory of the novice. On this account most prospectors either steam the mollusks over a mild fire, or spread them out in the sun to slowly dry, when the two parts of the shell separate readily. The exciting moment comes when the contents of the shell is divulged, for much or nothing hangs on the revelation.
In fact, this insignificant-looking, dirty clam that may contain a treasure of value is an object of interest in itself. Content to lie in almost any kind of water, living on animalcules, very prolific, and a pearl producer, he travels slowly back and forth from mid: stream to shore unless he is gobbled up by the muskrat, who loves him dearly and eats him, pearl and all. The pearls are always near the shells, and can be squeezed out of the meat, with the fingers. Sometimes they are found loose in the shell, and at other times they are attached to it. If loose, the chances are that they may fall out, and good pearl hunters on this account search the bed of the stream, and even dig up the dirt to see what will "pan out."
In the early days of the industry, the slugs or small pearls were thrown away, but now they are kept and sold by the ounce or separately. These are always in the meat, and sell from two to five dollars. New processes in setting jewelry have made them in demand. Contrary to general belief, the expensive pearls are not always round or oblong in shape. Many fine specimens are "baroques," that is, they assume grotesque forms, a fact that can be accounted for by their origin, for scientists tell us that a pearl is really a malformation caused by some foreign substance finding entrance to the shell, and irritating the mollusk to such an extent that he exudes a liquid, which hardens and eventually becomes a precious pearl.
The prospector moves from one part of the stream to the other as soon as one mollusk bed is devastated. Some beds seem to contain more pearls than others, but it is the size and thickness of the pearl that make it invaluable for some articles of jewelry, and lapi-
daries in our large cities are using them frcely. If any criticism is to be made, it is that they lack the yellow tint of the Oriental product. Many sell for high prices, however, and the black pearls which are occasionally found are exquisite.
To the casual observer, pearl hunting seems the easiest way in the world to earn a living, but it must be remembered that not one in fifty of the right spe cies contains a pearl, and many mollusks are so light colored that they are known to be valueless, and are thrown away without being opened. It is a hit-and miss sort of business, into which many start. Those that remain to the end get a good living, and every summer finds so many engaged in the work, that pearl hunting has become one of the established means of livelihood in the Mississippi Valley.

## SCIENCE NOTES.

In a paper presented to the German Physical Society, F. Meyer treats of the permeability of argon for the ultra-violet rays. He uses an apparatus which is the same as he employs for ozone researches and is on the same. plan as the photo-electric photometer devised by H. Kreussler. A glass tube 8 inches long and 2 inches in diameter, closed at the ends by quartz plates, is used as an absorption tube. After filling the tube with a mixture of argon and nitrogen, the author measures the extinction of the radiation by alternately inserting or removing the gas tube. The results he obtains show that argon is quite free from appreciable absorption for ultra-violet rays between $\lambda=186$ and 300 . In any case the absorption does not exceed 3.2 per cent under the conditions of the experiment. As the ordinary air contains about 1 per cent of argon, the latter cannot play any important part in the absorption of the sun's rays having short wavelengths. Accordingly, we must abandon Hartley's hypothesis, which holds that the substance contained in the air and to which is due the sudden ending of the solar specter for $\lambda=293$ is identical with argon.
A new process brought out in France relates to the preparation of a derivative of castor oil which can be mixed with the mineral oils. A product of this kind has been already obtained by distilling castor oil up to the point where it loses a determined weight, and stopping the distillation before a product of gelatinous appearance is separated out. The present process, which avoids the losses coming from the distillation and also suppresses the disadvantages which are well known in connection with the dry distillation of oils, consists in heating under pressure the oil to be treated. To carry this out the oil is heated under a certain pressure in a tight boiler until it becomes capable of mixing in all proportions with the mineral oil. It is recognized that the best results are obtained with a temperature of 260 to 300 degrees and a pressure of 4 atmospheres by keeping up the heating for some ten hours. Then the boiler is left to cool completely before it is opened. The product which is thus obtained can be mixed directly with the mineral oils. Observations which have been made up to the present also show that by operating in a closed vessel we avoid all danger of forming a gummy product from the castor oil.
L. Sindet, of Paris, finds that certain metals such as copper when placed under constantly aerated water in the presence of iron act to increase the oxidation of the latter, and that others like tin, lead, zinc, alum inium, and magnesium keep back the rusting of the iron just as alkaline carbonates do. Among the bodies which prevent the rusting of iron, arsenic holds the first place with its compounds. In presence of aerated water they furnish arsenious acid and perhaps suboxide of arsenic $\mathrm{As}_{2} \mathrm{O}_{3}$. Using arsenic in large quantities sometimes the oxidation of the iron is entirely stopped, or again it is only slowed up. Arsenic acid arsenites, and the alkaline arsenites at 1 per cent strength completely stop the rusting. Orpiment (sulphide of arsenic) gives also a strong effect. Wishing to apply his researches to the study of the causes of rusting of tinned or galvanized iron cans which are used to carry denatured alcohol, he finds that the car bureted alcohols containing 50 per cent of light ben zine have a great activity in the production of rust Benzine having an equal volume of alcohol added to it appears to triple the speed of rusting. Aldehyde, ethyl or methyl acetate do not provoke the oxidation, but they attack the zinc, the tin, then the iron of the ves sels, and it is the acetates of zinc, tin, or iron from the decomposition which begin the rusting of the iron, especially in the presence of benzine. Although ar senic, etc., totally stop the oxidation, and this during several months of contact, it is evident that we could not use them here, seeing that even though the alcohol dissolves but traces of arsenic, the latter is oxidized in the liquid and the products of the oxidation are more solid than the arsenic itself. He was able however, to give a steel sheet a surface cementation by arsenic and it did not rust, while a non-treated sheet exposed at the same time to moist air became entirely covered with rust.

CROSSING THE CONTINENT BY AUTOMOBILE.
There can be no question that the idea of a transcontinental automobile trip was considered by motorists almost as soon as this sport began to assume its prominent position in America. Apparently the first serious attempt which has been recorded was that made by Alexander Winton and Charles Shanks in a Winton car in 1901. This expedition ended unsuccessfully, for after the Sierras had been overcome with difficulty, the sands of the Great American Desert were found to present an unsurmountable obstacle. It was not until 1903 that the continent was actually traversed from ocean to ocean in a motor car. The first successful machine was a Winton touring car carrying Dr. H. Nelson Jackson and Sewall K. Crocker, a professional chauffeur. In this year no less than three parties were able to perform the journey, the other two trips being made in a Packard car and an Oldsmobile runebout, respectively.
Dr. Jackson and Crocker left San Francisco on May 23, in a double-opposed-cylinder touring car of 20 horse-power. The route from San Francisco lay northward along the Sacramento to Redding at the upper end of the valley and thence into lower Oregon, striking boldly across that State and then along a course over the Rockies entirely off the line of all railroads and one that fairly bristled with difficulties. The most annoying troubles were often the minor ones; for not only were these very frequent, but they were of great diversity as well. At only one place did the travelers run out of gasoline, and on this occasion the unhappy Crocker walked 29 miles to procure a fresh supply. At one time they were without food for thirtysix hours and were indebted to a lone but friendly sheep herder for a generous meal. A block and tackle with which the travelers had provided themselves proved invaluable in rescuing the machine from sand, mud, or streams which had been "rushed" unsuccessfully. The steep, rough, and bowlder-strewn grades were overcome one after the other, though the narrowness of the roads, or rather trails, necessitated the most careful driving. A very difficult portion of the journey was that between Redding and Pocatello, Idaho. At Caldwell, in that State, a third person was added to the party in the shape of "Bud," a bulldog, who soon became an expert autoist and a pleasant companion.
As was repeatedly found in later trips in the West, the deeply worn ruts of many of the roads gave almost as much trouble to the low-built cars as the sands. Frequent stallings in mountain streams were no unusual occurrences, but, on the whole, fairly good time was made in crossing the mountains, notwithstanding the loss of a set of ball-bearings from a front wheel with subsequent inefficient repairs by a wayside blacksmith. Travel through the "Bad Lands" was rough in the extreme, as the roads, almost impassable originally, had been rendered still worse by recent cloudbursts. The hardest climb was over Elk Mountain in Wyoming. The stretch through Laramie and Cheyenne, clear across the great plains to the Mississippi, was monotonous, but not very troublesome. From Omaha to Chicago, following the general line of the Chicago and Northwestern Railway, and thence through Cleveland, Buffalo, and Albany, to New York, the journeying was good, and was accomplished pleasantly and without much difficulty. So, on July 26, 1903, with the arrival at the great eastern metropolis, was completed the first automobile journey across the American continent, thus adding one more to the number of the expeditions, beginning with the ox-
wain and the mule-team, which started nearly a cen tury ago.
Of the three transcontinental trips made in 1903, the journey of the 12 -horse-power, single-cylinder Packard, with E. T. Fetch as driver and M. C. Krarup as observer, was the most direct and central between San Fran cisco and Denver, through California, Nevada, and


## "Old Steady" in the Bad Lands.

Utah. The start was made on June 20, and the journey was completed on August 21, in a wild night drive into New York city. The entire time on the road was 62 days, including a four-day stop at Denver for rest and necessary repairs. The car was of the regular stock type, and with two people aboard weighed nearly 3,000 pounds. Despite the severe strain to which the mechan-
one point the machine descended 800 feet in two miles practically sliding that distance in $91 / 2$ minutes under brakes. The troublesome sand in Nevada was successfully combated by using two 24 -foot strips of canvas to give traction in the worst places. The alkali marl and innumerable washes encountered in the 300 -mile stretch across the Humboldt Valley taxed the endurance of the car and travelers to the utmost. Even more annoying were the ravines and gulches of the desert, and here further trouble was caused by the depth of the ruts, the higher middle portions of the road frequently lifting the wheels of the low-built car clear off the ground. The tough sage brush not only whipped off the canvas under the engine, and the paint from the car body, but completely wore away, as well, the tough wooden handle of a shovel strapped underneath. The steep sides of many ravines were climbed by "jumping" the car by fly-wheel momentum. The worst stretch of rocky, tortuous, and bowlderstrewn road was encountered in Soldiers' Canyon, Utah.

The hardest portion of the trip was over when Denver was reached, though beyond that city barbed-wire cattle fences and irrigation ditches were often annoy ing. Through parts of Nebraska and Iowa the muddy condition of the roads made the travel almost amphibious, but through Illinois to Chicago, the conditions were excellent. From that city to New York, little trouble was found beyond occasional muddy stretches, and during this part of the trip a good daily average was maintained.
The third journey of the year, the remarkable trip in the little single-cylinder Oldsmobile, was made by L. L. Whitman and E. L. Hammond, who left San Fran cisco on July 6, bearing a letter from Mayor Schmitz of that city to Mayor Low of New York. The machine was of the regular 5-horse-power runabout type, and carried, besides the occupants, only the most necessary articles. The road lay through Sacramento, Placerville, and Carson City to Reno, and was followed in a leis urely manner, no attempt at record time being made Ogden, Utah, was reached after a hard struggle with the Great Desert of Nevada, which entailed consider able suffering from the alkali dust. During runs, which would last entire days, nothing was to be seen but sand and sage brush, but a two days' rest at Ogden thoroughly re freshed the travel fres. On several oc casions the trail of the Packard party was noticed in the desert sands.
The trip to Den ver from Reno last ed eight days, fol lowing the line of the Union Pacific Railway through Wyoming. This portion of the route was extreme ly difficult and af ter passing through Webber Canyon the terrible roads rocks, washes, and alternate adobe mud and sand gave a great deal of trouble. Som good roads wer
enstantly subjected, the interruptions due to breakdowns were trivial. The course, east of Denver lay through Omaha, Chicago, Cleveland, Buffalo, and Albany.
Crossing the Sierras from Placerville was often exciting, particularly the descent from the summit of the divide to Lake Tahoe, about 8,000 feet below, where at


A 50 Per Cent Grade 100 Feet Long.


Navigating Through Iowa Mud.
ound over the Laramie plains, but otherwise it was almost necessary, at times, to make the road. The Rockies were crossed amid clouds and rain, and to Omaha the journey was enlivened by continuous rains and seas of mud. A nine-day wait at that city for bet ter weather conditions proved to be of advantage, for with drier roads, the 600 -mile run to Chicago was made in four days. The mud was still bad however, and the sea son seems to have been one of exception ally heavy rains From Detroit to New York the conditions for travel were far better, and in one af ternoon 125 miles were covered. The city and the Atlantic were reached on September 17, after days and weeks of untiring ef fort. The travelers were enthusiastic about the machine, which was found to have stood the gruel ing journey splen didly

The transcontinenta
trip accomplished by L. L. Whitman and C. S. Carris in a 10 -horse-power Franklin car, in 1904, was remarkable in several ways, primarily as this was the first

Huss and Milford Wigle, reached the goal first, June 21, followed just one week later by P. F. Megargel and Barton Stanchfield, in "Old Steady." The cars, which
he cars were forced along through the mud under great difficulties. The distance from Omaha through Cheyenne to Laramie was safely accomplished, but the


A Western Hostelry, Cottonwood Ranch, Idaho.


The Reo Experimenting. A Combination of Sand and Snow in Central Oregon.
air-cooled car to perform this arduous journey, and as the entire time between start and finish was less than 33 days, cutting the previous record of 61 days nearly in half. The start was made from San Francisco on August 1, in a regular four-cylinder stock car, and on September 3 the wayfarers entered New York city, having made the excellent daily average of 155 miles, the highest day's run being 325 miles. The entire journey was performed without serious accident of any kind, and at the finish the machine barely showed even the slightest evidence of the numerous hard knocks and the unmerciful driving it had undergone. The most difficult portion of the trip, naturally, was that which included the crossing of the Sierras, the Rockies, and the deserts. The Sierras were crossed through Emigrant Gap, from Colfax to Reno, and here the roads were terrible. At one point a descent of 1,200 feet in one mile was accomplished. From Reno through Utah the roads were almost a negative quantity, and the deep sand, canyons, and gulleys gave the travelers a hard time of it. The performance of the air-cooled motor in the blazing heat of the desert was splendid, 600 miles of this Sahara being crossed in seven days. Through Wyoming the course followed the Northern Pacific Railroad, and was difficult in the extreme. At one place, while running at full speed, the rear axle of the car struck a concealed sawed-off telegraph post, and this resulted in a dead stop, which precipitated the occupants of the car over the dashboard. Strangely enough, the only damage caused by this accident was a bent truss rod. Good roads were found across the Laramie plains, and the descent through the Rockies was safely concluded. Good weather permitted record speed to Omaha, and from there to the Atlantic the conditions were excellent, so that this portion of the trip was a mere pleasure jaunt.

An interesting tour was that of the two Oldsmobile runabouts from New York to the Lewis and Clark Exposition last summer, for not only was the journey made by a partly new transcontinental route, but the two machines were racing for a prize of $\$ 1,000$ besides. "Old Scout," driven by Dwight D.


The Packard Ready for the Mountains or the Desert.


Rough But the Last Resort in Nevada.
were of the ordinary runabout type, left New York May 8, and remained in company until Omaha was reached. Two weeks' rain had made the roads across Illinois, Iowa, and Nebraska almost impassable, and
journey from there to Boise, Idaho, appears to have been more of an athletic contest than a road race, as to begin with the roads were usually conspicuous by their absence, or, if present, almost beyond description. Through Idaho and Oregon they encountered the best roads west of Chicago, though there was some thrilling traveling across the Cascades. The time of the winning car was 44 days, 40 days being the actual running time.

The first round trip from ocean to ocean and return ever attempted was that undertaken by Percy F. Megargel and David Fassett, who left New York in the 16 -horse-power dou-ble-opposed cylinder Reo touring car "Mountaineer," on Saturday, August 19, 1905. The Atlantic-to-Pacific portion of the trip has been successfully concluded, and the travelers are now on the return journey from San Francisco.

From New York westward to Wyoming the journeying was under excellent conditions, and 100 miles a day was easily covered. Crossing Wyoming the sand was often bad, especially in the Red Desert, and sand tires with which the "Mountaineer" was provided were very useful. The deep snow and terrific gales of the Rockies made the six days' travel over the mountains extremely dangerous, while at Bitter Creek a four days' delay was caused by an 8 -foot rise of the water after heavy rain. Despite the hard going from Cheyenne the party reached Portland safely on November 10. At the present writing the tourists are nearing Albuquerque, New Mexico, on the southern return trip from San Francisco. This part of the trip has been far more thrilling and difficult than that to Portland. Coming over the Cajon Pass in California, the travelers had a very narrow escape when the car, skidding on a sandy road, turned over completely and rolled down a steep embankment though strangely enough, without material damage to mechanism or passengers. The trip across the Great Desert was enlivened by a fierce sand storm. In the Arizona Mountains the snow was very troublesome, and near Flagstaff the travelers nearly perished in a terrible storm, being without fcod and gasoline for 36 hours. They were

rescued by a search party seeking a lost ranchman, whose body was later found within a mile of the Reoites' camp.
The brief summary given above of cars which have crossed the continent would not be complete without mention of the trip made in 1904 by Mr. Charles T. Glidden in his English Napier. This machine ran to St. Louis in the tour to the Exposition, and thence to Minneapolis, Minn., where flanged wheels were placed upon it, and it completed the trip to the coast on the railroad track. For pleasure purposes this method of making the trip would seem to be ideal. But from a sporting and machine-racking point of view, the journey as accomplished by the six American cars was immeasurably superior. The record-holder, the aircooled Franklin, is the only car fitted with a fourcylinder vertical motor, as well as the only air-cooled automobile that has ever made the trip. The other machines, also, are all of typical American construction, having horizontal single- and double-opposed-cylinder engines. Of the six successful cars, four are light runabouts, and three of these are of the same make. The American light car has thus proved itself the stanchest and most speedy of machines in a test such as has never been undertaken by European makers. Not only this, but the trip has also been made twice by motorcyclists-first in 1903 by George A. Wyman on a Yale-California machine, and second, last fall by W. C. Chadeayne on a Thomas Auto-Bi. The time of the former was $481 / 2$ days, and that of the latter 47 days, 11 hours, and 35 minutes.

A -IOTOR EQUIPMENT FOR BICYCLES. Our illustration shows a compact power outfit for converting an ordinary bicycle into a motor-driven machine. This outfit can be readily attached by anyone with the aid of a few ordinary tools, as all the parts are clamped to the frame with bolts and nuts, and there is no brazing or soldering required. As can be seen from the cut, the motor drives, by means of a chain, a rubber-covered friction wheel placed in the rear triangle of the diamond frame, directly over the bicycle wheel. This friction wheel is carried in a fork pivoted upon the vertical post, and adapted to be pressed against the tire by means of the long lever shown in front of the seat. The machine is started with the friction wheel raised, and when the rider has it fully under way, he can throw in the friction, start the motor, and proceed under its power. In coasting or when riding in a crowded street, the motor can be stopped and the friction wheel raised. This is a very advantageous arrangement, as it is not necessary to run the motor except when it is in use. The whole outfit weighs but 45 pounds, and, with a 2 -horse-power motor, the machine will carry its rider about 30 miles an hour.

## A LIGHT FOUR-PASSENGER RUNABOUT.

The single-cylinder runabout with a box behind which opens and forms an extra seat, is one of the new light cars for 1906. In our illustration, Mr. R. E. Olds, the inventor, is shown at the wheel. This car is fitted with a $43 / 4 \times 6$ engine, two speed, planetary transmission, and inclosed expanding ring brakes on the rear wheels. It is an extremely powerful little machine, capable of carrying four people 25 miles in


A 2-HORSE-POWER MOTOR WITH FRICTION DRIVE FOR CONVERTING AN ORDINARY BICYCLE INTO A POWER-DRIVEN MACHINE.
trated on page 38 , and other interesting features.

## A LIGHT AND SPEEDY RUNABOUT.

The light-weight runabout shown below is the new 10-horse-power Maxwell car intended for light and high-speed work. This machine is fitted with the usual double-opposed-cylinder Maxwell motor, placed crosswise beneath the bonnet and having a two-speed planetary transmission in the same case with the cranks of the motor, which makes it impossible for any of the movable parts to get out of line. The motor, which is a $41 / 2 \times 5$, has been considerably improved over that used last year. The heads and valves are water-cooled, which enables a higher compression to be used. The transmission is fitted with a multiple disk clutch and runs in oil. The same automatic com pression oiler is used as was employed last year on the Maxwell cars, and the rear axle and bevel gear drive are also identical. The propeller shaft has two universal joints, packed in grease. The rear axle is mounted on roller bearings. The side thrust of the bevel driving pinion is taken up by a blank roller of the same size as the driving pinion, and which is fitted against the smooth bevel face of the drive gear so as to hold the latter in position. The car is provided
with a steel body and pressed steel frame. Its official record of a mile in $1: 18$ is an indication of what may be expected of it in the way of speed on the level. The Maxwell-Briscoe Company is another firm to this year bring out a new 4-cylinder 32-40 horse-power touring car. Besides this car, the company also makes a truck and a Limousine body car. The double-oppos ed-cylinder touring car and runabout, which were so successful last year, will also still be manufactured The company now has three factories, and is turning out eight different models.

## A Motor Honse Boat.

A luxurious motor house boat is in course of construction for the Marquis de Dion, who is so closely identified with the internal combustion engine of that name. The craft is 124 feet in length, with a beam of 16 feet 6 inches and of shallow draft. The boat will be provided with a sitting and sleeping compartment combined, a dining saloon 20 feet long by 15 feet broad, bedrooms, bathrooms, kitchen, captain's apartment and quarters for the crew. With this motor water villa the owner in tends to tour the various waterways and canals of France, accompanied by automobiles, with which he can indulge in land excursions when he so desires. Later the boat will wend its way through France to Marseil les, and thence round the coast to Monaco, where the owner will winter. The vessel will have a speed varying from eight to nine miles per hour.

One of the most important moves in automobile building has been made by the American Locomotive Company. It involves the manufac ture of the Berliet car in America on the same plans and designs as are followed in the factory in France.
French workmen in Lyons and American workmen in the United States, working. simultaneously, but three thousand miles apart, in the production of automobiles, the part of which will interchange across the ocean, is a manufacturing accom plishment worthy of note. The French and Ameri can workmen might be standing side by side so closely and exactly do they follow the same standards, templates, patterns, and gages. This is done in the construction of the Berliet car, so that an American-built car may be taken for a tour in Europe, or a Lyons-built car may be brought over for a tour in this country, and repair parts which are sure to fit are available nearby in either case. This will avoid months of such delays as are very familiar to the users of foreign-built cars. This is rendered possible by the use of the metric system and by main taining the strictest conformity to standards, patterns, and gages and the closest adherence to specifications for material.

A new station for wireless telegraphy, according to the Neue Freie Presse, is being installed at Norddeich, in Germany, on the North Sea. The area covered by its operations will have a radius of over 900 miles, and will include Germany, Austria, Switzerland, France, Great Britain, and Denmark, as well as the greater part of Italy, Sweden, and Norway, and portions of Spain, the Balkan peninsula, and Russia. The station is being equipped with the Telefunken system.


## A FOUR-CYLINDER AIR-COOLED RUNABOUT

The latest application of the four-cylinder air-cooled motor to a light runabout is typified in the WalthamOrient machine illustrated herewith. In this $1,300-$ pound car the motor is placed longitudinally under the bonnet with a fan in front to blow on it. A three-speed slid-ing-gear transmission is placed back of the motor and connected to the usual uni-versally-jointed propeller shaft with a bevel-gear drive at the rear axle. The transmission is so arranged that no gears are in mesh when the car is running on the high speed. This arrangement is shown in the photograph reproduced herewith. For the intermediate and low speeds the sliding member, 4,5 , is moved to the left by shifting fork, $S$, until 5 meshes with 6 or 4 with 3 . As rod $S^{\prime}$ (upon which $S$ is mounted) is moved, it carries with it slide $G$. A roller on the end of lever, $E$, is set in a notch in this slide. The other end of $E$ fits in a shifting collar, 9 , of gear, 2 , and $E$ is mounted on a pivot at its center. As $S$ and $G$ move to the left, $E$ moves a certain distance with them, or until the roller slips out of the notch and rides upon the edge of $G$. The other end of $E$ is moved to the right and gear 2 is slid into mesh with gear 1 and held there until the high speed is again engaged. This speed is obtained
by locking the left-hand end of the lower shaft to the short right-hand end carrying gear 1 , by means of the jaw clutch, MF. The drive on the low and intermediate speeds is through $1-2-3-4$ and 1-2-6-5 respectively, while the reverse is had through 1-2-7-8-4. Pinion 8 is the intermediate pinion in mesh with 7 and running on a stud attached to the gear case. This transmission has the advantage $t h a t$ all gears on the lay shaft are idle when the car is on the h igh speed.
Another cut shows the carbureter with side broken away. The chamber on the left contains the float, which rises as the gasoline enters through the pipe in the bottom, and lowers the needle valve by means of the levers above it, until the gasoline reaches the desired level. The valve is then closed, and it


TYPICAL 3-SPEED SLIDING GEAR TRANSMISSION SHOWING DIRECT dRIVE ON HIGH SPEED.
$E$. Lever for shifting gear 2.
fork for sliding gears 4 and $5, M$, , Jaw clutch for direct through drive. $S$, , Shifting
$S^{\prime}$, Rod with notches, to which $S$ is attached. $G$, Notched slide adapted to move with rod $S$.
opens slightly to let in the fuel in proportion as it is used. The gasoline is maintained in the spraying nozzle at the level shown. The air, aspired through the lower horizontal pipe, passes up through the hood


THE FRICTION DISK DRIVE EMPLOYED ON THE BUCKBOARD RUNABOUT.
This form of drive has also been used successfully on heavy commercial vehicles and touring car
within its periphery. It is integral with the spider, $T$, and is held to its seat by the coiled spring shown When the suction of the motor increases and more air is required, this valve is raised and an additional supply of air beyond what normally passes through the holes, is drawn in. The tension on the spring may be adjusted by the milled nut, $x$, on the top of the carbureter. The engine of this runabout has a $31 / 4$-inch bore and $41 / 4$-inch stroke. It is rated at 16 horse-power. $A$ belt-driven fan running on ball bearings is used to keep it cool. A governor is fitted also. The crankshaft is supported in five long plain bearings. The 72 -pound flywhee carries a leather-lined internal cone clutch which is accessible and may be readily removed. The engine is oiled by an automatic sight-feed oiler. Jump spark ignition with separate coils, and storage batteries is used. The commu tator has a special wipe contact and is conveniently placed. The car has an 82 -inch wheel base, standard tread, and $30 \times 31 / 2$-inch tires. It will travel 40 miles an hour on a fuel consumption of one gallon per 15 miles.
The other car shown is the very light, low-powered runabout, which has been de veloped from the buckboard originally built by this company. As with the buck board, the motor is placed at the rear end
around the spraying nozzle and out through the hole at the back, which is shown in the cut half closed by the throttle. The throttle lever is seen on top. The horizontal disk above the hood and spraying nozzle has a hole in the center and a ring of smaller holes just of the car, being mounted on the frame of the body directly over the rear axle. The motor shaft is placed engthwise of the car. On its forward end is a large friction disk. A countershaft placed in front of the disk carries a friction pulley at right angles to the latter. By sliding the pulley across the face of the disk any number of $\quad d i f f e r e n t$ speeds can be ob tained. 'The reverse is obtained by sliding the pulley over to the opposite side of the disk, and any speed from the slowest to the highest can also be had in this di rection. The friction disk arrangement is shown in the cut above The countershaft drives the rear wheels by chains, as shown in the cut below. A fan is placed in front of the motor. The valves, commutators, and spark plug are readily got at from behind.

a typical flont-feed automatic CARBURETER.
$N$, Spraying nozzle. $T$, Auxiliary air valve. $S$, Adjustable spring of
air valve. $x$, Thumb screw for adjusting tension of $S . X$, Throttle air valve. $x$, Thumb screw for adjusting tension of $S$. $X$, Throttle air valv
valve.


rear view of light buckboard, showing double chain DRIVE FROM COUNTERSHAFT.

## THE FRAYER-MILLER SIX-CYLINDER AIR-COOLED MOTOR.

One of the greatest improvements in automobile mutors for this year is the development of the six-cylinder, four-cycle gasoline motor. The Napier Company, of England, was the first to bring out a racer with a six - cylinder motor, and to demonstrate the superiority of thesame motor on touring cars. A number of foreign firms, as well as several of the leading American comAmerican com-
panies, are manufacturing six-cylinder watercooled motors this year; but this year; but
the annexed ilthe annexed il
l u st ra tion shows a positive-ly-cooled waterless six-cylinder engine of $41 / 16$ bore of $41 / 16$ bore
by $51 / 8-\mathrm{inch}$ stroke, which is capable of
developing 50 horse-power. The cylinders are cast with pinlike projections around the heads, as shown in the smaller cut. The valves are attached to each side of a cylinder head, and the whole cylinder is jacketed with an air jacket of aluminium. Air is blown by a powerful blower, gear-driven from the crankshaft in front of the motor four times as fast as the motor revolves. A pressure of about 2 ounces is produced in the large pipe running over all the cylinders, and this pressure is sufficient to force the cooling air down through the jackets and pins which project from the cylinder walls. So efficient is the cooling, that a relatively high compression-75 pounds-can be used without danger of premature explosions from heat. This system is one of the few in which the motor is positively cooled at all speeds. The car upon which this motor is mounted is fitted with a four-speed, selective-type transmission and bevel gear drive to the rear axle. Non-adjustable ball bearings are used liberally throughout the car, both in the transmission and the rear axle. The wheel base of the machine is 100 inches, and the tires $34 \times 4$. The difference in smoothness of running between a four-cylinder and a six-cylinder motor is found in the almost imperceptible impulses obtained from the latter, while those of the four-cylinder are distinctly noticeable. Furthermore, the six-cylinder engine is so flexible that the car can be driven at any speed from 4 to 60 miles an hour on the fourth speed gear under throttle control.

## THE MARMON AIR-COOLED TOURING CAR.

The main features to be noted about this zar are the carrying of the entire power mechanism on an independent triangular
sub-frame, the elimination of chains and universal joints, and the mounting of both the body frame and sub-frame upon three pivoted points, which gives it extremely easy riding qualities. The photographs reproduced herewith show the general appearance of the


SIX-CYLINDER AIR-COOLED MOTOR OF THE FRAYER-MILLER CAR.
A gear-driven blower in front maintains an air blast in the pipe and down through the aluminium air jackets. The
spark plags are in the cylinder heads. Three pipes from the carbureter supply the three pairs of cylinders. Note also spark plugs are in the cylinder heads. Thre
the vertical fender from mud guard to frame.


CYLINDER, AIR JACKET, AND PISTON OF FRAYER-MILLER MOTOR
The cylinder has small beat-radiating pins cast on it,
as has also the under surface of the piston head. The as has also the under surface of the piston head. The
valves are bolted to cslinder head. The spark plug in valves are bolted to cylinder head. The sp
top is got at through hand hole in bus pipe.
ing a short distance forward. The cross member of the sub-frame is pivoted at each end; and has rising from its center a pivotal support for the main frame. This pivot allows the latter frame to tilt and assume any inclination given it by the rear springs, which support its oth er end. A vertical move ment of either front wheel does not affect the main frame in the least (as shown in the cut), and it merely causes the sub-frame to rock around itspointof support at the rear without any strain to the mechanism this frame carries. A vertical movement of eitherrear wheel, on the other hand, tips the main frame corre spondingly but affects the subframe not at all, saveto raise its rear end the same distance the rear axle rises
in the center. Thus it can be seen that neither frame is submitted to any twisting strains whatever, and that the carriage body is not affected by obstructions passed over by the front wheels. Both frames are of armored wood. The sub-frame consists of an oak I-beam inclosed in steel.
The motor is a $45 / 8 \times 51 / 2$-inch four-cylinder engine with cylinders in pairs set at an angle of 90 deg. It develops 28 horse-power at about 1,200 R. P. M. The valves are in the cylinder heads, operated mechanically, and fitted with large spiral springs. A belt-driven fan sends a powerful draft of air between the cylinders, and a plow within the bonnet diverts it to the heads. The draft produced by the motion of the car strikes the heads directly by passing through openings in the sides of the bonnet. An oil pump in the base of the crankcase forces oil from an oil well through a suitable pipe and stuffing box into the front end of the crankshaft. This is hollow and has small holes opening into all the bearings. The crank pin boxes have corresponding holes connected by straight oil pipes to the wrist pins, so that the oil is forced to all parts of the engine, and a spray of oil, exuding from the bearings, lubricates the pistons. A gage on the dash indicates the oil pressure. The twospeed planetary transmission is carried on the propeller shaft, which is without support between the engine and the foremost of the two bearings that carry its rear end. The transmission is without internal gears. Its three sets of three pinions are each formed from one piece. The clutch and bronze brake bands are large and run in oil. The reverse can be used as a brake if
(Continued on page 49.)


THE MARMON AIR-COOLED TOURING CAR WITH ALUMINIUM BODY AND DASH.
Note the fenders between running board and body in addition to those over the wheels.


THE $45 / 8 \times 51 / 2$ MARMON AIR-COOLED MOTOR, SHOWING PIPE CONNECTED 45/8 $\times 1 / 2$ MARMON AIR-COOLED MOTOR, SHOWING PIPE CONN
TO HOLLOW CRANKSHAFT FOR CIRCULATION OF OIL FROM
TANK IN BASE.

## A REVOLVING-CYLINDER MOTOR CAR.

A machine of distinctive design, and having a motor of decidedly original construction is illustrated herewith. This machine showed its capabilities in the Chicago-St. Paul tour last July, when it covered the 500 -odd miles through mud and rain in good time, it making the best time of the two air-cooled cars which completed the run.

The motor of this car is similar to the Balzer engine described in our 1904 Automobile Number, the main difference being that the former has its cylinders revolving in a horizontal instead of a vertical plane. The A. F. motor is controlled by variable compression, the charge from one cylinder being almost entirely expelled and sucked into another when the engine is running light. The carbureter is replaced by a gasoline pump which sprays the fuel through a pipe, $P$, into chamber, $C$, containing a leather gas-supply bag from which the gas is drawn to the cylinders through passages, $D$. The mixture is obtained by regulating the stroke of the pump. The spark is adwanced automatically according to the speed of the motor. A positive-feed oil pump lubricates all parts of the motor with certainty. A single spark coil with vibrator answers for all the cylinders. The spark jumps outside the motor from the stationary conductor, $B$, to the porcelain binding post, $F$, on the revolving crankcase, whence the secondary current passes through a wire to the plug, $G$. The inlet and exhaust valves are in the cylinder heads, each pair being operated by a single lever pivoted between them and rocked by suitable cams in the crankcase. Auxiliary exhaust ports, $E$, with wire gauze, make a muffler unnecessary The entire power plant, transmission included, weighs 480 pounds, 230 pounds of which represents the weight of the motor. The revolving part of the motor-cylinders and crankcase-weighs 190 pounds; so that, although there is no flywheel, the effect of a 190 -pound flywheel is obtained. The motor weighs only 9 pounds to the horse-power. At a speed of 600 R . P. M. the air rushes over the longitudinal flanges of its cylinders at the rate of a mile a minute. This positive cooling of the cylinders at all speeds and without the use of fans or blowers, is the one chief feature of this car. Because of it, the car scan be run at all times and under all conditions without loss of power from overheating. A $5 \times 5$ five-cylinder mator giving 45 horse-power is
ment of sliding gears used in connection with it makes possible the obtaining of two more speeds ahead and another reverse. The countershaft carrying the transmission is directly below the motor and is driven through bevel gears. A single chain from it to the
the largest engine that has been built thus far, but engines of still greater horse-power could no doubt be made to run successfully.
The transmission is of the planetary type giving two speeds ahead and a reverse, but a simple arrange


THE 43/4 $\times 51 / 2$ KNOX 4-CYLINDER AIR-COOLED MOTOR.
Note the auxiliary coil springs on rocker arms of iniet valves; also wires running direct to spark plugs from
high tension distributor on gear-drıven magneto. The carbureter and fan are also plainly visible.


THE NEW MERCEDES-TYPE SELECTIVE TRANSMISSION HAVING A DOUBLE
BEVEL GEAR DRIVE.
THE NEW MERCEDES-TYPE SELECTIVE TRANSMISSION HAVING A DOUBLE
BEVEL GEAR DRIVE.
differential on the live rear axle transmits the power Because of the light weight of the power plant, the car with its heavy closed body weighs only 2,000 pounds. The steering control levers can be quickly changed to the inside if necessary, and the front seat and footboard be closed. The car is thus an ideal two-passenger car for stormy weather or a five-passenger open car (by letting down the windows) for fair weather.

## A NEW FOUR-CYLINDER AIR-COOLED MOTOR AND SELECTIVE-TYPE TRANSMISSION.

A new form of selective-type transmis sion giving four speeds ahead and a reverse, with direct drive on the high speed, is shown in the annexed cut. The main shaft, $A$, is very large in diameter, and has four integral fluted keys to drive the sliding gear members. It is coupled directly to the clutch shaft of engine and runs in bearings, $P P$, the rea bearing being bolted to the bottom of the case and also braced by arm, $O$, which is arched over the cross shaft to the rear end of case. The second motion shaft, $B$, runs in bearings, $P^{\prime} P^{\prime}$, and has gears, $F G H$, rigidly secured on it. The dif ferential gears are of the bevel style and are inclosed in the perforated case, $M$, which has its ends extended from sleeve, $M^{\prime}$, and runs in bearings, $P^{2} P^{2}$. Brake drum, $N$, is firmly secured to case, $M$, and has two metal shoes which are applied by a pedal. Two bevel gears are secured to the periphery of $M$. One, $L$, is the direct high-gear drive, meshing with pinion, $I$, and the other is the drive for lower speeds, meshing with pinion, $J$, on the second motion shaft. Bevel pinion, $I$, is integral with internal gear, $V$, and runs on ball bearings on shaft, $A$, except when it is clutched to this shaft by sliding the gear, $E$, into mesh with $V$, by means of fork, $Q$, and shifter bar, $Y_{3}$, giving fourth speed on direct drive. On this drive bevel gears, $J$ and $K$, and shaft, $B$, are running idle, and gears, $F G H$, are not in mesh. Meshing $E$ with $H$ gives third speed. By means of fork, $R$, and shifter bar, $Y_{2}, D$ is meshed with $G$ for second speed or $C$ with $F$ for first speed, $C$ and $D$ being integral. Reverse gear, $W$, is mounted between two supports on the bottom of case and shifted by fork, $S$ and shifter bar, $Y^{\prime}$, into mesh with $C$ and $F$ for the reverse motion. Spring-pressed balls in the cases, $U$, (Continued on page 49.)


AN EX-SPEAKER AND A WELL-KNOWN SENATOR READY TO RIDE IN AN ADAMS-FARWELL REVOLVING-CYLINDER MOTOR CAR


THE MOTOR AS SEEN WHEN BACK COVER IS RAISED. The motor is located underrear seat and can be readily inspected from behind the car.
Parts: $\boldsymbol{A}$ revolving crankcase ; $\boldsymbol{B}$, arm carrying insulated sector to which jump Parts: $\boldsymbol{A}$, revolving crankcase; $\boldsymbol{B}$, arm carrying insulated sector to which jump.
spark is attached; $\boldsymbol{C}$, gasoline tank and carbureter; $\boldsymbol{D}$, inlet and exhaust passages to valves in head, $E$, auxiliary exhaust ports $; F$, porcelain binding post



MOTOR WITH ONE CYLINDER REMOVED, SHOWING ARRANGE MENT OF THREE CONNECTING-RODS ON ONE CRANK.

THE CADILLAC SINGLE-CYLINDER LIGHT TOURIYG CAR.
The graceful lines of the new sińgle-cylinder Cadillac are apparent from our illustration. As far as the mechanism is concerned, this has undergone no radical change since the first car was built over three years ago. The workmanship is so good that many of the early cars are still in use to-day after receiving many hard knocks, yet being in constant service for several seasons. Simplicity and service are the things for which this car is noted chiefly. It is so constructed that any of the parts (including the crankshaft bearings) may be readily and cheaply renewed. Its single cylinder is fitted with a copper water jacket which is clamped in place without the use of gaskets. A thorough water circulation is maintained by a positive-ly-driven centrifugal pump. The carbureter consists of a simple mixing valve operated by the suction of the motor. The spark plug is made up of two mica plugs set in a suitable cap. As both terminals of the plug are insulated, it does not shortcircuit readily. The 1906 car is fitted with a mechanical oiler driven by a cam on the countershaft. This oiler forces oil through large pipes to the bearings, cylinder, and crank, the result being that the wearing parts are always properly lubricated. A very good feature of the car is that the starting crank can only be put on when the spark is retarded-an arrangement which makes a "kick back" of the engine impossible. The bore and stroke of the motor is 5 inches. Eight horse-power is guaranteed at the start, but after an engine has been run several months, a brake test
will often show 10 horse-power or over at $1,300 \mathrm{R}$. P. M The runabout will go 20 to 30 miles on a gallon of fuel and the touring car 17 to 20 . On English roads as high as 40 miles on a gallon has been attained. The front end of the machine is supported by a transverse


THE NEW CADILLAC 8-HORSE-POWER SINGLE-CYLINDER TOURING CAR.

## THE OLDSMOBILE TWO-CYCLE AND FOUR-CYCLE

 TOURING CARS.The Olds Motor Works have this year brought out a new, light, side-entrance tonneau, shown herewith, which has for its motive power a two-cylinder, vertical, two-cycle engine, placed in front under the bonnet. The chassis of this car is identical with that of the larger four-cylinder fourcycle touring car. The front end of the two-cycle chassis is shown herewith. 'The motor is substantially constructed, having a large crankshaft and bearings 3 inches long. The latter have adjustable boxes for taking up the wear. A relatively high compression (about 8 pounds) is obtained in the crankcase, the space of which is filled by aluminium disks on the crankshaft. The transfer ports are of liberal dimen sions, and as direct as it is possible to make them. The result is that about 25 horse-power is obtained with two $5 \times 5$-inch cyl inders. This power is transmitted to the rear wheels through a threespeed sliding-gear transmission of the selective
spring mounted on a rocker which sets upon the up wardly-curving tubular front axle. Thus the axle can be raised at either end without affecting the body in the least. The car is fitted with double band brakes on the differential, which is driven from the engine by a hardened detachable roller chain of the cotter-pin type. The Cadillac company are also making two fourcylinder cars having $43 \times 5$ and $5 \times 5$ engines respectively and being fitted with their three-speed planetary gear. These cars are very similar to that illustrated in our issue of December 16 last.
type and the usual universally-jointed propeller shaft and bevel gear drive at the rear axle. The latter is fitted with roller bearings, while the transmission has babbitt bearings, lubricated by oil-soaked waste. The transmission gears are of high-carbon steel, tempered and hardened. The lower half of the transmission case is removable, and the upper half is provided with an inspection cover for examining the gears. The view of the chassis from beneath shows very distinctly the arrangement of the different parts. A universal joint
(Continued on page 50.)

front end of chassis of olds 2-cycle car, which has TWO $5 \times 5$-INCH CYLINDERS.


THE 4 $1 / 4 \times 43 / 4$, 4-CYLINDER, 4-CYCLE OLDS TOURING-CAR MOTOR.

the olds light, 2-Cylinder, 2-CYCLE touring car. WEIGHt, 1700 POUNDS.


UNDER SIDE OF CHASSIS OF OLDS 4-CYLINDER CAR. A TYPICAL CHASSIS WITH bEVEL GEAR DRIVE.

A DETACHABLE LIMOUSINE TOURING CAR.
A strong, well-built touring car having a detachable Limousine top and several other novel features, is that made by the Welch Motor Car Company, of Pontiac, Mich. This machine has a standard $45 / 8 \times 5$-inch four-cylinder motor, having a range of from 150 to 1,800 R. P. M., and rated at 30 to 36 horse-power. The top view of the motor, shown herewith, gives a good idea of the arrangement of the valves in the cylinder heads. The latter are made as near spherical as possible, so that the wall surface exposed to the flame is about one-third less than in the usual motor. This arrangement allows of the charge entering the cylinder quickly and in a cool condition. A full charge is drawn in and expelled from every cylinder during each two revolutions of the crankshaft. This form of cylinder and arrangement of valves is similar to that of the Fiat engine, which, it will be remembered, made such a remarlable performance in the Vanderbilt cup race last October. The burning of the charge is said to be quicker and more complete in a spherical combustion chamber, as the flame does not have to travel more than one-fourth as far as it otherwise would, in order to complete the ignition of the charge. Furthermore, the loss of power through the absorption of heat by the cooled cylinder walls is also largely cut down. On account of these facts, the makers ciaim 20 per cent more power than is obtainable with motors of the same size and of the usual construction. The perfect combustion of the charge and the straight exit it makes through the valve in the head eliminate all exhaust valve troubles, and make the motor particu larly reliable.
The transmission used on this car has its gears always in mesh; but, by means of individual, multipledisk clutches, no gears are running on the high speed. There are but two speeds forward and a reverse. Two multiple-disk clutches, of 150 square inches friction surface each, and a sliding jaw-clutch, are used to obtain these three speeds. All speeds are obtained with a single lever at the right of the driver, and the car can be thrown instantly from the high speed into the re verse.

A novel feature of this car is the arrangement of the pump (which is of the centrifugal type) in the center of the honeycomb radiator. The spindle of the pump projects through at the back of the radiator, and has the fan mounted upon it. A pulley on the hub of the fan is driven by a belt from a corresponding pulley on the crankshaft. The valves


THE 1906 PEERLESS 30-35-HORSE POWER TOURING CAR HAVING SHAFT DRIVE AND 4-SPEED TRANSMISSION.
of the motor, which are set at an angle of 45 degrees are operated by a central camshaft running over the cylinders and driven by bevel gears from the crankshaft. The timer is also located on a vertical bevel gear-driven shaft, at the forward end of the motor High compression is used in this engine, and is said to make it very efficient
The radiator contains 13,500 square inches of radiat ing surface. It is made up of seamless brass tubing and, although all the tubes form a solid mass, any one tube can be easily removed and replaced, if necessary If the pump should cease to work, the radiator would still operate on the thermo-siphon principle. This car is noted for the use of plain bearings almost through out. These are very generous in size, and are made invariably of steel on bronze, each bearing being automatically flooded with oil. A telescopic steering post is one of the novel features of this machine, and is an arrangement which adds greatly to the comfort of the driver in getting in and out of the car. The Welch machine is one of the largest and most handsomely finished American touring cars. Besides the novel fea tures in its construction, the fact that the closed Limousine top may be removed wholly or in part makes it a particularly useful car for all-year service.

THE PEERLESS 30-HORSE-POWER TOURING CAR.
The new touring car put out by the Peerless Com pany, while having no very radical changes over las year's machine, has been improved in various places and brought thoroughly up to date. The cylinders of the motor are cast in pairs, with inlet and exhaust valves on either side and mechanically operated by separate camshafts. All the valves and valve springs are interchangeable. The cylinder castings are im ported from France, and great care is taken in the boring and finishing of the cylinders. The bore and stroke of these cylinders are $41 / 2$ by 5 inches, and the motor develops its full power at 1,000 R. P. M. Al gears, as well as the water pump and governor, are completely in cased. The motor is lubricated by the splash sys em, the oil being fed by a mechanical lubricator An automatic float-feet carbu reter having a water jacket sup plies the gas to the engine. Ignition is by storage batteries and in dividual coils. The commutator is located just back of the rear cylinder, it being set at an angle of 60 degrees and driven by bevel gears from the camshaft. The commutator consists of a roller
(Continued on
page 50.)


TOP VIEW OF THE WELCH $45 / 8 \times 5,4$-CYLINDER MOTOR.
The valves set at an angle of 45 deg. in the cylinder heads and operated mechanically by rocker arms moved by a
central longitudinal cam shaft, are the main features of this engine. The commutator is on the left-band end of camcentral longitudinal cam shaft are the main features of this engine. The commutator is on the left -band end of cam-
shaft, the other end of which is driven by an incased bevel gear. The spark plugs are seen in the crlinder beads, the
8-feed mechanical oiler beside the npper frame, and the individual exhaust pipes and twin water pipes, as weil as the 8-fee mechanical oiler beside the npper frame, and the indiviual exhaust pipes and twin water pipes, as well as the
belt-driven fana, are also distinctly visible, The long rod at the bottom of cut is the patent telescopic steering column.


THE 30-36-HORSE-POWER WELCH 4-CYLINDER TOURING CAR TO WHICH A LUXURIOUS LIMOUSINE TOP CAN BE ATTACHED.

Note the heavy I-beam front axle and the centrifugal water-circulating pump in the center of the radiator. The latter is novel and distinctive feature of the Welch car,

## HIGH-POWERED AMERICAN TOURING CARS.

 CLEVELAND 30 -HORSE-POWER TOURING car. A substantially-built touring car of modern construction is the 30 to 35 -horse-power Cleveland shown in the annexed illustrations. This car is thoroughly up to date and, besides the usual three-speed transmission three - speed transmission has several improvements that are usually found on the best foreign cars. The first of these is the adoption of the low-tension make-and-break system of ignition with a gear-driven Sims-Bosch magneto as the source of current. The operation of the igniters is shown in the smaller cut. By referring to this cut, the reader can see that the chief parts of each igniter mechanism consist of a small camshaped projection, $T$ (which is part of the movable stem of the igniter) ${ }^{\text {i }}$ and a long finger, $D$, which is mounted upon. an eccentric and is clamped to a vertical rod driven by bevel gears from the camshaft. Another eccentric, $E$, is placed beside the finger, $D$, and the latter is held against $E$ by a light spring, $F$. Another light spring, $S$, separates the electrodes after they are pressed together by the finger, $D$, and then suddenly released. A reciprocating motion is given $D$ by the eccentric upon which it is mounted, and as it approaches the finger, $\boldsymbol{T}$, it is pushed side-

FRONT VIEW OF CLEVELAND MOTOR WITH GEARS EXPOSED

Note make and break igniters with knifeswitches above on left and
eear-driven magneto below; also centrifugal water pump and pulley for fan on gear-driven shaft on right. The large waars pure on the cam silafts
for operating the valves. These shafts run thaf the speed of the motr for operating the valves. These shafts run at half the speed of the motor.
The vertical rod on left-hand side of motor operates the igniter mechanism The vertical rod on left-hand side of motor operates the igniter mechanit.
of the forward cylinder and is revolved by a bevel gear on the camshaft.
ways by the eccentric, $E$, so that after it has moved $T$ a certain distance and made the contact within the cylinder, it slips off $T$ and allows the latter to spring back, under the influence of the spring, $S$. The result is the circuit is made and quickly broken, which gives a large


THE 30-35-HORSE-POWER CLEVELAND 4-CYLINDER TOURING CAR.
practice is to inclose all the gears and run them in an oil bath, which gives them a long life and does not produce much noise. The motor is buil strongly and of the best material. It is lubricated by a force-feed oiler, which supplies oil to all of the bearings. The crank-pin bear ings are fitted with patent ring oilers, with which the oil is thrown by centrifugal force into the hollow crank-pin. The cylinders are $41 / 8$-inch bore by $51 / 4$ inch stroke. The transmission gives three speeds forward and a reverse, with a direct drive on the ligh speed. It is connect ed with the rear axle through the usual propeller shaft having two universal joints, the rear most of which is provided with a slip joint, to com pensate for the vertical movement of the car upon its springs. The rear axle is of the usual tubular type, with which the wheels are carried upon ball bearings. The differential gear within this axle, and the live axles
spark. The insulated post of the igniter is shown just at the left of $F$. This is connected to a common busbar by means of switches, seen above the motor in the other view. The system of levers, $H, H, H$, are connected so as to rock the different eccentrics, $E$, and cause them to throw the rods, $B$, out of contact with the fingers, $T$, earlier or later. The spark is retarded in this way when starting, and afterward it is set about at dead center. As the magneto speeds up, the spark increases in volume and ignites the gas quicker, which has the same effect as an automatic advance. The end view of the motor shows the two half-speed


IGNITER MECHANISM OF ONE PAIR OF CYLINDERS OF CLEVELAND TOURING CAR.
gears in mesh with the smaller gear on the crankshaft. These drive still smaller gears, which rotate the water pump and fan (through a belt) and the magneto, respectively. The illustration shown above on the left is a typical end view of a modern motor having valves placed symmetrically on each side. The present
which drive the wheels, all run on ball bearings. In ternal expanding brakes are placed in the rear wheels. The muffler of this car is much like that of the Rich-ard-Brazier. It is composed of concentric tubes having perforations of sufficient area to allow the gas to expand from one chamber to the other without back pressure. Flattened tubes projecting back of each rear wheel emit the exhaust gases, which lay the dust rather effectually. The machine is fitted with $34 \times 4$-inch tires, (Continued on page 51.)


GEAR BOX OF THE ROYAL TOURING CAR
This is a typical 8 -speed sliding-gear transmission. The hangers are on
the to of gear box, which also carries intermediate pirion for the reverse. the top of gear box, which also carries intermediate pini ion for the reverse
The single sliding member on square lower shaft is moved by a fork fitting The single sliding member on square lower shaft is moved by a fork fitting
in collar between the two gears and mounted on a slidable rod carried in
top of case. The jaw teeth on right side of sliding top of case. The jaw teeeth on right side of fliding member engage similar
teeth in extreme right-hand gear for producing the third speed, which teeth in extreme right-hand gear for producing the third speed, w.
gives a direct through drive from one end to the other of lower shaft.


THE 32-38-HORSE-POWER ROYAL TOURIST, WHICH WAS DEVELOPED FROM THE VANDERBILT CUP RACER.


THE 4 $1 / 2 \times 5$ ROYAL ENGINE, SHOWING BEVEL-GEAR-DRIVEN PUMP AND COMMUTATOR.


The Haynes $\mathbf{5 0}$-Horse-Power Touring Car.


The 1906 Lane Steam Touring Car. This is One of the Few Steam-Propelled Cars still Manufactured.


The Rambler 18-Horse-Power Double-Opposed-Cylinder Touring Car.


The New Grout 30-35-Horse-Power, 4-Cylinder, Gasoline Touring Car.


The 40-45-Horse-Power Columbia Heavy Touring Car.


The 45-60-Horse-Power New American Mercedes. An Exact Duplicate of the Famous German Machine.


The 16-Horse-Power $11 / 2-T o n$ Truck of the Rapid Motor Vehicle Company.


The 20-rassenger Oldsmobile Bus ritted With a 16-Horse-Power, 2-Cylinder, Vertica!

## a NOVEL 4-CYLINDER TOURING CAR.

The new Northern touring car is of the 4 -cylinder type. The cylinders and water jackets are all in one galvanized casting, the cylinders being properly spaced to allow of a thorough circulation of water. The bore and stroke of the motor are $41 / 2 \times 5$. It is rated at 30 horse-power, and, at 900 R. P. M., will drive the car


Fig. 1.-FRONT END OF NORTHERN TOURING CAR.

at a speed rate of 30 miles an hour. The crankshaft is offset slightly from the center line of the cylin ders in order to get a better leverage on the power stroke, and the same practice is followed with the cam shaft, which is placed at one side of the valve stems instead of directly under them. The engine has liberal hand holes in the base for aujusting the crankshaft bearings. The valves are all in the heads, and are operated mechanically by tappets and push rods. The eight rods can be seen on the left side of motor in the cut. The carbureter, a small float-feed affair, is fast ened to the inlet pipe, $I$, at $O$. No special water pump is used, the inclosed 2 -to- 1 gears at the front end of the motor being made to serve this purpose. The water pipe is shown running from the base of the for ward cylinder to the incased gears. The pipe, $W$, on the other side conveys the water to the radiator, and thence to the water jacket. The radiator, which is not shown in this view, is placed as usual in front. The commutator is located at $C$ on the same shaft with the 2 -to- 1 gear. It is readily accessible, as can be seen While these are novel features, they are by no means the only original ones about the car, for the control, clutch, and transmission are all along novel lines. An air compressor ( $A$, Fig. 1) is driven by a crank on the camshaft. A valve on top makes it possible to obtain any desired pressure up to a certain point. A pipe runs from the compressor to the forward end of the crank shaft, which is made hollow throughout. The flywhee contains an annular chamber, in which are two stee disks separated by two thin disks of fiber. The rear most steel disk is connected to the propeller shaf through a universal joint. Both disks, as well as the joint, are thoroughly inclosed and protected. The chamber in the flywheel is air-tight, and by admitting the air pressure between the disks it locks them to the


Fig. 2.-CONTROL APPARATUS OF NORTHERN CAR.
The gears are shifted by the smalier whee within the sterine wheel.
flywheel, which then drives the propeller shaft. The disks are 11 inches in diameter and with 75 pound air pressure, three tons driving pressure is obtained in the clutch. By opening the air valve a little at a time, the clutch may be made to take hold very easily and without any jerks. The transmission is located just in front of the rear axle, and the only connection,
in addition to the propeller shaft, which it has with the front of the vehicle is a single rod for shifting the gears. This rod is connected so as to be operated by a smaller wheel within the steering wheel. The reverse is obtained by depressing a pedal on the steering column. It is impossible to throw the reverse into action unless the gears are in neutral position. The great strength of the rear axle and the wide band-brakes employed on the hub of the rear wheels can both be seen in Fig. 3, which also shows the long muffler tubes extending nearly the whole length of the body underneath the same. The band brakes are operated by compressed air, and are very powerful. The bands are $31 / 2$ inches wide. Inside the brake drums are expanding ring brakes 3 inches wide. These are operated by a pedal, and are to be used in case of emergency

Still another novel feature of the new Northern tour ing car is the lever starting apparatus shown in Fig. 1. This consists of a long lever having a pawl engaging with a ratchet-toothed wheel on the motor shaft, and thus making it possible to turn the motor over easily by a series of pulls straight from the shoulder, instead of having to swing a large crank. Grease cups on the bolts of the springs keep these properly lubricated at all times. This is one of the minor details of the car, but one which shows how much thought and ingenuity have gone into its construction

The control of the machine is almost entirely by the three small levers and the two wheels shown in Fig. 2. The smaller wheel, as previously stated, shifts the gears and gives the first, second, and third speeds forward. A direct drive is obtained on the high speed. By turning this wheel back to the neutral position, and depressing the pedal at the base of the steering column, the reverse is obtained. The small lever, $B$, operates the clutch, while the lever, $A$, is for advancing or retarding the spark. Below the steering wheel is the throttle lever, $\boldsymbol{C}$. Moving this forward opens the throtthe, while moving it backward closes the throttle and applies the air brakes. Thus it can be seen that the car is controlled almost entirely by the back-and-forth movement of this one lever. The location of the steering column on the left side of the car is an advantage in passing through traffic, as it enables the driver to see what is in front of him before turning out for a vehicle. Furthermore, when approaching a curb, the empty seat is always next to the latter, and it is not necessary for the car to be turned around. The weight of this car is approximately 2,300 pounds, and the speed possible to obtain with it is in the neighborhood of 50 miles an hour. The car has a wheel base and a body capable of accommodating five people. It is shod with $32 \times 4$-inch tires. Besides this new car, which is constructed under the patents of Charles B. King, the Northern Manufacturing Company still builds its double-opposed-cylinder touring car and its singlecylinder runabout. A feature of the former car is the use of interchangeable bodies, which makes possible a closed Limousine for winter, or an open side-entrance tonneau for summer use.

## A SILENT NON-ADJUSTABLE BALL BEARING

Ball bearings were originally used on some of the first automobiles constructed in this country; but owing to the constant trouble which they gave, most of the makers discarded them. During the last two years a new type of ball bearing has been developed in Germany, and has found its way into use on many of the leading foreign cars. Owing to the fine quality of steel used in its manufacture, and to the great care with which the balls are examined and tested, this bearing has shown itself to be very reliable under almost all conditions. Its friction is so small that the loss amounts to only $1-8$ or $1-6$ of one per cent of the total load carried, instead of from 3 to 5 per cent; while the start ing friction is no greater than the friction when running. The new bearing consists of two annular ball races, each of which is in one piece. By placing the outer ring in a position eccentric to the inner one, the balls can be slipped into place with the coiled springs between them. The latter keep the balls separated, so that there is no clicking sound as they drop over the top of the bearings, such as is the case with the ordinary bearing. A wool pad placed inside the spring absorbs sufficient oil to keep the balls lubricated for long periods. The balls and races are made from a special high-grade steel. Both are very hard and tough, and have a high polish. Numerous tests are constantly made of sample sets of bearings, in order to be certain that the quality is maintained and in order to improve, if possible, this quality. result of such tests the manufacturers have discovered a new steel alloy that allows the load on the bearings to be doubled. But one ring of balls is used in any bearing, the result being that the space required is much smaller than is usual. The fewer balls used also tend toward simplification, These bearings are
used almost universally in the transmissions and wheels of high-grade cars. The Daimler Company has become a convert to their use on the engine crankshaft, and both the Mercedes and Hotchkiss machine use them in this important part. Their high efficiency and the little attention which they require make them ideal for automobile service.

## The Carrent supplement

Jacques Boyer opens the current Supplement, No 1567, with a most thorough article on the methods


## Fig. 3.-NORTHERN REAR AXLE

The wide band brakes are applied by compressed air. Expanding emer-
gency brakes are connected with a pedal. The long muffler tubes can be seen on each side beneath the body
employed in France for fattening fowls. Wonderfully sharp and clear photographs accompany his text John C. Sparks gives some wholesome advice on the subject of boiler compounds. Of the interesting feat ures of modern constructive practice which call for appraisement, either from their extreme novelty or successful application, none holds so high a place as the remarkable adaptability of armored concrete to the many and varied engineering requirements of the times. For this reason Lieut. Henry J. Jones's thor ough discussion of the subject will doubtless be read with interest. Sir Oliver Lodge, in a most striking paper entitled "A Pertinacious Current; or, the Stor age of High-Tension Electricity by Means of Valves,' shows how it is possible to dissipate fog or smoke o to deposit metallic fumes. A tunnel was recently bored through the Santa Cruz Mountains which is of engineering interest, inasmuch as it is approached at one end through a concrete retaining wall or dam that has stood for over eleven years without the leas sign of cracks or any failure whatever. Mir. Herber I. Bennett describes this wall and its method of con struction. Prof. A. E. Outerbridge reviews recen progress in metallurgy. The Generation of Ozone by Means of Ultra-violet Light is briefly described.

Offcial Meteorological Summary, New York, N. Y., December, 1905

Atmospheric pressure: Mean, 30.09; highest, 30.86 lowest, 29.46. Temperature: Highest, 57; date, 3d lowest, 19; date, 1st; mean of warmest day, 48; date $3 d^{\text {a }}$ and 29th; coldest day, 24 ; date, 15 th; mean of maxi mum for the month, 43.6; mean of minimum, 31.8 absolute mean, 37.7 ; normal, 34 ; average daily exces compared with mean of 35 years, +3.7. Warmes mean temperature for December, 42, in 1891. Coldes mean, 25, in 1876. Absolute maximum and minimum for this month for 35 years, 68, and -6. Average daily excess since January 1, +0.2 . Precipitation 3.67; greatest in 24 hours, 1.38; date, 20 th and 21st


THE HESS-BRIGHT NON-ADJUSTABLE SILENT BALL BEARING USED ON MANY HIGH-GRADE TOURING CARS
average for this month for 35 years, 3.40 ; excess +0.27 ; accumulated deficiency since January $1,-0.17$ Greatest precipitation, 6.66 , in 1884 ; least, 0.95 , in 1877. Snow, 0.7. Wind: Prevailing direction, west; total movement, 10.774 miles; average hourly velocity 14.5 miles; maximum velocity, 64 miles per hour. Weather; Clear days, 8; partly cloudy, 12; cloudy, 11.

A TIRE BUILT TO REPLACE THE PNEUMATIC AND CARRY YOU OVER ANY ROAD WITHOUT TIRE TROUBLENO EXCESSIVE VIBRATION. THIS TIRE IS FULLY GUARANTEED


CONDITION OF ROADS NO BARRIER TO THESE TIRES. WON'T COME OFF. WILL FIT CLINCHER RIMS. WILL OUTWEAR 3 TO 5 SETS OF PNEUMATICS. WILL ABSOLUTELY ELIMINATE TIRE TROUBLE

## REDUCE UPKEEP OF CAR

Over 2000 owners who were formerly prejudiced against solid tires are now staunch friends of the Swinehart Tire and maintain that the machinery of their cars has not been injured in the least and recommend the tires to their friends.

FOR AN UNBIASED OPINION ASK THE USER OF A SWINEHART TIRE FOR DETAILED INFORMATION WRITE FOR CATALOG "S." UNEQUALLED FOR DURABILITY RESILIENCY

RELIABILITY

## The Swinehart Clincher Tire and Rubber Company

## Automobile Novelties and Improvements.

## THE GABRIEL HORN.

During the past year many large cars have been fit ted with a compound horn, or whistle, giving a musical


EXHAUST-BLOWN HORN SOUNDING AN OCTAVE.
note of varying pitch and intensity. This horn is worked directly from the exhaust pipe of the motor, and it can be applied to any multiple-cylinder car. An improved horn of this type, having eight separate pipes, has recently been put on the market. The new horn is a sort of miniature pipe organ, being operated by a keyboard and being capable of sounding a full octave. The improved horn can be made to play a tune when a musically-inclined person fin gers the keyboard

[^0]guide boards, by which the tourist may be forewarned and his course directed to the avoidance of these pitfalls. Many of these danger signs have already been put up, and the Pittsburg Board of Consuls of the American Motor League has been particularly active in western Pennsylvania in putting this work in evidence. The league sends out stencils, from which these signs can be easily made by a man of ordinary skill, and in some cases the completed signs are sent out ready to be put up.
Blanks are being sent to automobilists in several States, with letters requesting information as to points where these signs should be erected, and a contract has been made with a firm in central New York for a large number of signs, which will be put up in place within the next few months. It is believed that before the end of 1906 more than three thousand of these signs will be placed in different parts of the United States.

## ELECTRIC LIGHT FOR CLOSED CARRIAGES

The little lamp shown herewith is intended to be used in the roof of a Limousine or other closed body, and to be run from the ignition accumulators with which all large cars are supplied. The lamp is fitted with a silver-plated reflector mounted in a supporting ring. In front of the reflector an incandescent lamp of special design is hung on silver springs mounted in ivory bushings. An oval, beveled, plate-glass cover locks on the rim, and effectually protects both lamp and reflector. The initials of the owner of the car can be cut in this cover, if desired. The lamp is intended to be placed horizontally in the roof of the vehicle, and not in the position shown in the cut. The hanging of its bulb on springs makes the latter specially durable for automobile service. Although the light is shown here with a switch upon the base, it is usually wired with a switch in some convenient place where it can be readily reached when one wishes to turn on the light. If it is necessary to run the wires on the surface of the woodwork, a polished wood back of mahogany or oak with grooves for the wires can be used. The lamp is about six inches in diameter, and projects about two inches from the roof of the carriage. It is adapted for a four, six, or eight-volt set of accum-


ONE OF THE AUTOMOBILISTS' ROAD SIGNS THAT ARE BEING LOCATED IN DANGEROUS PLACES.
ulators, and will furnish from four to eight candle power, according to the bulb that is used. Another convenience about a car is a small electric light on a flexible cord, for use in case of a breakdown.

## NEW SPRING WHEELS.

Among the new spring wheels which are coming out
in France we note the S. Guigner wheel. It is manu factured by Bourgine \& Lebon, of Parthenay. It has a central wood disk which carries the spokes, also of wood, and upon the wood disk are placed two metal plates carrying the axle, but being independent of it and able to allow for the play required by the springs.


CEILING LIGHT FOR CLOSED CAR.
The two metal plates completely cover the wood disk on both of its sides and are joined by three bolts. The wood disk has large openings which allow the bolts to pass through. The metal plates are also connected at the rim by eight cross-pieces carrying the springs. The elasticity of the system is obtained by coiled springs which connect the two metal plates with the inner rim of the wheel. The springs are attached to the rim by a special device which seems to hold them in place and also to regulate the tension. The springs can be taken off in a few seconds. Owing to this construction, the car is suspended to a certain extent at the center of the wheels by means of the coiled springs, which work by traction and by compression and give a good effect in deadening the shocks. The center of the wood disk has an opening which allows the axle to take the necessary play. The three bolts connecting the two plates carry washers or separating pieces for the plates, and at each side of the bolts is a rectangular cavity in the wood piece which carries a coiled spring working against the bolt by compression, or else a rubber block serving the same purpose, so that we obtain a deadening of the shock at the time of sudden starting or a quick stop. To complete the elasticity of the system the central part of the wheel carries a heavy rubber washer or cylindrical piece which is used to complete the action of the springs at exceptional times, under a very heavy shock. By the above combination the inventor claims a very great ease of movement combined with all the desired rigidity of the wheel. The expense of keeping it in order is reduced to the changing of the rubber tires, which are solid, and it is recognized that a good solid (Continued on page 38.)


WHEEL WITH FLOATING HUB SUSPENDED BY COILED SPRINGS FROM THE RIM.


WHEEL FITTED WITH SECTIONAL TIRE AND SPECIAL sPRING-SUPPORTED HUB.


Wheel with an internal spring driving WHEEL.


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The one motor car driven by a reliable, test-proven air-cooled motor.
The motor car is not an every-day purchase. It costs considerable money, and if it does not run satisfactorily it is of little value.

There must be a good motor to make a good automobile. Water-cooled motors have many troubles-the perfect water-cooled motor has yet to come.
The perfect Air-cooled motor is here. It is the air-cooled motor of the Aerocar.
Because of its wonderful efficiency in power; because of the saving in weight; because of simplicity and strength in mechanical construction; because of its uniformly smooth workingruns steady with the rhythm of an electric dynamo;-because it is the same reliable sure-working motor under all climatic conditions, midsummer or midwinter makes no difference, there's nothing to freeze nor nothing to thaw ;-because of ease of control, economy of maintenance; because it will develop continuous higher power, for weight, and give greater speed than any other motor; because of its assured reliability and greater durability of service.
The body of the Aerocar compreres nost favorably with an other automobile, either foreign or American. It embodies the
best features of each, is graceeful in design, is most comfortably roomy, is luxuriousily upholstered, and fnished along the strictly
 Aerocar 1906. 24 h. p. Four cylinders. Five passengers. 45 miles an hour. 104
inch wheel base. Shaft drive. $\operatorname{lididing}$ gear transmission. Three speeds and reverse. Leather-
 the road, including two large glass headiights, 82,800 f. o. b. Detroit.
will

The Aerocar Company, Detroit, Mich.


## NEW SPRING WHEELS.

Continued from page 36.)
tire will run from 10,000 to 12,000 miles upon fairly good roads without needing repairs. The weight of the Guigner wheel is from 70 to 100 pounds, according to the size, and at present it is made in 30 to 38 -inch sizes Another interesting effort to grapple with the problem of obviating the disadvantages inherent in pneu matic tires is the invention of Mr. George Middleton of London. In this device, instead of the wheel rims being shod with pneamatic tires, the air cushion is inserted round the hub of the wheel, so that the wheel proper has no rigid connection with the axle or driving medium. This device has been thoroughly tested with a 15-horse-power Panhard car, the wheels of which


## A NOVEL DASHBOARD IGNITION OUTFIT.

were fitted with it and shod with solid tires. Over 15,000 miles have been covered, and the system has proved fairly successful. The degree of resiliency is of course not equal to that of pneumatic tires, but it has the surety that a puncture is a very remote possibility. Should, however, the air cushion break down, the car can still be safely run to its destination where the defective tube can be repaired. Access to the tube can be effected quickly and easily since the outer flange is made removable for this purpose. Several highpowered cars have already had this pneumatic hub fitted to the driving wheels, so that the latter can be shod with. solid tires, and the conversion has proved completely successful.
A wheel having a hub somewhat similar to the above-described wheel, but in which the hub is supported on springs instead of on a pneumatic tube, is also shown at the bottom of page 36 . This wheel is provided with a solid tire put on in sections, which are held to the rim by special binding screws. The arrangement is a compact one and it has a very neat appearance.
A somewhat more complicated wheel, designed for a like purpose, consists of a hub tied by tangent spokess


Fig. 1.--UNIVERSAL Joint assembled.


Fig. 2.-SECTION through joint.
to a ring surrounded by an annular coiled spring, and situated within the rim of the wheel. This ring is straddled by twelve radial rods connecting the rim of the wheel with a metal ring surrounding the hub, and these rods also have coiled springs acting under compression. The inner ring having the annular coiled
spring may be considered an inner driving wheel, for as the axle begins to turn, the spring is compressed against the radial rods or spokes. thereby giving a spring-drive to the rim. The stright coiled springs which run to the rim act as shock absorbers or spring cushions which take the place of pneumatic tires.

## Roman Antiquities Discovered in London.

Another section of the ancient Roman wall has been brought to light during the construction of a factory in the City of London. The unearthed relic measures 20 feet in length by 7 feet in height. Owing to its extreme antiquarian interest, the wall is not to be demolished, but is to be left in position, the new factory being built around it. It will then project about three feet into one of the rooms on the lower ground floor. To protect the wall from crumbling under the vibration of machinery and other causes, it is to be inclosed in a galvanized-iron netting similar to that around the Roman remains at the London Coal Ex change. In the course of other excavations upon the site for a fire station in Cannon Street, a Roman bath was unearthed. The relic is in a perfect state of preservation and is quite complete. It measures inside 10 feet 6 inches in length by 6 feet 3 inches wide, and weighs about seven tons. This monument has been removed intact, and will eventually be placed in a museum.

## A DASHBOARD IGNITION OUTFIT

In the Mosler ignition device, illustrated herewith, all parts of the electric system of an automobile except the batteries, spark plugs and connecting wires, are carried in a brass-framed glass case attached to the dashboard. The case contains the coil, a primary interrupter, and a secondary distributor, and these are always visible, thus permitting adjustments and repairs with little loss of time.
The wire from the batteries connects through the binding post, $K$, with the primary of the coil, $J$, while the other end of this winding is joined through the contact, $H$, with the fixed sector, $I$, on the rear wall of the case, $I$ being connected through the brush post, $C$, with the four segments of the primary interrupter. The primary circuit is completed through the grounded shaft and car body to the batteries.
One terminal of the secondary coil winding is grounded through the same post as the primary, while the other connects with a brass strip, $F$, carried by the hard rubber support, G. From this the current is carried to a central terminal, $E$, of the distributor by a movable flexible rod, $D$, which is so hinged at the bracket end that it can be swung from the terminal $E$, to permit the opening of the circuit. The high tension circuit from $E$ is through revolving ball contact with the rotating T-shaped brush. The outer ends of the four high-tension terminals which are inclosed in the insulations, $B$, are in direct contact with the four segments, $A$. These are secured to the rear panel f the casing and are connected to the four wires to the spark plugs.

## AN IMPROVED UNIVERSAL JOINT

A universal joint has recently been invented, which is so designed that it can be taken apart without the use of tools. One of our illustrations shows the com plete joint with one of the grease cups removed, while the other is a section which clearly shows the novel construction. It will be observed that the joint com prises a central cubical block, $G$, through which passes a shouldered pin, $\boldsymbol{C}$. A hole is drilled transversely through this pin and the block to receive the pin, $A$. A small locking pin, $B$, passes lengthwise through the pin, $C$, and transversely through pin, $A$, serving to hold them together in proper relative position. The projecting ends of these pins find bearings respectively in the forks, $E$ and $D$, which are carried on the two sections of the shaft. Bushings, $F$, are driven into the holes in the forks, and the threaded ends of these bush ings carry the grease cups. Spring stops on the forks press against the cups to prevent them from working off the bushing. Packing rings at the bottom of the bushings prevent the escape of the lubricant, which is kept in holes drilled in the ends of the pins, $A$ and $C$. When it is desired to take the joint apart, two adjacent grease cups are removed. The pin, $B$, is then removed, permitting the pin, $A$, to drop out, where upon the joint falls apart.

WHEEL CLUTCH FOR USE WITH A SOLID REAR AXLE
Many attempts have been made by inventors to devise some sort of a clutch for use on the rear axle of an automobile, which would do away with the compli cations and deficiencies of the differential gear. We illustrate herewith a simple clutch which appears to have solved the difficulty. The rear axle turns on oller bearings, carried by the housing 1. The sleeve 2 , on this housing carries a friction band, 3 , which is mounted on the hub of the nut, 4 , and is free to move in and out with this nut. The nut engages a thread on the axle. It will be observed that the periphery of
the nut is formed with inclined faces adapted to engage one or other of the clutch faces on the hubs, 5 and 6. The illustration shows the nut engaging the "go-ahead" clutch, 5. If, as in rounding a curve, the outer wheel travels faster than the axle, it tends to feed the nut out to a neutral position between the two faces. When the motion of the axle is reversed, the thread feeds the nut back against the clutch, 6 , and then again, if the wheel travels faster than the axle, the clutch feeds the nut in far enough to disengage the clutch faces. As a result of this construction, the wheel which is doing the harder work receives more power, whereas with a differential axle the wheel which is doing the less work is favored at the expense of the other. An extreme example is that of a machine equipped with a differential axle standing


AUTOMATIC WHEEL CLUTCH MAKING POSSIBLE A SOLID LIVE AXLE
with one wheel on dry pavement and the other on a muddy or wet spot. The latter wheel will spin idly around while the other remains stationary. The improved axle here shown would make both wheels turn at the same speed, expending the greater power on the wheel which engages the dry ground.

## THE THOMAS SAFETY RATCHET DEVICE.

One of the most striking features of the Thomas car is a safety ratchet device arranged on the brake drums of the rear wheels and having for its object the instant stopping of the machine should the brakes fail to hold and the car start to run down hill backward. By the movement of a small lever placed on the dash, the driver rotates the rod, $D$, and, by means of the connection, $B$, draws up the pawl, $C$, against the rat-chet-toothed ring, $A . C$ is held against $A$ by means of a spring suitably connected in the system, with the result that if the car is backing, it is instantly brought to a standstill and its passengers are saved from disastrous results. This device is a valuable one, and should be placed on more of the large touring cars, as failure of the brakes in a critical moment is one of the troubles to which such cars are prone. The

thomas safety ratchet device for stopping a CAR from backing down hill

1906 Thomas is as commodious a car as heretofore. It has a $51 / 2 \times 51 / 2,4$-cylinder, 50 -horse-power motor, $34 \times 41 / 2$-inch tires, a 118 -inch wheel base, and weighs in the neighborhood of 3,000 pounds. Every car is sold under a guarantee that it will develop a speed of 60 milles an hour.


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In the Los Angeles Dealers' Run; in the Glidden Tour; in the Mt. Washington 'Climb to the Clouds' and on the Syracuse and Empire City race tracks REO cars broke the reliability, economy, climbing and racing records; and leapt at one bound into the front rank of star performers.
REO cars stand up to practical every day work without trouble or complaint. What REOS have done REOS will do.
Write for the REO book that tells why.
REO 1906 Runabout, 8 h. p., 900 pounds, 2 'passengers. 25 miles per hour. 8650 . With folding seat, 8675 .
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The CLEVELAND has real, solid, tested, standing-up ability. The complete chassis is made by the Garford Company-the largest manufacturers of exclusively high grade automobile parts and chassis in America. Price $\$ 3,500$ to $\$ 5,000$, depending upon body equipment
The ignition is by the imported Simms-Bosch low tension Magneto, with which all important foreign cars are equipped. The spark is make and brake and controlled by the speed of the engine-doing away with the spark plugs, coils, intricate wiring and batteries.
The carburetor is automatic and requires no adjustment. It will not flood. The exhaust on the muffler prevents dust from coming in the rear of the car.
Our catalogue illustrates and describes in detail the wonderful mechanical constructio which makes the CLEVELAND a year ahead in American Automobile building FREE on request.

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See the curved irons on the bows. This is the only right way to make the bows; they are straight on the lower ends. The drop forgings will stay in place, and they make a neat, substantial job. See them at the shows. Ask for Colonel Sprague.

Send for our catalogue.
THE SPRAGUE UMBRELLA COMPANY
NORWALK, O.

The Wright Aeroplane and Its Fabled Performances.

A Parisian automobile paper recently published a letter from the Wright brothers to Capt. Ferber of the French army, in which statements are made that certainly need some public substantiation from the Wright brothers. In the letter in question it is alleged that on September 26 the Wright motor-driven aeroplane covered a distance of 17.961 kilometers in 18 minutes and 9 seconds, and that its further progress was stopped by lack of gasoline. On September 29 a distance of 19.57 kilometers was covered in 19 minutes and 55 seconds, the gasoline supply again having been exhausted. On September 30 the machine traveled 16 kilometers in 17 minutes and 15 seconds; this time a hot bearing prevented further remarkable progness. Then came some eye-opening records. Here they are:
October 3: 24.535 kilometers in 25 minutes and 5 seconds. (Cause of stoppage. not bearing.)
October 4: $33.455^{\circ}$ kilome ${ }^{+}$ers in 33 minutes and 17 seconds. (Cause of stoprage, hot bearing.)
October 5: 38.956 kilometers in 33 minutes and 3 seconds. (Cause of stoppage, exhaustion of gasoline supply.)

It seems that these alleged experiments were made at Dayton, Ohio, a fairly iarge town, and that the newspapers of the United States, alert a.s they are, allowed these sensational performances to escape their notice. When it is considered that Langley never even successfully launched his man-carrying machine, that Langley's experimental model never flew more than a mile, and that Wright's mysterious aeroplane covered a reputed distance of 38 kilometers at the rate of one kilometer a minute, we have the right to exact further information before we place reliance on these French reports. Unfortunately, the Wright brothers are hardly disposed to publish any substantiation or to make public experiments, for reasons best known to themselves. If such sensational and tremendously important experiments are being conducted in a not very remote part of the country, on a subject in which almost everybody feels the most profound interest, is it possib'e to believe that the enterprising American reporter, who, it is well known, comes down the chimney when the door is locked in his face-even if he has to scale a fifteen-story sky-scraper to do so-would not have ascertained all about them and published them broadcast long ago? Why particularly, as is further alleged, should the Wrights desire to sell their invention to the French government for a "million" francs? Surely their own is the first to which they would be likely to apply.
We certainly want more light on the subject.

## AUTOMOBILE SHOCK-ABSORBERS.

Devices for easing the shock to the springs and checking the rebound of the same are daily becoming more numerous. The original device of this sort was first used on the Richard-Brazier racer, which won the Gordon-Bennett race in 1904. This was the Hart-ford-Truffault suspension, which has since been widely used on all makes of cars. It consists, in its latest form, of two flat lever arms pivotally attached to the lower part of the spring, where it is clamped to the axle, and to the body respectively. These lever arms terminate in flat disks, which are fastened together by a central bolt, and which clamp a leather washer between them. A five-pronged starwheel on the outside of one disk is used for adjusting the pressure, and is locked in place by a lock nut. The turning motion of the disks on the friction washer, which takes place when the spring is compressed (bringing the two arms together) or when it recoils (throwing the arms apart), produces a braking effect upon the spring, which adds greatly to the easy-riding qualities of the car.
Another form of shock-absorber which has been patented lately consists of a pneumatic pad placed on the axle and having the spring resting upon it. This pad absorbs all the vibrations, and makes it possible to use solid tires on the wheels.
Still another new device for checking the rebound of the spring is shown herewith. The action of this apparatus is as follows:
To the frame of the car is fastened a central disk, by bolts, $C \quad C$. This disk has four cam slots in its periphery, in which are the rollers, $D D D D$. Bearing on these is a steel friction band, $B$, split crosswise to give a certain elasticity as the rollers come and go. Surrounding this band is a fiber band, $K$, which takes the thrust between $B$ and the split hub, $L$, of the arm, $A$. The back end of the hub is split and has two extending lugs. Secured in the lower lug is a bolt, which passes freely through the upper lug. Bearing on this lug and pivoted on the bolt is a cam with the upwardly extending arm, $F$, which in turn is connected to the arm, $A$, by the helical spring, $G$. This spring is adjustable in its tension by virtue of the rod passing through $F$. The arm, $A$, is connected by the adjustable rod, $H$, to the spring, $I$, of the car.
When the car gaes over a bump, the frame, $E$, moves toward the spring, $I$, and consequently throws up the arm, A. This action is without resistance on the
part of the device. When the frame and spring tend to separate, however, the four rollers engage with the friction band, $B$, and cause a braking action to take place between the friction band and the fiber band. The tension on the brake is at all times self-adjusting both as to tension and wear, by means of the cam bearing on the upper lug of the split hub and the spring, $\boldsymbol{G}$, the degree of tension being governed by the eyebolt passing through $F$. Thus is obtained a self-


## AUTOMOBILE SHOCK-ABSORBER.

adjusting suspension, which only checks the rebound of the spring, allowing it to act without hindrance when deflecting.

## THE FRANKLIN AIR-COOLED CARS.

The latest type of Franklin machine is a 6 -cylinder, 30 -horse-power car, fitted with a 3 -speed sliding gear transmission and capable of traveling 50 miles an hour. The engine of this car has mechanically-operated inlet and exhaust valves, as well as auxiliary exhaust valves of the same type. The cylinders are of uni form thickness, and the head has been decreased in thickness over that used last year. The inlet and exhaust valve chambers in the top of the cylinders are flanged with radiating ribs. The auxiliary exhaust valve is said to be beneficial in three ways, viz.: It gives a much freer exhaust, which reduces the back pressure and lowers the temperature of the remaining gases; the main exhaust valve is not subjected to such a severe flame, because the pressure in the cylinder has been lowered; and lastly, no carbon deposits form in the combustion chamber, and the cylinders never become fouled through surplus oil. Graphite may be used in the crankcase, if desired. The diagram showing the cross section of the Franklin clutch gives a good idea of a multiple-disk clutch, such as is now being used on many of the leading cars. The disks are of phosphor-bronze and steel, the former, $C$, being prevented from rotating in the flywheel by the bolts, $E$, on which they are mounted so that they have lateral movement. The other disks, $D$, are located between the first set and are fastened to the clutch sleeve, $B$, on which they can move laterally. This sleeve is connected to the transmission shaft by means of the universal joint, $U$. A flat. spiral spring, $S$, holds the plates firmly in contact when the clutch is engaged. As the flywheel revolves, it carries with it the first set of disks, $C$, and these also carry along the second


CROSS-SECTION OF THE FRANKLIN CLUTCH.
set of disks, since all are pressed together by the spring, $\mathcal{S}$. When the pedal lever, $L$, is moved forward by means of pressure on the clutch pedal, the clutchshifter lever, $M$, is moved backward, carrying with it the trunnion, $T$, and the clutch sleeve. The latter brings with it the ball thrust bearing, $H$, consisting of three plates, the center one of which contains a large number of balls. This tinrust bearing compresses the
spring, $\mathbb{S}$, relieving the pressure upon the disks, which are now free to move, and which separate sufficiently for the oil from the oil bath in which the clutch runs to fill the space between them. A. certain amount of time is taken for the oil to be squeezed out when the disks are thrust together again by the spring, and the result is that the clutch takes hold gradually and without jerk.

Automobile Notes.
A comprehensive idea of the proportions of the automobile industry in France may be gathered from the fact that in that country there are twenty large motor car manufactories devoted to the production of automobiles, and their average daily output is two vehicles, representing 14,400 vehicles per annum. To these must be added the output of fifty smaller establishments, which produce on the average 9,000 vehicles per year. France has thus an annual total production of over 23,000 motor car chassis, exclusive of carriage bodies and outfits. A large proportion of this production is exported, some 7,000 annually being sent to England, of which a large percentage is re-exported to the colonies. Other countries are also good customers of this prominent French industry.
The proper degree of inflation of the pneumatic tires for automobiles of large size exercises a farreaching influence upon the life and durability of the tires. A tire insufficiently inflated is short-lived, owing to the rim of the wheel tending to break the beaded edge of the tire from the tread, while excessive inflation maintains the fabric at such a tension that disintegration of the fabric must inevitably occur very quickly. The correct pressure, according to the most prominent manufacturers, should be in the case of the tires for the front wheels from 70 to 80 pounds per square inch and from 80 to 90 pounds for the rear wheel tires. If this pressure is not adhered to a very severe contracting and expanding action takes place just above the point of contact all the time the tire is rolling over the ground, with the result that enormous friction is set up. This causes considerable heating of the walls of the tire with the results of cracking and bursting. To make sure that the pressure is correct, a good pump with a gage should be used, and it is advisable that the latter should be tested from time to time to insure that it is registering correctly.

Accumulator design has recently experienced a radical change by the appearance on the market of the new "Morrison" storage battery, which is manufactured by the Universal Electric Storage Battery Company, of Chicago. The designers of this battery have departed from accepted practice in an attempt to avoid one of the principal causes of depreciation, viz., the shedding or gradual loss of active material from the positive plates. In so doing, they have not only successfully accomplished the results desired, but in addition have gained a noticeable increase in capacity per unit of weight. These departures from the older and better known designs are embodied in a peculiar construction of positive plate. This is made up of twenty or more horizontal rectangular frames, whose length is equal to the width of the plate and whose width is the same as its thickness, i. e., about $1 / 2$ inch, while their height is somewhat less. These frames have numerous transverse ribs, the spaces between which are filled with active material, thus making each frame a solid rectangular block. These blocks are assembled one above another with transversely-grooved wood separators of the same size placed between them. Vertical side bars dovetailed and lead burned to them tie them together so as to form a complete plate. The result is a plate of unusual mechanical strength in which the active material is totally inclosed, and consequently the possibility of loss from the plate eliminated. By this construction the manufacturers are able to employ a very high percentage of active material per nound of plate. Complete expansion of active material is assured before the sections are filled, and no mechanical pressure is required to hold the active material in place, as is the case with other forms of pasted plate. The artive material is consequently left in a very porous condition, allowing good circulation of the electrolyte. As it is within the plate, and surrounded by the lead grid, the elements of the battery can be assembled with the metaliic surfaces of positive and negative plates close together, instead of the active material being on the surface, and the lead in the interior. The internal resistance of the cell is accordingly greatly reduced. The manufacturers of the "Morrison" battery claim for their output absolute retention of the active material, giving durability and continued full capacity; large active surface and great porosity of active material for the action of the electrolyte, giving great ampere capacity per pound; better circulation for the electrolyte; two metallic surfaces opposite each other, giving the lowest internal resistance of any cell; great mechanical strength; entire freedom from buckling. The company have in sonstant service a great number of their batteries used for train lighting, truck, and automobile work, all of which are said to be giving entire satisfaction.

Every man who has cut his automobile eye-teeth, who has mastered his abc's in the school of motor experience, knows that a whole lot depends upon the maker, after the car is his.

The nimble tongue of the salesman maketh many boasts, and his unblushing assurance giveth the purchaser much hope.

But-what does the manufacturer guarantee? -That's the point.
This much is certain: Every maker guarantees all he safely can, for, to the experienced buyer, it is the guarantee that sells the car, not airy, fairy promises.

Now, there are certain reasons-distinguishing reasons-why the Stoddard guarantee can be big and broad and generous.

Why the makers can and dare stand behind their machine-not with a little, limited, conditional guarantee, but with a sweeping assurance of lasting quality and performance that covers the car like a tarpaulin.

These are the reasons: The frame of the STODDARD-DAYTON Model D Touring Car is made of a kind of steel that is found in no other car-hot-rolled, high-carbon, pressed steel of unequaled toughness.

The weight is equalized and so perfectly distributed that the strain, coming upon all parts, really reaches no part. The load is cared for by re-enforced springs and roller bearings sswimming in lubrication, so that it just about carries itself.
 hill or down, practicall, noiseless; entire transmision on roller bearings ; mechanical lubrication; $30-35$ horse-power.
Proportion of power to weight, one horse-power to every sixty pounds. $\$ 82.250$. Send for our 1906 catalog K and further particulars as to the guarantee that $p$ roves our faith and insures $y$ our protection.
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Model D

GASOLINE CARS FOR 1906
$\mathrm{A}^{\mathrm{RE} \text { built of the best materials in the world under methods and processes more }}$ A advanced than those employed in any automobile factory other than our own. No consider: tion of the cost of production has been permitted to interfere with making perfect every part and piece of each model, whether pertaining to mechanism, bor'ywork or general equipment. The expense of making the crankshafts, for instance, is six times greater than that of any previously made in this country. We guarantee that these cars, each according to its power and place, will yield the greatest things possible in motor service.



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 forged in one piece; rotary pump oil lubrication ; pressed steel frame, 98-inch whel base ; double side
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 THE RUBBER TIRE SPECIALISTSAfter exhaustive experiment and careful study of the requirements of pneumatic tires, we have invented a tire which has every possible good feature of the best, with practically all of their objectionable features eliminated.

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## SNOW SCULPTURES.

There is some ground for the statement that snow is the most widely used material for modeling, though the latter, it is true, is generally of a very primitive description. In practically every country where the snowfall is sufficiently heavy, the boys of the cities; as well as their brothers of the country districts, at the arrival of winter proceed to form the glittering white masses into coarse shapes, which an active fancy will recognize as the representations of men or animals. In some localities this sport is developed to a fairly high degree, and entire communities, young people and old, often take a hand in the healthful pastime. In the Harz Mountains of Germany, for instance, attractive groups of snow sculptures are sometimes encountered, though thest productions never attain the level of true art.

An Italian sculptor, Signor Achille Carressa, of Genoa, who has become famous through his Columbus monuments designed for certain South American cities, was one of the first to accomplish the task of producing snow representations of truly artistic value. The southern home of the artist bids fair to surpass parts even of the north of Europe in the rigidity of its climate, and with the first heavy snowfall Signor Carressa quickly installs his studio on the neighboring Piazza San Giro, and surrounded by the wondering crowd, he produces these charming examples of the plastic art, which by their delicacy of design and execution are little inferior to marble sculptures.
The accompanying engravings illustrate several of these works of the Italian artist. The latest production is the statue of Genova, patroness of the city of Genoa. The inscription reads: "Record of the Great Snowfall of January 18, 1905," and a splendid, though fragile souvenir the statue is. It is truly unfortunate that the only means for preserving these works of art is through the agency of the camera.

## The Money of Savages. <br> by Henri coupin.

Many savage tribes know no commerce except the direct exchange of one useful object for another, but numerous other tribes have experienced the necessity of facilitating business by the creation of a standard currency which enables exchanges to be made indirectly and at any time. This money varies greatly in character in different places. Sometimes it has only an arbitrary value, sometimes it is also available for use as ornaments, or otherwise.
The money most common ly employed by primitive peoples consists of useful objects. Examples are: Slaves (in Africa and New Guinea), cattle (reindeer among the Lapps), salt (in Laos), furs (in Siberia), cloth (in Africa), shells, beads, feather and other ornaments, and even various articles of food.
If the money is not useful in itself it must naturally be composed of rare materials. "Thus the Pellew islanders," says M. Deniker, "carefully preserve as current money (andou) a certain number of obsidian or porcelain beads and prisms of terra cotta, imported no one knows when por how which have wery high values. One tribe possesses a single prism of clay (called baran) which is regarded as a public treasure. In the neighboring island of Yap the place of money is taken by blocks of aragonite, a mineral which is not found in the island but is brought from the Pellews. The value of a block is proportional to its size, a thousand-franc note (\$200) being represented by a huge disk which two men can hardly carry. These stones serve rather to flatter the vanity of the wealthy natives, who exhibit them in front of their huts, than to facilitate barter."
But this is an exceptional case. Usually, preference is shown for more convenient objects which combine a maximum of value with a minimum of weight. For example, the Chorchon and Bannock Indians of Idahq and Montana use teeth of the wapiti deer as money. For the same reasons Scandinavian tribes, like the ancient Carthaginians, employ as money the skins, and the Michmis make use of the skulls, of animals, while the money of the Loyalty Islands consists of ropes made of fox hair, which may be cut to any desired length. The Mexicans formerly made extensive use


A Characteristic Bust of Columbus by Signor Carressa.
of cacao beans and this sort of money is not yet entirely obsolete, despite modern facilities of communication.

Shells are often used as money. According to M. Deniker, the tooth shell, or "elephant's tusk," is thus employed by the Indians of northwestern America. The wampum beads of the tribes of the eastern United States are made of the shells of Venus mercenaria, a species akin to the cockles, etc.
But of all shells the cowry is most used as money. The species most frequently employed are Cyprea moneta and Cyprea annulus, of which the former appears to be commonest in Asia, the latter in Africa.

Both species occur throughout the Indian Ocean, but they are gathered in large quantities in only two districts, the Maldive islands, west of Ceylon, and the Sulu archipelago, between Borneo and the Philippines.


Genova, the Patroness of Genoa, Made After the Snowfall of January 18, 1905.
the importation was carried on also by Europeans. The cowry is still current money throughout the west coast of Africa as far as the River Conanza in Angola. Farther south, in the region extending to Walrus Bay, we find another variety of "shell money,". consisting of fragments of a large land shell, Achatina monetaria, strung in cords. This money is manufactured chiefly in the Selles district in the interior of Benguela, whence it finds its way throughout the coast and even to London. The strings of shells are about 20 inches leng and were worth, fifteen years ago, from 10 to 30 cents each.
Among articles of food employed as money the most important are rice in the Philippines, bricks of tea in Mongolia, and lumps of salt in central Africa, where this indispensable substance is very rare
Iron, bronze, and other metals are very widely used as money. They occur in many forms, from simple rods and crosses to the circular coins common among civilized peoples. Sometimes the form is such that any desired value may be obtained readily by cutting In central Africa, for example, debts are paid in brass or copper wire, and bars of silver are current money in China.-Translated for the Scientific American from La Science au XXme Siècle.

## The Blessings of Cold.

In the Medical Era for October, Dr. Robert Peter maintains that cold is a blessing when you learn to endure it. He points out that its endurance can be acquired gradually if begun early in the season. He does not believe in coddling the body with woolens. "Better keep blood in circulation by outdoor exercise," says he, "so that if heavier clothing should really be needed the body will not require its encumbrance too much."
Graduated baths, with friction, he tells us, will harden the body very much, especially when followed by vigorous exercises in graded temperatures. " 1 know a man," says he, "who is always astir and who wears not even a shirt, but only blue jeans and blouse, all the year round. He has his windows open all the year round, day and night, no fire, and thoroughly enjoys it. While this is an extreme case, it shows how one can inure himself to cold."
Dr. Peter expresses the conviction that the subjects of ventilation and heating, which are important fac tors in the winter months, are not as well understood as they might be, and he attributes much of the illness during the inclement part of the year to the fou air and fuel gases, to which the baneful effects of indoor life are mainly due. Ac cording to him conditions should be reversed, and it would be wiser to camp out and bask in the winter sun and to stay at home in the summer shade..
"As to ventilation," says he, "it can never be over done, and especially is this true at night. Our bed rooms should be well venti lated. One-third of our lives is spent in them. A bedroom with southern ex posure is probably best in winter and it is a cheer and godsend. It is death to germ life. It will cut shor a cold or catarrh and the white plague cannot lurk there. As we need the shade in summer, we need the sun in winter."
After a consideration o the diet, which should be more stimulating at this season of the year, the author emphasizes the fact that the respiratory organs mostly stand the brunt of the winter diseases. The doctor believes that we must

On the Asiatic continent they are used as money most extensively in Siam and Laos, where, twenty years ago, from twenty to thirty cowries were equivalent to one centime ( 100 to 150 to a cent).
Tropical Africa, however, is the true realm of the cowry - a fact which is explained by its rarity. The shell is not found in the Atlantic and it has traversed the continent from Zanzibar, on the east, to Senegal, on the west coast, solely in consequence of commercial relations. Such relations must have been established at a very early date, for Cadamosto and other Portuguese explorers of the fifteenth century speak of the use of cowries as money among the "Mames" of Senegal. In Africa the exchange value of the cowry is much higher than in Asia, a fact which indicates that it is imported. The cowry was probably introduced to the east coast of Africa by the Arabs. Subsequently


A Striking Likeness of the Italian Compose Verdi. help us out in our prophy look to the circulation to help us out in our prophy laxis. "After a cold is once contracted, however," h says, "open the flood gates of elimination and equalize the circulation. A good physic or a Turkish bath may restore conditions."

In recent years the construction of railways pro ceeded in Germany at the rate of about 621.5 miles per annum. The entire mileage exceeds at present 34,183 miles. The electrification of raiiways is still confined to a few suburban lines, where the system works satisfactorily. The question of long-distance electric railways is still being studied, but no decision has been arrived at so far. Plans are said to be under consideration for the introduction of electric services between Düsseldorf and Cologne- 23 milesand Berlin-Hamburg-185 miles.

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Buy car whose vital points have been in use practically untensively by prominent makers than any other car in existence.

Buy a one that is guaranteed to give better service the second season than the first, and that will not be a back number in six months through the caprice of the maker, a car that will carry you on the direct drive from four to fifty miles, or better, per hour, and take ninety-five per cent of all hills on the high gear. K now what you are buying. Ask for our treatise on Horse Power and our latest catalog. Welch Motor Car Co., Pontiac, Mich.


Mon Pope=Hartford Model F
is the result of our 28 years of experience in making and marketing mechanical vehicles and is the latest product of our famous Hartford factories. MOTOR: consists of 4-cylinder, vertical, water-cooled engine with cylinders cast in pairs; all gears encased; brake test $28-30 \mathrm{H}$. P. TRANSMISSION: sliding gear, 3 speeds forward and reverse. CARBURETOR: specially designed, insuring economy in fuel consumption and maximum power. CONTROL: throttle and ignition levers on single sector that does not revolve with wheel. DRIVE: bevel gear through propeller shaft to the rear axle. TONNEAU: non-removable, dust-proof, double side entrance. DESIGN: artistic in conception and execution

While great attention has been given the essentials of construction it will be found that no detail has been overlooked. Everything that will contribute to the user's comfort and convenience has been embodied in this up-to-date car. (Extension top, \$125 extra.)

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is our 2-cylinder, opposed, $18 \mathrm{H} . \mathrm{P}$., touring car. The engine is under the hood and all parts are accessible for inspection and repair. This is our dependable 2-cylinder machine of last year with such minor changes as have been suggested by a season's use.

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## Hartford, Conn.



## ELECTRICITY IN HOSPITALS

## by emile guarin

Among the manifold purposes for which electricity is capable of being employed, its applications to therapeutics are the most curious, and a number of them a.re doubtless known to our readers. However this may be, we think it will prove none the less interesting to describe th e electric apparatus which hospitals now have at their disposal.
The description that we propose to give is that of the apparatus which has been furnished quite ecently to a hospital of London by Messrs. Lemmon \& Co., of that city.
Among the principal of such apparatus we may mention those emco those em-


Fig. 2.-Finsen Apparatus.
connecting, as in wireless telegraphy, the electrodes between which the sparks jump with the armatures of a battery of Leyden jars. The tension thus obtained is enormous and the discharges are very strong. Nevertheless they are applied to the subject to be
treated, without any danger, either in the form of general or partial electrification.
The French Lortet-Genoud lamp, which the hospital has more or less modified, is applied to the treatment of lupus, that repugnant disease of which electricity has cured so many persons, and also to the treatment of rodent ulcer. We have all probably h a d a $n$ opportunity of witnessing some of the ravages of these two. cutaneous affections. D i seases of this kind, those of the skin, are extremely painful, and those afflicted with them sometimes present a horrible sight. In this domain alone electricity has already earned our gratitude, since, for such affections, i t furnishes one of the best
treatment of neurasthenia rheumatism, anæmia, and pul monary tuberculosis; a LortetGenoud lamp, a Finsen-Reyn lamp, an improved Finsen apparatus, a Roentgen apparatus, a Wimshurst machine, etc. The various instruments are placed in the upper-story rooms of one of the buildings. They are supplied by two groups of generators of electricity, that is to say, by two groups each consisting of a steam motor that actuates an electric generator.
These generators give a con tinuous current and send it to a distributing board provided with commutators, etc., in order to permit of distributing the cur rent among the different experi mental rooms.
For the treatment of arthritis, rheumatism, anæmia, and neu rasthenia use has been successfully made of high-tension cur rents, which are also efficacious ly employed for pulmonary tuberculosis in certain stages These currents are produced by means of an induction coil, with a special mercury interrupter. This latter is actuated by a small motor that receives a continuous current from the line wire. A continuus current is likewise sent through the intermediu m of the interrupter to the primary of the coil, which thus receives very short emissions that succeed one another very rapidly, and, through induction, produce alternating currents in the secondary of the coil. The rapidity of the oscillations is increased by


Fig. 4.-Roentgen Apparatus for Hospital Use.


Fig. 5.-A Wimshurst Machine.

The Lortet-Genoud apparatus (Fig. 1) consists of an arc lamp mounted upon a heavy standard, and the rays of which are projected by means of a double screen provided with two central lenses of rock crystal upon the affected part of the patient.

Between the walls of the lens support circulates the cold water designed, as in the types to be mentioned further along, to protect the lenses and absorb the calorific rays. The pencil produced by the lamp consists, in fact, of calorific, luminous, and chemical rays, and the object to be attained is to disperse those that would have only an injurious effect, and allow of the passage of the chemical ones, which alone are capable of acting efficaciously.

The Finsen apparatus, of which the Finsen-Reyn is only a simplified modification, is likewise employed for the treatment of lupus. It is therefore designed to permit of concentrating a pencil of chemical rays, that is to say, of ultra violet ones, upon the affected part of the patient, who lies upon a special couch.

In the simultaneous treatment of several persons, there is employed a $n$ improved model which i $s$ especially c h aracterized by a better utilization of the luminous intensity of the lamp, the c o n sumption of which is notably reduced as compared with that of the former types. It consists (Fig. 2) in principle, of a


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will center public interest in the Palace Touring Car and the Two-Cycle. Both of these cars emphasize the wonderful development of automobile construction in America. In style they set a swift pace for European manufacturers, and in performance they leave nothing to be desired in the way of speed, reserve power, easy riding qualities and general all-round completeness. Careful attention to the minutest detail is apparent in every line from the perfected motor to the adjustable lamp brackets.

If you, as a Possible Buyer of an Automobile (the Probable Buyer of an Oldsmobile after you have investigated) are too busy just at this time to let us give you a demonstration of our 1906 models, you can make a note, mental or otherwise, of the points which mark the strong individuality of these cars -the superior quality and big value they represent on your money investment.

In general appearance the Palace Touring Car, Model S and The Two-Cycle, Model L are very similar, both conforming in design to the most approved European practice. The general lines of both cars are the same. Both have all the regulation outfit, sliding gear transmission, pressed steel frame, bevel gear drive, material of the best-everything that anyone has or wants to have and a number of features all our own;

The gasoline 'motor'"-the life center of the automobile-is merely a gasoline engine. We have built gasoline engines for 25 years, and we know this end of the business-know what not to build as well as what to build. The result of this experience is found in the motor equipment of every Oldsmobile.

The Four-Cylinder Motor of Model S is compact and free from complications; it is. vertical, water-cooled, located under hood, and perfectly balanced. The bore is $41 / 4$-inch with $43 / 4$-inch
stroke, and the actual horse power is from 26 to 28 . The weight of the car is 2,200 pounds. Wheel base 106 inches. Price $\$ 2,250$, with complete horn and lamp equipment.

The Two-Cycle Motor is likewise vertical, water-cooled and located under hood. Bore 5 inches, stroke 5 inches. THERE ARE ONLY THREE WORKING PARTS IN THE MOTOR ITSELF. If you don't know anything about gears, valves, guides and a few other things, you don't have to learn, because they are not there in The Two-Cycle. It is a $24 \mathrm{H} . \mathrm{P}$. team without a harness. It's the only new thing in the last five years-a trial will convince you. Price $\$ 1,250$, with complete horn and lamp equipment.

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## MOTOR TALK COUPON

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Enclosed find 25 cents, for which have Мотов Talk, a magazine devoted to automobiling, sent to me for $I$ year.

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metallic cylinder suspended from a strong support and inclosing a lamp of great illuminating power. To this cylinder are secured telescopes, as well as tube for the circulation of water for cooling the telescopes and compressors. These telescopes are provided with rock crystal lenses. Between the two side ones there is a space filled with distilled water for the purpose of protecting the lenses against a high temperature and of eliminating the calorific rays. The last of these are absorbed at the other end by a column of distilled water about twelve inches in length comprised between the two lenses. The compressors consist of two rock crystal lenses between which water constantly circulates. They are applied closely to the skin and finally exclude every trace of all but the chemical rays.
Another operating room contains apparatus (Fig. 3) for experiments in galvanism, Faradization, and electrolysis. Here, too, are treated rheumatism and paralysis, and more particularly the affection known as writer's cramp
The apparatus of this laboratory are connected with a tablet of polished marble which carries different measuring, regulating, and commutating instruments. These latter are principally a sensitive galvanometer of precision for measuring intensities; a reversing commutator for reversing the direction of the current; and a rheostat, otherwise called a regulatable resistance, of 10,000 ohms divided into 56 degrees, that is to say, permitting of passing from 0 to 10,000 ohms through 56 graduated values, and of thus obtaining a very precise regulation of the current, etc.
A second group of very similar apparatus is placed in another room.
Roentgen rays are rendering valuable services in therapeutics, and the use of them in hospitals is now quite general. These rays, with whose strange powers every one is familiar, are, as is well known, obtained by producing electric discharges of great frequency in bulbs of highly rarefied air. Such discharges are produced by an induction coil of which the arrangement presents certain analogies with that which we have briefly referred to above in connection with high-tension currents. The most characteristic part (Fig. 4) is the bulb, which is mounted upon a heavy standard surrounded by a transparent screen in the form of a globe, which in tercepts the X-rays and protects the operator and patient against their dangerous effects. They are cap able of reaching only the part of the body affected since they are conducted by a tube of appropriate form fixed in an aperture with which the globe is provided. Such an arrangement presents different advantages.
Let us have a few words to say also of the Wims hurst machine (Fig. 5), one of the most remarkable of friction apparatus, and which is described in all works on electrostatics. This apparatus is employed with success in America for the treatment, under the name of Franklinization, of certain nervous affections, and especially of rheumatism. The use of it is spreading likewise in England.
Finally, an apparatus which is no less interesting is the one that serves for massage and advantageously replaces massage by hand. This apparatus, of which the use is rapidly spreading, consists of an electric motor to the shaft of which is secured a large flexible cable, to the end of which is fastened a ball to which is communicated a vibratory motion of which the aimplitude depends upon the regulation given it by means of a special arrangement that can be made to


Automaton Writing. Chest Meckanism Exposed.
act during the operation. In this massage ball there are three screw holes into which may be introduced pieces of appropriate form for the local massage of small muscles in certain parts of the body. The motor employed for this is a special one, and is at the same time a transformer which converts the continuous current furnished it by the line wire into an alternat ing one-a form of current that changes direction periodically and regularly with more or less rapidity. Another purpose for which the current is used is for the small electric lamps employed for the treat-


A bicycle generating station used by the german army's WIRELESS TELEGRAPH CORPS IN THE SOUTH AFRICAN CAMPAIGN.
pany, of Berlin, who were the constructors of these stations, have recently designed another type of such lightness as to require no carts in their transportation. Chiefly remarkable in this portable outfit are the means of generating energy. A bicycle dynamo is used. The constructive principle of the latter is simple. A small direct-current dynamo of about 100 watts output is fitted to a bicycle frame. The rider, if he may be so called, keeps the machine going by smart pedaling. From the sprocket of the bicycle frame the movement is transmitted to the dynamo by means of a belt, driving a specially-designed aluminium disk, the ratio of transmission being so designed as to have the dynamo produce sparks of 4 millimeters length in the induction coil, in normal operation. As the dynamo is located in front of the operator, the latter is in a position at any moment to supervise its uniform activity. The weight of the dynamo outfit is 30 kilogrammes ( 66 pounds). In the place of the device above described, a stationary motor cycle with a dynamo fitted on can be used. Apart from the dynamo a portable accumulator battery can be made use of to supply the energy required. The battery includes eight cells (16 volts), possessing a capacity of about 30 amperehours with a five hours' discharge. The admissible limit of discharging intensity is about 25 per cent greater than the energy necessary in normal working order. The cells are inclosed in an ebonite box, which is in turn divided into two compartments of 30 kilogrammes (66 pounds) weight each.

## A CLEVER MECHANICAL AND ELECTRICAL

AUTOMATON
An interesting, novel, and pseudo-scientific attraction has recently been entertaining London audiences at the Hippodrome variety theater. This is a cleverly-constructed figure which apparently
ment of laryngitis and analogous affections. The ap plications of electric energy to medicine will doubtless not stop here. Surgery will also find in the electric current a sure and valuable aid.
M. Leduc has already made known the anæsthetic effect of electric currents of high frequency, and has demonstrated that, under their influence, any animal falling upon the side sleeps a deep sleep that is interrupted neither by the prick of a needle or a burn by a hot iron.

It is doubtless known that MM. Didsbury and Reg. nier have constructed, upon this principle an apparatus designed for the painless extraction of teeth. It has recently been found that the violet rays have the same effect.

The rays of an incandescent lamp, with a bulb of proper color surrounded by an appropriate shade, directed upon the eyes of a patient by means of a reflector of nickel-plated metal, produce at the end of two or three minutes an anæsthesia that suffices for the performance of unimportant operations.

These are facts of great interest that are multiplying every day and are constantly increasing the number of our methods of combating disease.

## A NEW TYPE OF PORTABLE WIRELESS TELEGRAPH STATION. <br> by dr. alfred gradenwitz.

A very convenient type of portable wireless telegraph station was described by the author some time ago in these pages. The Wireless Telegraph Com-


Introducing "Enigmarelle." walks and writes automatically. It is called "Enigmarelle," and is seemingly a mechanical and electrical combination. The figure stands exactly six feet in height, weighs 198 pounds, and is composed of 365 distinct and separate parts. As to composition, the feet are of iron, the lower limbs of steel and wood, while the arms are of steel and copper. The body is an insulated steel wire frame, cased with fiber and rawhide, while the head is of wax. The figure contains seven motors, three of which are spring and four electric. They are distributed in different parts of the body and are said to operate the various members assigned to them in the following manner:
The two most powerful motors, which are of special design, propel the lower limbs, and cause the automaton to walk. A third operates the arms, a fourth the balance weights. Of the spring motors, the first controls the head, the second acts as an auxiliary to the electric motors in the movement of the arms, while the third operates the wire bobbins, which wind and unwind with the ever-changing position of the weights.
There are fourteen dry storage battery cells of small capacity. They are of special design and constructed to serve a double purpose-not only to furnish power to the motors, but also to maintain the equilibrium of the figure. A little below where the hip joint would be on the left of the figure, is the terminal of a semi-circular vulcanite track, which passes up and over the upper part of the chest, de-
(Continued on page 57.)


The Automaton Riding a Bicycle.


## That Helping Hand-Electric Welding

Motor Car Manufacturers, Take Notice!

This illustration will give you an idea of how helpful this new and modern process of welding can be in the construction of special shaped parts.

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## CONTNENTALTIIRES



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Chicago, 111
GEER GREEN EGG MOTORCYCLE

H. P. Double-Cylinder WRITE FOR CATALOGU HARRY R. GEER CO. 1015 pine st.t.
st.Louts. Mo.
R.ADIUM AND THE RADIO-ACTIVE Substances. No better or clearer scientific account ba
been published than that contained in Scientific all that is at present known about radium paper present ralo Eureka Auto Jack No. 3

This auto jack is a little wonder Lig power. Small in size but win gounds, capacity yoon pounds. Haan or lowers by using same. haise
To pump down it must be buder
 raise a weigh
press odown on
the little stee lever a and steck
it out by turn
and it out by turn-
ing to the right
or te tit
pump down re-
lease the little spring lever.
N. MOWER U.S. A.

Utica, N. Y., U. S. A.

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 compex mechanism
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The elastic ink compe essed by ink the reservoir is
underser thar thumb, and, when re-
under under the thumb, and, when re-
leased, instantly draws in the
ink throun ink through the feed ciannels
at the point. The quickly ad.
justed lock-ring prevents ink rombeing forced out agantin. Feeds In reservorir in used. Alwayspespon ink
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kick or balk. Cieans itself as easily as it is is filled. Fully guar-
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## recently patented inventions.

## Of Interest

 EGG-CASE-CARRYING ATTACHMENT FOR VEHICLES.-R. N. Story, Clay Center, Kan The aim of this improvement is to provide anovel simple case-holder that may be readily and securely mounted and detachably secured upon the rear portion of a buggy or a like onveniently placing and holding an egg-cas on the vehicle for transportation of the filled
.
BEEHIVE.-J. F. Stills, School, Ill. The aim of this improvement is to produce a moth
deceiver attachment which acts for such purpose and also serves as a rest or support for the frames, and also to produce a separator-
board whereby the size of the colony may be accommodated and regulated, and also to pro duce a beehive the general make-up
will facilitate the handling of bees.
fence-post.-S. H. Summerscales, Winaipeg, Canada. This invention relates to general use is especially adapted for use as a fence-post. Among the other uses to which
it may be put are the supporting of walls, floors, ceilings, roof materials, and railroad rails. The principal objects are to provide a support of non-inflammable material which is
not subject to decay on account of the action not subject to decay on account of the action of the elements and
well-known difficulties.
BROODER-COOP.-T. O'BRIEN, Branford, Conn. The coop is arranged to insure proper ventilation and to provide a clean and healthy
brooding-compartment for a hen and a separate scratching-compartment for chicks, to allow the latter to readily pass from the brooding to the scratching-compartment, and vice versa, and to allow the chicks to scratch and feed weather without annoyance from the sitting hen or chickens from other coops, and to pro-
tect the chicks from attack at night or day from tect the chicks from at
enemies of the chicks.

## nemies of the chicks.

HARVEISTING-MACHINE.-W. Livtschak, Wilna, Russia. In this patent the invention relates to improvements in harvesting-machines
whereby the construction of the machine is whereby the construction of the machine is
simplified and a new combination of known simplified and a new combinat is produced, so that the usefulness of the machine is considerably increased. The for grass.

## Of General Interest

wall-covering.-T. Cleary, Schuylerville, N. Y. In this instance the object of the
invention is the provision of a new and improved wall-covering which has a highly ornamental plush effect. The invention consists of a new article of manufacture-namely, a
wall-covering consisting of a fabric body and coating thereon in plush effect.
HOISTING DEVICE.-P. A. Gould and G. R. Watson, Saranac Lake, N. Y. This de-
vice is for facilitating the raising of heavy weights. It is especially useful in lifting transformers to attach them to electric-light poles. One object is to produce a device which
may be readily set up temporarily upon an may be readily set up temporarily upon an electric light pole for the purpose suggested.
A further object is to so construct the device A further object is to so construct the device
that it readily adapts itself to the constructhat it readily adapts itself to the construction work at the top of an electric-light pole,
enabling the device to be readily applied to poles of different ki
differently arranged.
COMBINATION-TOOL-E. Hogan, Portland, Ore. This tool is capable of many uses. It may be used as a level to level in all dir-
ections without moving the tool. Difference between low and high points in degrecs may also be determined. It may be used as a
plumb to plumb at any angle without moving plumb to plumb at any angle without moving
the same and to determine the amount of angular deviation of objects. It levels and
plumbs one way and any angle desired at right angles at the same time without moving the tool.
ARCH-FILE-R. H. Johnson, Jersey City, The principal object is to provide means whereby the distance from each other of the arches or other holding de-
vices for the file can be varied at will to accommodate different punchings in the sheets to be held. Means provide for easily detach-
ing the arches from the main body of the holder and readily slipping the articles to be eld onto them
head-rest.-F. M. Kandle, Atlantic City, N. J. In the present invention the improve-
ment is in head-rests intended especially for barbers' chairs, being in the nature of a flexible cover for the ordinary head-rest provided
with means whereby it may be secured in place upon the head-rest and with openings through which a sheet of paper forming a sanitary
cover may be passed and with means for supporting a package of paper.
CONDENSER.-F. Kaiser, New Orleans, La. This improvement is in surface condensers in-
tended especially for condensing and cooling ammonia-gas, but may be used for condensing steam or for use in any other suitable heat-
exchanging apparatus. It relates particularly to the sets of condensing-tubes and the construction whereby they are secured within the shell, sc the tubes can be readily assembled, can be conveniently inserted or removed from
shell to prevent any leakage, and will com-
pensate, in a measure, for variation in expansion and contraction between such tubes and the shell of the condense
ATTACHMENT FOR FRUIT CANS AND JARS.-C. M. Leffingwell, Littlefalls, Minn. Briefly stated the improved attachment in-
vented by Mr. Leffingwell holds fruist submerged below the surface of the juice and also serves it may be readily lifted out of the jar with the mold adhering thereto.
Chemical chart.-C. D. Poore, Minneapolis, Minn. Mr. Poore's invention relates specially arranged for work in chemistry the arrangement being such as to assist the investain in determining the composition of cerchemical terminology for compounds of known
composition and in studying chemical reaccompo
tions.

Machines and Mechanical Devices. SHARPENING-MACHINE FOR DRILLtion relates to sharpening-machines for drillbits, such as shown and described in the Let-
ters Patent of the United States, formerly ters Patent of the United States, formerly
granted to Mr. Proske. The object of the present invention is to provide a machine arranged to permit of sharpening various sizes of drills in a single pair of dies by the use of
different-sized dollies, the sharpened drills being accurate and regular both in gage and form to insure drilling of straight holes without danger of the drill sticking in the hole.
SOAP-MACHINE.-N. G. Knight, Crestline, Ohio. In this case the improvement refers to
machines for effecting saponification, and has for its principal objects the provision of a convenient arrangement of gearing for driving
the rotatable elements and means for introducing material during the operation of the machine.
Key-seating device.-I. W. Jones, Birmingham, Ala. Chief objects of this invention a straight and readily detachable and replaceable cutter to be employed, to permit the cutter to the end, to secure a solid and strong abutment for cutter to bear against while operating, to place the feeding mechanism for cutter above the cutting edge, to provide the feeding-pin with means for increasing tension of relieving action at the time when tension is most needed, to avoid putting strain on the
feeding mechanism while cutter is operating, and to make the bar strong and protect all parts from chips
BELT-GUIDE.-M. E. DeGree and D. C.
McAlister, Flaxton, N. D. The principal objects of the invention are to provide means for guiding a belt to or from a pulley, even when the two pulleys over .which the belt passes are not of alinement, to provide means for pre-
venting the belt from being thrown from the pulleys under any circumstances, and to guard against any cutting action upon the belt or any
unnecessary wear thereof.

## Medical Appliances.

ReCtum-supporter. - E. H. Higbee to pre, Th. The purpose of the invention appliance especially adapted for the relief and cure of prolapsus of the rectum and
hemoryotds or piles and to so construct the appliance that it may be worn with comfort and may be partially removed in an expeditious and
SURGICAL APPLIANCE.-H. T. Foote tor is ochelle, N. Y. The object of this inven turnal emissions of the male human being, the device being simple and durable in construction, designed for convenient attachment and the dorsal veins of parts, and allowing the wearer to urinate while the device is in posi

Prime Movers and Their Accessories
ROTARY ENGINE.-G. L. Loper, Norcatur, Kan. In this patent the invention consists in
the novel construction and arrangement of parts acting upon the general principle in re the outside casing revolves and the steam i admitted to the same through a central co
having steam-ports. having steam-ports

## Pertaining to Recreation.

BOW-FACING OAR.-G. M. Kerry, Boyne Mich. In operation the gunwale-plate io
clamped to the gunwale and the thole-pin is passed through the opening in the bottom the groove and into the gunwale, the body
portion of the yoke engaging the groove to portion of the yoke engaging the groove to
prevent rotation of plates. Moving the handle sections in the usual manner will produce
reverse movement of the blades. the blade is permitted by hinging of the plates to the yoke. To convert bow-facing into sternfacing oars, it is only necessary to remove the gunwale-plate and insert cotter-pins.
Note.-Copies of any of these patents will Please state the name of the patentee, title of


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had at the office. Price 10 cents each.
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price.
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labeled.
(9868) J. T. asks: I would like to ask you if you can give me a formula for
sensitizing porcelain with a solution and then electroplate it with copper? A. An article of porcelain which is to be plated with copper
may first be coated with a tough varnish such as copal, and when the varnish is dry it should
and be thoroughly cavered with plumbago as a basis
for the copper plating Sometimes a flashing of gold is burint on and the cóppè is deposited upon the gold. This makes a firmer deposit than is possible with varnish. F'or details o troplating,"
(9869) W. A. M. writes: Some time ago you published certain notes showing how fo calculate the dates on which Easter will
fall, were very interesting, but obviously incomplete, it being necessary to consult a
calendar to find the day of the week corres ponding with the date arrived at by the cal culation. If you have a calendar for the year there is no need for your rule, in is easier to
turn up March and April and find it all worked out for you. If you have not the said almanac, of finding the day of the week for any date, or conversely the date of any day in any year. by Subtlety," because the vowels $a, e, i, o, u$
$w, y$ are incorporated in the order to show the
date of the first Thursday in each month of the year 1905 ; thus, the first vowel used in the motto is $u$, representing the first month, the second vowel $e$ stands for the second month motto stands for the twelfth month. Next the $u$ representing the first month is the fifth in the order $a, e, i, o, u, w, y$, and the first Thurs The fourth vowel is $w$ for the fourth month the first Thursday in fourth month was on the 6th, $w$ being the sixth in the order $a$
The ninth and twelfth months are each repre sented by the ninth and twelfth vowels $y$,
which is the seventh in the order $a, e i$, $o$, etc showing that the first Thursdays in the nint and twelfth months fall on the 7th. The mott "Queen" is the first three months, "Woman" the second three months, "wins by" the third quarter, and "subtlety" the last three month week will be December 28, 1905? The vowel order $a, e, i$, etc., therefore the $7 \mathrm{th}, 14 \mathrm{th}, 21 \mathrm{st}$ and 28th December are all Thursdays. Ex. 2 What day of the week will be September 4,
1905 ? September is the ninth month. The inth vowel is $y$, therefore as Thursday is the Tth, Monday will be 4th. Ex. 3. What will be
the date of the third Monday in June, 1905 June is the sixth month, the sixth vowel is $a$ showing that Thursday was the first (a being the fifth. The third Monday in June, 1905 was the 19 th . It must be remembered that th dates given in the motto are Thursdays fo 1905. They win be Fridays in 1906, and Satur days in 1907, in 1908 they will be Sunday
until February 28 , after which they will be Mondays, and so on forever, constituting a perpetual calendar. Ex. 4. What day of th your rule for finding the date of Easter year)? Rule. To the difference between the years, add the number of leap years that have
intervened, divide by seven, and count back as many days as the number remaining. Thi
will give the day for the year, and proceed as will give the day for the year, and proceed as
above. Thus, 1818 from 1905 leaves 87 , add 21 leap years, making 108, dividing by 7 eaves three of a remainder. Three days back day as the day for 1818 , that is, the dates given by the motto were Mondays in that year Now March is the third month, and the third vowel in the motto is $e$, the second in the 1818, was the etc. The first Monday in March, the 9th, 16th second day of the month, and and the 21st was Saturday, next day Sundaythe earliest possible date for Easter. To find the day for any future year, proceed exactly as
in Ex. 4, but count forward the number of days shown by the remainder. A. This ingenious
scheme is adapted perfectly to all years in
which January 1 is Thursday; but for other
years some calculation is required. It does
not fix Easter day. As we have said before Caster cannot be fixed by persons not familia
Eater with the motions of the moon. The best way to find Easter for any year is to refer to an
Episcopal Prayer Book, which gives the dat for several centuries.

## NEW B00KS, ETC.

Oil Colors and Printers' Inks. By Louis Edgar Andés. New York: D. Van Nost Price $\$ 2.50$, 1204 . 12 mo .; pp 212. Price, $\$ 2.50$

This is a practical handbook treating of linseed oil, boiled oil, paints, artists' colors, lampblack and printers' inks, black and col
ored. In addition to information with regard to linseed oil, the chief raw material, its pur fication, and bleaching for making varnishes and pigments, the book contains short disserta ions on the theory of drying oil, of the pig adulterations. A special chapter is devote to lampblack. Attention is given to the manu facture of pigments, their mixing and grinding, and to the manufacture of printers' varnishes
and colored inks, including all the latest and colored inks, including all the lates artists' colors is quite new, and will not be found in any other work of this kind. The author has been engaged for a number of ears in the manufacture of Fifty-six il ustrations accompany the text.

Engineering. A Textbook for a
Short Course. By Lieut.-Col. G. J. Fiebeger, U.S.A., New York: John Wiley \&
Price, $\$ 5$.
This textbook is designed primarily for the cadets of the United States Military Academy, who have been fitted for a profession in whic pplication. In time of peace the officer in an isolated station finds himself called upon
to act as engineer and constructor of buildto act as engineer and constructor of build-
ings, roads, and bridges. If not the engineer harged with the construction of water work nd sewerage systems, he finds himself charge with their maintenance and repair. In time buildings and bridges enables him to effect heir destruction without loss of time or the id of skilled workmen. The entire subject of apping, mining, pontoneering, etc., is simply he application of principles of civil engineer ng and tactics to military problems. For the bove reasons the faculty of the Military academy has always provided a short course civil engineering, and it is for the use written The author is Professor of Engineer ing at the United States Military Academy, nd he has produced a most valuable text on.
Introduction to the Design of Beams,
Girders, and Columns, in machines and STRUCTURES. With examples in Atherton, M.Sc. London: Charles Griffin \& Co. Philadelphia: J. B pp. 236. Price, $\$ 2$.
The design of beams in relation to strength nd stiffness and convenience of construction a study that appeals to all classes of engineers and architects, for in all machines
and structures beams appear in one form or nother, and little progress can be made in cientific designing without a proper under nderlying their construction Hence great prominence is rightly given to this subject in course of applied mechanics, machine and building construction, and naval architecture.
As denoted by its title, this book is extremely As denoted by its title, this book is extremely htroductory in its aim and scope. A careful xamination of this book shows that the author as producea a conscientious work, which can
Earth and Rock Excavation. By Charles
Prelini, Co.E. New York: D. Van Nos-
trand Company, 1905. 8vo.; pp. 357. trand Con
Price, $\$ 3$.
The author justly states in his preface that tion into which the excavation of construc does not enter to some extent, and in many engineering works, excavation is by far the argest item of labor and expense. Despite almost barren of books which treat of earth and rock excavation in a concise and compreensive manner, having regard both for the lanning and computation of such work, and or the methods and machines by which it is
 with the following obje chiefly in view irst to concentrate in a small volume scriptions of the various operations which are equired for planning and executing any work of excavation in earth or rock; second, to classify and describe clearly the various implements and machines used for excavating and author away the material. So far as the English language which gives these facts. An examination of the books shows that the
practical side is in no case neglected for the practical side is in no case neglected for the
theoretical. It is a good addition to the
theoretical. It is a g

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READ THIS COLUMN CAREFEULLY--You will tind inquires for certain celasses of articieus
numbered in consecutive order. If you manu fumbered these coosocecurite us ar at once ynu wawill
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sary to give the number

Marine Iron Works. Chicago. Catalogue free. Inquiry No. 7660.-For
able of use in a wood heater.
C.S." Metal Polish Cap Inquiry No. 9661, Indianapolis. Samples free.
 durable. 144 millineters inward clear diameter and conr-
responding thickness. to bezr inward presure an eerly
200 atmosp heres ; ubes to be about 120 centimeters
Drying Machinery and Presses. Bules, Louisville, Ky. Inquiry No. Y6i62-For makers of portable table
to be attached to aly chair. Wanted.-Purchaser for Monazite, Molybden
Wolfram. Apply Monasite, Box ris, New York.
inquiry No. Y6f3.- For manufacturers of powder, I sell patents. To buy, or having one to sell, write Inquiry No. g664.-For manufacturers of machmery for maknag nailing,
large as $29 \times 19.5 \times 11.7$ inches.
The celebrated "Hornsoy-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company
Foot of East 138th Street, New York. Foot of East 138th Street, New York.
Inquiry No. 9665 . - For manufacturers of pins.
WANTED. -Ideas rearding patentable device for WANTED. - Ideas rearding patentable device for
water well paste or mucilage bottle. Address Adhesive, P. O. Box 7\%3, New York.
Inquiry No. 9666 . - Wanted, makers of smanll
water uabe boilers
1 have for sale the U. S. and all foreign rights of new patent Improvements in Water 'Tube Types of Boiler
Great economizer. J. M. Colman, Everett, Wash.
Inquir y No. 7667.-For manufacturers of dental.
goods, such as teeth and filling materials.
Young, American permanently residing in Lima
Peru, S. America, wishes to hear froin firms intereste to be represented there. Further information.
Inquiry No.
ing fire escapes.
ing fire escapes. 668 . - For parties engaged in erect
For Sale - Patents. - Life saver; great money duced before; can be seen; only buyers. Apply by letter, Nicholson, 6513 d A venue.
Inquiry No. 7669.-Wanted, addresses of makers
Manufacturers of patent articles, dies, meta machinery tools and wood fibre products. Quadriga Manufacturing Company, 18 South Canal St., Chicago. Inquiry No. 7 670.-For dealers in name plates,
trunk checks, old badges, tic. PATENTS.-Wanted, the service of a patent exper ply who has not had a thorough education along tec nical lines, and who has not had experience in patent practice. Munn \& Co., 361 Broadway, New Yori.
Inquiry No. $76 \boldsymbol{2}$ 1.- For manufacturers of pro-
ducer gas macnines.
Sawnil machinery and outits manufactured by Lane Mfg. Co.. Box 13, Montpelier, Vt.
Inquiry No. $769: 2 .-$ For manufacturers of astro
nomleal telescopes.
Inquiry No. 7673.-Wanted, manufacturers of
railroad rron. Inquiry No. 7674.--Wanted, makers of elastic
bed mattresses aud pillows. Inquiry No. 7675 .- Wanted, name and address of
the makers of tne tileciric Shoe-shining Macunue.
 Inquiry No. 767\%.-W anted, a 1,000 -foot ga
holder. Inquiry No. 7688.- Wanted, hand knitting ma-
chines ror cheap culton stockings. Inquiry No. Y679.-For makers of thermostats
and neat regulators. Inquiry No. 7680 .-For manufacturers of molds
for moldiug plaster.
Inquiry No. 7681.-For dealers in crude rubber. Inquiry No. 76S:
glass boties. -Wanted, manufacturers Inquiry No. 7683.-For dealers in Canada or Bra-

Inquiry No. y685.-Wanted, catalogues of the
latest tire extinguishers by carbonic acid or other
Inquiry No. 7686 .- Wanted, makers of advertis-
ing clocks, about 6 feet high by 2 feet wrde.
Inquiry No. 9687 . - W anted, a pump for drawing
water out of a suck lue
for natural was.
Inguiry No. g688.-- Wanted, machines for drying
cutting and evaporating fruits.
Inquiry No. y689.- Wanted, makers of apparatus
suitable for general metallurgical and healiug pur-
Inquiry No. 9690 .-For makers of parts with
which to construct a dynamo. $\underset{\text { tirst-ciass rubber-stawp ink. }}{\text { Inquiry }}$ No. 7691 .- Wanted, recipes for making rt-lass
mill crayons:
Inquiry No. 7693.-Wanted. makers, of hosier
machines. also. ot a machate by whicu 2 to 8 dozen
Guernsey frocks. an be made in
In 1
Inquiry No. 7694.-Wanted,
Inquiry No. 9695 .- Wanted, the name and ad-
dress of the makers ot the celeorated Chime Hall Clock
movements, tubular
Inquiry No ${ }^{1696}$ -
s. of coal oil stov

Inquiry No. 9697 .-For makers of coal oil stove
burners, also crude oil stove burners. Inquiry No. 7698 .-For manufacturers of induc
tion coils.
Inquiry No. N699.
who 亡end sled runners. minquiry No. $\mathbf{g 7 0 0}$. - For manufacturers of pepper-
Inquiry
sa ws. wire, hinges $;$ also cotton goods.
Inquiry Noarings.
by0\%.-For manufacturers of ball

THE MARMON AIR-COOLED TOURING CAR. (Continued from page 2E.) necessary, but the large expanding-rin brakes in the rear wheels are usually am ple. The rear axle has an aluminium gear case, whose two halves are cast upon two axle sleeves, thus making an integral piece of each. The wheels and differential revolve on Hyatt roller bearings. Floating interior half-axles drive the wheels through jaw clutches on the hubs. The thrust of the bevel pinion is taken up by a rolling contact of the pinion against the bevel gear-a very simple arrangement.
Aluminium is used wherever possibl throughout the car. The body is con structed almost entirely of cast alumi nium, as is also the dash and fenders Vertical fenders from running board to body are one of the good features, as they keep down both dust and mud. The entire machine, with the exception of wheels and tires, is constructed in the large new addition the company has made to its plant for this purpose. The car is one of the best-built air-cooled machines on the market. That it can make fast time under all ordinary circumstances was demonstrated by its performance in the economy test held last November.

NEW FOUR-CYLINDER AIR-COOLED MOTOR (Continued from page 29.)
fit into notches in the shifter bars to locate them securely when the gears are completely in mesh. The bars are shift ed by a single hand lever working in an H-shaped quadrant on the selective sys tem. The selecter box is dustproof, and contains a simple device which positively locks, in their neutral position, all the shifter bars except the one in use.
This transmission is modeled after the latest Mercedes speed-change gear. The shafts run on the non-adjustable ball bear ings (which are also used on the road wheels), and the differential countershaf across the rear of the transmission is used for transmitting power to the wheels by means of sprockets and chains. The outer ball bearings of the countershaft are exactly under the sprockets. The advantages claimed for the transmission are that the divided shaft with one part running on the other (which makes a bearing difficult to oil and subject to reat wear) is entirely avoided, while he shafts are much shorter between bearings, and hence have no tendency to spring while the intermediate gears are in use.
Six years ago the Knox Company built their first machine, fitted with a single cylinder air-cooled motor of 4 horse-pow er. This was the first slow-speed motor of large bore and stroke to be made com mercially successful. It was superseded by still larger motors of the double-opposed, horizontal type, and this year a still larger vertical, four-cylinder motor has been placed on the market. The cylinders of this engine have a $43 / 4$-inch bore by $5 \frac{1}{2}$-inch stroke. They are cast separately, and besides having reinforcing ribs near their base, they have about onethird fewer pins per square inch of cylin der surface, and the pins are about half the length of those that were used here tofore. Experiment has shown that the Knox cylinder is more efficient when a lesser radiating surface is used. As heretofore, everything is very substantial about the Knox car. The $15 / 8$-inch crank shaft is supported in five separate bear ngs attached to the upper half of the crankcase. These bearings are 3 and inches long, and those of the hollow wrist pins are $21 / 4$ inches long. The valves, which are located in the cylinder heads, re 2 inches in diameter and interchange able. They are made of a special steel and nickel alloy. Each valve cage fits nto a pocket, from which it may be re moved without disturbing any of the con nections, and simply by unscrewing one nut. The valves can, therefore, be ground outside of the engine. Separate cam shafts operate the inlet and exhaust valves, by means of push rods and rocker levers. Special auxiliary coil springs are

# Locomobile 

30-35 H. P., $\$ 5,000$
15-20 H. P., \$3,000
These models are almost identical in design; contain the same carefully selected materials; and are constructed throughout with equal care. Both models are furnished with complete touring equipmen


Specifications of Type "E" 15-20 H. P. Locomcbile Price $\$ 3,000$
 base ; gears enclosed. Same general type as made by us for
four seasons rank Shaft, machined from one solid forging. CARBURETER, automatic type with balanced throttle valve. IGnITIoN, make-and-brake system used by us for the second
season. Ignition cams solid with admission cam shaft which slides in bearings to advance or retard spark.
MAGNETO, low tension, our design ; permanent magnets from
the best makers in the world ; impossible to disturb any electrical adjustments by removing or replacing magneto. Oil UBRICATOR, large mechanical oiler. Large supply pipes.
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NOTE.-Our $30-35$ H.P. Locomobile Type "H" $\$ 5,000$, is intended for those requiring greater power and greater seating capacity. The specifcations are the same as those printed above with the following exceptions; Motor $41 / 2$-in. bore, $51 / 2$-in. stroke.;
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attached to the latter. The gears are all inclosed and run in oil. The camshafts may be easily removed, and the crank bearings can be adjusted through the inspection covers in the crankcase. Hightension magneto ignition is employed, the magneto being gear-driven direct from one of the camshafts. A coil is used in connection with the magneto, and the distributor on the same directs the current to the spark plugs of the various cylinders. A metal-to-metal cone clutch running in oil is located in the flywheel of the engine.

THE OLDSMOBILE TWO-CYCLE AND FOURCYCLE TOURING CARS.
(Continued from page 30.)
is placed between the engine and the transmission in addition to the two protected universal joints in the propeller shaft. The motor and transmission are mounted upon a sub-frame, which is suitably braced by steel plates riveted to the main pressed-steel frame. All working parts of the machine may be removed without disturbing the alinement of the crank and transmission cases. The radiator also is mounted on the sub-frame, for the purpose of doing away with excessive vibration of this delicate member. The running board and mud guards are attached by means of tapered sockets, which makes them readily removable. This is a minor distinctive feature of the new Olds car. The four-cylinder, fourcycle motor of the larger touring car also has several distinct features. In the first place, the oiling system is very complete. The oil is pumped from an oil well in the base through passages in the crankcase of the motor to all the bearings of the same. The lower half of the crankcase contains a certain amount of oil, the splash from which is used to lubricate the cylinders. The level is maintained in the base by means of holes leading to the oil well below, any overflow passing immedrately into this reservoir. A positively-driven oil pump operated from the camshaft (which is hollow and also has oil forced through it for the lubrication of its bearings) circulates the oil through the passages of the crankcase. A glass bull's eye in the front of the case shows the amount of oil present at all times. In the bottom view of the chassis the oil well is seen as a long cylinder running the length of the crankcase. The water pump is also ingeniously housed in the rear end of the crankcase, where it is driven by gears. The view of the motor shows the cylinders to be cast in
pairs, with all valves located on one side pairs, with all valves located on one side camshaft. The contact box is at the rear end of the motor on the top of a vertical shaft, driven by bevel gears from the camshaft. Jump-spark ignition with separate coils and both storage and dry batteries is used. The clutch is of the ordinary cone type, but it is equipped with a spring device which allows the load to be picked up slowly and without any jerks. The clutch cone carries a large grease cup for the lubrication of the bearing that the clutch revolves upon when it is not engaged. The exhaust and the inlet pipes of the motor can readily be removed by taking off the clamping piece held by two nuts. The valves can be removed through holes in the valve chambers, and the valve stems and their bushings can also be taken out by undoing the clamps which hold the latter in place. The crankcase bearings are supported on the upper part of the motor base, and the whole bottom half of the crankcase can be removed when it is desired to adjust these bearings. The steer ing gear of this touring car is very well designed and has small grease cups on all important joints, so that the wear can be minimized. All the steering connections are easily adjusted. An irreversible worm steering gear is used. The fourcylinder car has a $41 / 4 \times 43 / 4$-inch motor, capable of developing 26 to 28 horse power at 1,000 R. P. M. The machine weighs about 2,000 pounds, has 106 -inch wheel base, and is capable of speeds of


Vertical roller-bearing engines. Cylinders. cast separately, $51 / 8 \times 6$ inches, 50 H . P. An exclusive transmisston
absolutely prevents striping of gears. Positive cooling system. Individual and special lubrication. Master Clutch has metal faces and takes hold without jerking. Shaft drive. Exclusive universal joints that prevent wear on pins.
Sprocket and Roller Pinion and perfect Rear Axle, all exclusive. Roller-bearings throughout. 108 -inch wheel base, 3procket and Rouler Pinion and perfect Rear Axle, all exclusive. Roller-bearings throughout. 108 -inch wheel base
54 -inch tonneau, seating five people. Four to 60 miles an hour on high gear. Weight, 2,750 pounds. Price, $\$ 3,500$

## THE EXCLUSIVE HAYNES TRANSMISSION.

If an automobile weighing 2,750 pounds, plus the weight of five passengers, is dropped over a sheer embankment of 7 feet, the machinery will receive a shock of jus the same severity as if suddenly checked by shifting from high speed gear at 30 miles act as a brake, and the entire machine is severely strained. With the Haynes transmis sion, this cannot occur. A ratchet and pawl device permits the car to coast until the speed of the car and engine are relatively equal, when the pawls engage and the engines take up the load. While making the change in speed from high to middle or from high to low, the gears are running idle, permitting the operator to shift with perfect ease and without danger of burring or stripping the gears. With all forms of transmission excep the Haynes, the shock of sudden change of gears may be, and frequently is, thrown upon the machine, a thing impossible in the Haynes car and one of the reasons why Hayne This is but-lived and cost so little for repairs and up-keep. Engines, Master Clutch Universal Joints that do away with war it Rol Bear Sprocket and Roller Pinion, etc There is perfect harmony throughout its entire me Sprocket and Roller Pinion, etc. There is perfect harmony throughout its entire me
chanism, which makes its cost of operation, up-keep and maintenance extremely low.
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The four models we offer for 1906 are the result
of mature experience They are not new and
untried experiments. untried experiments. Each car is a dist new and
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has been built with a view to supplying the varied
demand for high-grade machines. In the Wayne demand for high-grade machines. In the Wayne
cara the autoonobilist will be sure to find a car
suited to bis needs cars the automomons.
suited to his needs.
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$51 / 2 \times 5$, cast in pairs and water cooled, capacity, seven people. This car has full 50 H. H . Pil
Sliding gear transmision, with Hesss Bright bali
bearings throughout.



Model B, 4 -cylinder. 5 -passenger car, 24-28
H.P. Sliding gear transmission. Price, $\mathbf{\$ 2 , 0 0 0}$. Model C is a 20 H. P. 5 -passenger car
This car has the samedouble opposed motor which proved so successful last season. Two seasons
use of this type of machine has proved it a
ideal family car, most economical in up-kee ideal family car, most economical in up-keep.
Planetary tranmmission with chain drive. Tires
$30 \times 31 / 2$. Price, $\$ \mathbf{\$ 1 , 2 5 0}$.

about 50 miles an hour. The lighter two cycle car weighs only 1,700 pounds, which, with its 25 -horse-power motor should make it a very speedy and capable machine over all kinds of roads.

## PEERLESS TOURING CAR <br> (Continued from page 31)

 running in oil, and the object of the box being set at an angle instead of vertical is to keep the roller always submerged which does away with trouble from arcing. The radiator is constructed of flat copper tubes connecting with the surrounding water tank, which is a solid casting. The gear-driven centrifugal pump, housed in the crankcase and run ning in oil, forces the cooled water from the bottom of the radiator up through the water jackets. The clutch is of the internal expanding type, which has the following advantages: lack of weight, and a consequent lack of inertia, or flywheel effect, which is apt to prevent the quiet and quick shifting of the gears; ease of gripping; and an even distribution of the wear, which is taken up automat ically. There is also no end-thrust with this type of clutch. A novel feature is the possibility of adjusting the distance of the pedal from the front seat to suit the length of the driver's leg. The transmission, which we illustrate, is a typical four-speed sliding gear of the selective type. Ball bearings are used throughout, and provision is made for oiling them from the gear case. As may be seen in the cut, there are two sets of sliding gears operated by two shifting forks. Two of the three bars shown operate these forks. The bars are locked by a transverse rod passing beneath them and through notches on their under surface. This locking rod (which is seen at the righthand end) has a single notch which, when it is brought under any rod, frees it so that it can be moved back and forth by a vertical lever having a ball tip, which slips into the notch seen on the upper surface of each rod. The main shifting lever works in an $H$-shaped quadrant.

The side movement of this lever accom plishes the selecting of one of the three rods, while the forward and backward movement shifts one or the other set of gears forward or back, as the case may be. . The advantages of this type of trans mission are that the operator can alway change from one gear to the other with out passing through any idle gears For instance, he can pass immediately from the low speed to the fourth speed without throwing any gears into mesh except those of the latter speed. While this is an advantage for a skilled opera tor, a straightforward movement is easier for the beginner, and, consequently, gears of the ordinary three-speed type are gen erally preferable. The Peerless bevel gear drive is also shown. The differen tial is open, and two of the spur pinions can be seen through the casing. On each side of the differential are ball bearings and universal joints. The latter allow of a slight movement of the driving shafts, which extend through the tubular rear axle and drive the wheels through jaw clutches on the hubs. The wheels them selves revolve on adjustable ball bearings on the tubular axle. The universal joints mentioned make it possible to dish the wheels slightly, which adds somewhat to their strength. There is also no binding if the axle gets out of line. This rear axle construction has always been a fea ture of the Peerless car. The wheel base of the new car is 107 inches, and the wheels are 34 inches in diameter. The two rear springs are connected by a transverse spring that supports the body in
the center, and makes a very easy-riding car. Besides the 30 -horse-power car, a 45 horse-power model is also built.

HIGH-POWERED AMERICAN TOURING CARS.
(Continued from page 32.) has a 104 -inch wheel base, and weighs complete 2,300 pounds.
the royal 50 -horse-power touring car. The 1906 car put out by the Royal Com pany has practically the same chassis a the racer which made such a fine per formance at the Vanderbilt cup race last October. The motor has a bore and stroke of 5 and $51 / 2$ inches, respectively It is fitted with mechanically-operated valves on opposite sides, the cylinders be ing cast in pairs, and the valves being in terchangeable. The bearings are bronze on the crankshaft and hardened steel at the wrist pins. They are all of sufficient surface not to require replacement more than once a year. The gears which drive the cam shaft are of fiber, uninclosed The commutator is placed on top of the cylinders and is driven by bevel gears from the cam shaft. The centrifugal pump, which is also bevel-gear-driven and inclosed, can be seen in the view of the motor. The motor is fitted with a posi tive mechanical oiler which effectually lubricates all its parts. The ignition system consists of quadruple coils and storage batteries. It is of the usual jump spark type. The radiator, of the cellular type, has a large belt-driven fan behind . The Royal clutch is of the conica leather-faced type. It is of large diame er and has flat springs beneath the leath er for the purpose of making it take hold easily. A universal joint is used between engine and transmission in addition to the usual two joints in the propelle shaft. The transmission, shown here with, is of the sliding gear type, giving three speeds ahead and reverse with forward and backward movement of one lever. The shafts are mounted on ball bearings and the gears are bolted to flanges made solid with the shafts, in stead of being keyed or pirned. The gea case is suspended from the upper half by means of hangers, which makes it possi ble of removal without taking out the bolts which fasten it to the car, as by separating the two halves of the gea case, the bottom part carrying the gears can be immediately dropped. The inter mediate reverse pinion is carried upon short shaft in the upper part of the case and when not in use is thrown out of mesh by a spring. The rear axle is of the ive bevel-gear-driven type, the weight of the car being carried on the tubing which surrounds the driving axle. Roller bear ings are used in the axle and wheels.
he 50 -horse-power haynes touring car
Although one of the oldest automobile firms in America, the Haynes Company, of Kokomo, Ind., nevertheless obtained valuable experience in the past year with a racer built for the Vanderbil race. This car made one of the steadiest running performances of any in the race and won fourth place. The 50 -horse power 1906 touring car is practically a duplicate of the racer, it having all the features which were tried out on the lat ter. Besides the peculiar roller bevel gear drive employed on last year's cars, the new Haynes has an ingenious ratchet arrangement in the main driving gear of the transmission for the purpose of making it possible to jump back from high to intermediate or low speed when the car is running rapidly, without the dan ger of stripping the gears. This danger is a very grave one with all ordinary transmissions of the sliding type. By means of a ratchet in the main driving gear, this gear is allowed to run ahead of the driving shaft when the gears ar changed from a higher to a lower speed, which ordinarily results in the car tend ing to drive the engine and consequently being brought up with a shock. So sever the strain on the gears under thes conditions that a 2,750 -pound car carry-

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Type G, four-cylinder light car; air-cooled, shaft-drive, sliding gear transmission, 3 speeds and reverse. New and perfect disc clutch; force-feed oiler on the dash; side doors; 88 -inch wheel-base; 4 passengers; 35 miles an hour; 12 Franklin horse-power; 1,400 pounds. Full head and tail-light equipment. $\$ 1,800 \mathrm{f} . \mathrm{o} . \mathrm{b}$. Syracuse.
Why the astonishing fact that this light car, rated at 12 "Franklin horse-power," does more, on average roads, than any other car rated at 20 horse-power?

First: the real proportion of usable power is more han 12 to 20 . Other cars are rated at the maximum horse-power of their engine, running in the shop under ideal conditions. Franklin cars are rated at the power they develop under the practical average speed on the road ai 20 miles an hour.

Then: weight. Franklin air-cooling means a light engine and light construction throughout-no water or water-cooling apparatus; no heavy frame to carry them. At least 200 pounds saved on weight construction

Then: little power lost between the engine and the rear wheels. The same engineering ability that designed and refined the marvelous motor has refined and saved
power all over the car. Other cars lose enormous amounts of power in the clutch, transmission, joints in the shaft, bevel-gear, rear axle bearings- power is lost everywhere. In the Franklin this loss is trifling. This is a matter of fact and proof, and we have gone to the bottom of it.

Then: vibration. This is of enormous importance It uses up power to shake a car, as it uses up power to shake your fist. A rough road reduces the power of the average car 50 per cent. or more, and a very rough road often stops the car altogether. The Franklin full elliptical spring suspension, with its flexible wood-sill, takes up the vibration, leaving the working parts free to do their work.

Not one reason but a dozen, all thought out and worked out with the same thoroughness and disregard of precedent which invented the Franklin four-cylinder air-cooled motor, when all the other American makers said that four cylinders were unnecessary and that air-cooling was impossible.

Send for the Franklin 1906 catalogue-by far the handsomest motor book ever madewhich tells about

> 4-cylinder 12 h. p. Runabout, $\$ 1,400$ 4-cylinder 12 h. p. Light Car, $\$ 1,800$ Prices f. o. b. Syracuse, N. Y.
H. H. FRANKLIN MFG. COMPANY, Syracuse, N. Y., M. A. L. A. M.
ing a normal load undergoes, when the gears are changed from high-speed ( 30 miles per hour) to intermediate ( 15 miles per hour) a shock to its mechanism equivalent to a vertical fall of 7 feet. The new construction does away with this shock completely and the life of the gears is greatly increased by it. Another feature of the new car is a solid inner live rear axle. This is fastened to one side of the differential and to the corresponding rear wheel, while the other side of the differential is attached to a sleeve slipped over the axle and driving the other rear wheel. Both axle and sleeve run in roller bearings of ample size. This type of bearing is also used on the ends of the engine crankshaft, and in the transmission. A new inclosed universal joint which transmits the power through the wide, flat surface of the forks is another feature of the car. The clutch is of the band brake type, having springs in the drum for the purpose of cushioning the latter when the band takes hold. The water pump is a very powerful one, and the motor, which has a $51 / 8$-inch bore by 6 -inch stroke, has liberal water jackets. Special double piston rings are used with this motor. A mechanical oiler has leads to each cylinder and the crankcase.
the lane steam touring car.
A firm which has done much to promote the use of the steam vehicle in this country, and which still pins its faith to this type of machine, is the Lane Motor Vehicle Company, of Poughkeepsie, N. Y. The Lane car shown on page 33 embodies all that is best in steam vehicle construction, and is an up-to-date machine in every particular. The boiler, which is a combination flash and water-tube affair, is placed in front under the bonnet. The engine is located in an inclined position under the footboard, and the gasoline tank is under the front seat. single chain from the engine crankshaft to the differential on the rear axle drives the car. The layout of chassis just described is one which was employed with success last year by two American constructors. It has been adopted by the Serpollet firm of France for this year. Thus, while France is said to lead the world in gasoline car construction, one of her leading steam-car makers has adopted an American design. The arrangement of the boiler in front takes away the heat from beneath the seats, and allows of much more space for carrying purposes. The engine is readily accessible by removing the floor boards, and the boiler by removing the bonnet. The claim is made for the Lane boiler that it has the economy of the regular flash-tube type, the reserve of the water-tube boiler, and a better draft than either. The burner is made entirely of tubing, and is said to be indestructible. The engine is completely incased and protected from dust. It is of the cross-compound type, with $31 / 4$ and $51 / 4$-inch cylinders and a stroke of $31 / 2$ inches. The steam chests are placed side by side between the cylinders, and they carry on their back surface the control device for running the engine simple or compound. This is operated by a pedal extending through the floor, and by means of it the engine may be made to exert two and one-half times its normal power. The engine is mounted in a frame of steel rods, suitably braced. The crankshaft, with its eccentrics, flywheels, sprocket disks, cranks, and counter-balances, is a single piece of hardened steel having its bearings ground. The crankshaft and wrist pins have rol ler bearings, and the eccentrics ball bearings. Both the air and water pumps are inside the oil-tight casing, and are directly actuated by the crosshead. Experience has shown the makers that the piston and valve rods carry sufficient oil into the interior of the engine to lubricate the cylinders properly. An oil cup for this purpose is placed on the dash, but it is only intended to be used occasionally when starting. The automatic by-pass for the water is operated by a thermostat, which depends upon the


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If you have doubts as to the practical value of a two-cylinder car, where not over 16-20 H. P. is required, ask a "Maxwell" owner what he thinks of it. That is the keynote of our doctrine. If you are interested in advanced motor construction, it will pay you to get the facts about the "Maxwell." Most of them you can get from our catalogue which will be sent on request, but all of them can' be obtained from a talk with a Maxwell agent and a ride in a Maxwell car.

16-20 H. P. Touring Car $\$ 1,450 \quad 10 \mathrm{H}$. P. Tourabout $\$ 780$

## MAXWELL-BRISCOE MOTOR CO.

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Maxwell-Briscoe-Chase Co. 1502 Michigan Ave., Chicago, Ill.
Maxwell-Briscoe-McLeod Co.
Fisher Automobile Co. 243 Jefferson Ave., Detroit, Mich. 330 North Illinois Ave., Indianapolis, Ind.

water level in the boiler. There is also a hand by-pass arranged on the steering post for use, if necessary. The air pres sure on the fuel tank is maintained automatically by an air pump driven from the engine. The maximum pressure this pump can produce is determined by an adjustable clearance space, having a con siderable range of adjustment from the outside. An independent steam air pump for emergency use and for tire inflation is also provided. The boiler is fitted with a fusible plug in case the water level falls within three inches of the bot tom. This plug can be replaced without stopping the machine. The condenser, seen on the front of the car, is constructed of thin, flat, brass tubes, arranged vertically with their edges toward the front and air spaces between them. The steam enters a header at the top, and the water flows out at the bottom, and is returned to the tank by the back pressure The top carries a coil for heating the feed water on its way to the boiler. The condenser is said to return practically all the water when the engine is running compound under normal conditions. The dash of this touring car is fitted with a considerable number of gages for indicat ing all that should be known by the operator when driving the car.

## the rambler automobiles.

Besides the regular runabout and tour ing car of the single-cylinder and double-opposed-cylinder type which have been regularly made by the Jeffery Company, this concern has brought out for 1906 a standard four-cylinder touring car with a three-speed sliding gear transmission, shaft drive, and all the usual features of this type. The engine consists of four individual cylinders having a 4 -inch bore and $41 / 2$-inch stroke and rated at 20 to 25 horse-power. It has mechanically operated valves placed directly in the cylinder heads and onened by rocker arms on top of the cylinders. The rocker arms are made adjustable for the taking up of any wear; and the valves and cages may be removed readily for the purpose of grinding. The cam-shaft gears are inclosed in a dust and oil proof casing. The pistons of the Rambler engine are provided with six rings each, the rings being located in pairs with their joints at opposite points. Great care is taken in fitting the rings and pistons. The motor is fitted with a jump-spark ignition system, the source of energy being a six-volt, 60 -ampere-hour storage battery. Individual Splitdorf coils are mounted on the dash. A safety device is fitted to the en gine for the purpose of retarding the spark when the crank is released from the holding latch, in order to start the motor. The mechanical force-feed oiler is placed on the dash, with sight feeds in full view of the operator. A float-feed carbureter with an automatic air valve supplies the motor with the proper mix ture. The throttle is controlled by a special wheel just under the steering wheel. This control is peculiar to the Rambler cars and is used in combination with an accelerator pedal. The spark advance is inter-connected with the wheel throttle control, so that the spark is advanced ordinarily as the throttle is opened. Under conditions where this is not desirable, however, the spark may be retarded and the accelerator opened to obtain full power. The clutch is interlocking with the gear-shift lever, so that it is impossible to change gears without first disengaging the clutch. The car has two sets of brakes, the regular brake being on the differential drum, and the emergency brake being of the expansive type placed within the rear wheels. This company also makes a larger four-cylinder car having a $5 \times 5 \frac{1}{2}$-inch motor of 35 to 40 horse power and fitted with a countershaft and chain drive to the rear wheels instead of the bevel-gear drive used on the lighter model. The larger car is a trifle longer than the others and is provided with 34-inch wheels and 4 -inch tires. A Limousine model is also one of the products of Sine model is also one of the products of
the Rambler factory, which is this year
turning out one of the most complete lines of cars of any factory in the country.
the columbia 40-45-HORSE-POWER TOURING CAR.
The new Columbia heavy touring car is much the same as the 1905 model, though the new "Mercedes" type bonnet and several changes in the body have changed its general appearance. The motor is made up of two pairs of $5 \times 5$ cylinders. It develops its rated power at 800 R. P. M., but it has a range of from 150 to 1,500 R. P. M. under throttle control. The mechanically-operated valves are in a chamber on one side of the cylinders. The inlet valves are directly above the exhaust valves, and are opened downward by vertical pull rods having arms on their top extending over the valve stems. A cam-operated lever within the crank-case draws each rod downward and opens the inlet valve. The breech-lock scheme of fastening the spark plugs in place is retained. The ignition is by jump spark with quad coil on the dash and storage batteries as a current source. The crankshaft is made from a solid slab of steel. The car has a 3 -speed sliding. gear transmission and chain drive to the rear wheels. Roller bearings are used in the wheels. Both brakes are interconnected with the clutch, which is of the leather-lined cone type in the flywheel.
All the Columbia cars are fitted with a new automatic governor having no needle valve or gasoline-feed adjustment. The auxiliary air is let in by a sliding piston, which uncovers ports in the bottom of the carbureter. The governor operates a by-pass valve and not the throttle. The latter is connected to a pedal. The new $24-28$ horse-power fourcylinder light car has low-tension magneto ignition besides several other improvements. The E. V. Company also manufactures the same 18 horse-power double-opposed-cylinder car that it marketed last year. In electric vehicles, a brougham with cross seat in front for driver is one of the new models.
the grout gasoline touring car
The Grout Brothers Automobile Company, Orange, Mass., has once more turned its attention from the steam to the gasoline car, and a new, large touring car (shown on page 33) of 30 to 35 horsepower is the result. This machine is of the standard four-cylinder type, having individual, integrally-cast cylinders, with mechanically-operated valves placed on one side and driven from a single camshaft. The valves, as is usual with most modern cars, are all interchangeable. The ignition system, of the jump-spark type, is carried out with the use of a single coil and a new pattern of hightension distributor which allows of the use of rigid wires. An improvement is also to be noted in the spark advance mechanism. Instead of moving the box itself, the revolving wiper is made to advance on its shaft. The motor and transmission are oiled by a novel forcefeed lubricator, having a single pump and a distributing valve, which sends the oil through the various pipes. The transmission is of the usual three-speed type with direct drive on the high speed. The countershaft at the rear of the gear box runs on roller bearings, and has a band brake operated by a pedal. A double chain drive to the wheels is employed. The main frame of the Grout car is of armored wood, strengthened at the corners by steel braces. The power plant is mounted on a sub-frame of channel steel. Ball bearings are used in the wheels, which are shod with $32 \times 4$-inch tires having non-skid treads. The carr is controlled from the steering wheel, the ignition and throttle levers being mounted on segments, which remain stationary when the wheel is turned.
the american mercedes automobile.
The product of the Daimler Manufac turing Company, illustrated on page 33, is said to be an exact duplicate of the world-famed machine made by the Daimler Motoren-Gesellschaft. The American


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COVERT FIRE ESCAPE CO.,
Troy, N. Y.
company has acquired the complete specifications of the German machine, and in some instances has imported parts from Germany. The materials used in the construction of the American Mercedes are required to pass the same rigid tests used abroad. The steels used in the axles, crankshafts, gears, and gearshafts are made from a special alloy said to have a tensile strength nearly double that of the best axle and shaft steels obtainable here. Thus, it will be seen that as far as material is concerned, the American car should be equal to its more celebrated brother. The motor is a four-cylinder engine having its cylinders in pairs and the valves placed symmetrically. All the valves are operated mechanically, and mechanical make-and-break igniters are also employed in connection with a Simms-Bosch magneto. Sight-feed oilers located on the dash and fed by pressure are used for lubricating. There is also an auxiliary hand oil pump. The transmission is of the latest Mercedes type, in which there are two bevel gears on the differential. One of these is driven from the secondary shaft of the transmission, while the other is used only on the high speed when a direct through drive is maintained. Chain drive to the rear wheels is employed, and Brampton selfhardening steel chains are used. The car has two separate pedal brakes working on the transmission, as well as expanding brakes in the hubs of the rear wheels The engine develops 45 horse-power at 1,000 R. P. M. The cylinders are 120 by 150 millimeters. The valves are twice as large as those used last year, and the metal expanding clutch is inclosed and runs in oil. The engine crankshaft is mounted in non-adjustable ball bearings of the type shown on page 34 .

THE RAPID MOTOR VEHICLE COMPANY'S truck.
The truck shown on page 33 is fitted with a double-opposed-cylinder motor placed fore and aft of the vehicle beneath the driver's seat. This engine has a 5 -inch bore and stroke, and is rated at from 16 to 18 horse-power. It is connected direct to a planetary gear transmission, giving two speeds forward and reverse, and which is mounted at its outer end in a special form of bearing, which can adjust itself to any mis-alinement caused by strains upon the frame. A chain from the engine crankshaft runs back to a countershaft just forward of the rear springs, and the wheels are driven by individual chains from this countershaft. Roller bearings are used throughout, and the car is mounted on exceedingly heavy spring's, of which there are a considerable number. Transverse springs are used at front and rear, besides a supplementary transverse spring over the rear axle. This latter spring only comes into play when the car is heavily loaded. The body of the truck is very strongly constructed, and is heavily ironed throughout. The motor is lubricated by a mechanical oiler of novel design, which has but one plunger that forces the oil through a series of holes at every stroke. The commutator is placed in a very accessible position at the side of the car. The construction throughout is of the simplest and most substantial sort. A multiple-disk clutch is used for the high speed, and it is claimed that the car can be started on an incline when fully loaded by simply throwing in this clutch. The machine shown is intended for a load of a ton and a half, but it will carry heavier loads if necessary. oldSmobile bus.
The bus shown on page 33 is a 20 -passenger rig, mounted on the largest commercial vehicle chassis that the Olds Motor Works produce. This chassis is fitted with a vertical 2 -cylinder engine located under the driver's seat, and having a planetary gear arranged on its crankshaft. A Morse silent chain runs back from this shaft to a countershaft in front of the rear springs, and an individual chain from this countershaft drives each rear wheel, The machine is fitted with

## THE INCOMPARABLE WHITE

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## WHITE CATALOG

Every one interested in automobiles, whether steam, gasolene or electric, should write to u for the new catalog of the Model " $F$ ", White steam car. It contains, first of all, a brie historical sketch, tracing the gradual perfection of the steam engine by the labors of many gen erations of engineers. Then is related how Rollin H . White, by the invention of an entirely new system of steam generation, whereby the boiler was eliminated, devised the first successfu eam machine. This car was first offered to the public in 1901.
Brief references are made throughout the catalog to the success of this first model and to the constan_ victories and notable achievements which every model of the White steamer ha each year placed to its credit. There is also included a concise and lucid description of th White system. Finally, there are shown the various Model " F " cars-touring cars, Limousines landaulets, victorias, runabouts, extension landaulets-which we are now delivering.

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We can save you space and weight in your battery installations.

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roller bearings throughout. The wheels are large, and are shod with solid rubber tires. A speed of 15 to 18 miles an hour is obtainable on the high gear, and this machine will be found very serviceable for carrying on a bus business where the roads are fairly good.
the national six-cylinder touring car.
Without a doubt one of the largest and finest American machines is the new sixcylinder National. This car has a $41 / 2 \times$ 5 -inch engine, having individual cylin ders and mechanically-operated valves in a single valve chamber on each cylinder These valves are worked by a single camshaft. The crankshaft of the engine is supported in five large bearings, and the crankcase is divided into four compartments. It is also provided with hand holes of large size, so that the crankshaft bearings can be readily inspected. Jumpspark ignition with individual vibrating coils and a dynamo, storage and dry bat teries as sources of current supply are used. The dynamo is placed on end just back of the dash, so that its bevel friction pulley runs against the side of the motor flywheel. The commutator can be read ily reached by removing a cap. A posi tive mechanical oiler is used for lubricat ing the engine. The water-circulating pump is driven from the camshaft, and is readily removable without disturbing any parts of the engine. The same type of clutch having flat springs beneath the leather is used. The clutch is interlocked with the brake and gear levers. The propeller shaft and the transmission shafts are mounted on non-adjustable ball bearings. A feature of the National car that is noteworthy is the employment of two tie-rods between the steering knuckles of the front wheels. The hub of each rear wheel is fitted with two internal expanding brakes, as shown in the accompanying cut. This is a new feat

tWin expanding hub brakes. ure found on but few of the 1906 cars. One of these brakes is operated by a pedal, and the other by the mergency lever. The steering gear is of the worm type, and is non-reversible. The body used on the car is of cast aluminium. It is very commodious, and has a capacity of seven passengers, all facing forward The control of this car when running on the high speed is so complete that it can be speeded from 3 to 60 miles an hour simply by opening the throttle. A four cylinder National car holds the record of 1,094 3-16 miles in twenty-four hours. This means an average speed, while the car was running, of 51.9 miles per hour. The record was made upon the track at Indianapolis on November 4 last, and it was an excellent demonstration of smoothness and steadiness of running Two cars made the attempt on the previ ous record, but one was driven through the fence by accident at night. The other car continued in its race against time, and succeeded in beating the previ ous record by $789-16$ miles. It also broke the 150 -mile record, and all the other world's records from 650 to 1,050 miles. A test of this kind is one of the most severe that can be given a car, and one which approximates rather cioseiy to what it will have to do when driven at high speeds over good roads.
the stoddard-dayton touring car.
An excellent example of a modern 4
cylinder touring car is that made by the

The Morgan \& $\begin{gathered}\text { Wright Automobile } \\ \text { Tires. }\end{gathered}$
A firm that has done much toward bringing the automobile tire to its present improved state is the Morgan \& Wright Company, of Chicago. This company was well known for its bicycle tires some years ago, and it has consistently maintained its reputation by the manufacture of first-class tires. The 1906 line manufactured by this firm is said to have several distinct improvements as follows: In the first place, an increase in fabric strength of something like 40 per cent over the fabric ordinarily used has been obtained by a special method of manufacture. Furthermore, the fabric is so laid down in constructing the tire that the latter, when finished, has the precise shape that it would naturally have when inflated, and consequently there is no undue strain of the fabric set up when inflation takes place. Another advantage found in the Morgan \& Wright tires is that not only the tread but the whole tire is wrapped throughout in its construction. The "wrapping" process, which is rather of a mystery to the layman, is the process of laying in place by hand several layers of fabric, in order to insure a correct placing of said layers. In this way they obtain the position which they were to assume naturally, and' they are not subjected to undue strains of stretching. This process is generally used on the tread only, but with the Morgan \& Wright tire it is used throughout. The fourth improvement is'the employing of a very tough grade of specially compounded stock for the tread of the tire. The balance of the tire is made of the highest grade Para rubber, which gives the tire great resiliency. These tires are made in several styles, including the Clincher rim, the Dunlop rim, and with the Baily "Won't Slip" tread. This tread consists of a series of disklike raised places on the tread of the tire, which keep it from slipping under the most adverse conditions, and also aid in preventing punctures. The Dunlop tires are made of the very best materials. The rings which secure the tire to the rim are of imported piano wire. The great care which is used in the construction of the tires will be apparent when it is stated that the makers keep an expert constantly on duty at the mill which supplies them with the fabric, for the sole purpose of inspecting the raw material and rejecting any which shows the slightest impurity. The record of these tires for resiliency and durability is of the highest, and the reason for this is readily seen in the care which is taken in their construction.

HIGH-POWERED AMERICAN TOURING CARS.
(Continued from page 54.)
Dayton Motor Car Company, and known as the Stoddard-Dayton. This machine is a high-class car in every respect. It is fitted with a $41 / 2 \times 5$ Rutenber motor having interchangeable, mechanically-operated valves, all on one side. The inlet and exhaust pipes may be detached readily by removing four nuts. The connecting rods are adjustable at both ends. A mechanical pressure-feed oiler operated by an eccentric lubricates the engine. This is controlled by spark and throttle levers on the steering column. The brake pedal, when pushed, also throws out the clutch, and both pedals are connected so as to close the throttle and prevent the engine from racing. The transmission gives three speeds and a reverse. It is of the selective type and is controlled by a single lever working in an H -shaped quadrant. A double universal joint is fitted between its forward end and the clutch, which is of the standard cone type with ball thrust bearing. The rear axle is of the usual live floating type employed almost universally nowadays with a bevel-gear drive, the wheels turning on roller bearings on the ends of the incasing tube and being driven by the inner live axle through jaw clutches in the hubs. Expanding-ring

brakes lined with camel's hair are fitted in the wheels, and a transmission brake operated by a pedal is also provided. The car has a 103 -inch wheelbase, and $32 \times 4$ inch tires.
aUTO-CAR EQUIPMENT COMPANY'S COMmercial vehicles.
This concern makes a specialty of vehicles for commercial purposes, such as passenger omnibuses, delivery wagons, trucks, and sight-seeing automobiles. One of the new models on exhibition at the Armory Show is a 12 -passenger wagonette, fitted with a double-opposed motor of 18 horse-power, mounted crosswise beneath the body. This motor is in an accessible position and is fitted with a planetary transmission, giving two speeds ahead and a reverse. It drives, through an inclosed bevel gear running in oil, the countershaft from the ends of which chains extend to the rear wheels. The machine is very compact and neat in appearance. Its length over all is $91 / 2$ feet. It is fitted with movable sashes, which can be taken out in the summer, and which thus make it a practically open vehicle.
Another machine turned out by this firm has a handsome closed body designed to carry fourteen people, while two more may be carried on the driver's seat. The body is mounted on the running gear by a three-point suspension. The car is fitted with large 36 -inch wheels having $31 / 2$, and 4 -inch endless solid rubber tires in front and rear. Roller bearings are used in the wheels, which also have integral brake drum and sprockets attached. The car is driven by a four-cylinder vertical motor placed in front. This engine is said to develop 34 B.H.P. at 1,000 R. P. M. Its valves are all mechanicallyoperated and located in the cylinder heads. The motor is connected to a twospeed transmission, the gears of which are of wide face and heavy pitch. The machine has a wheel base of 120 inches. and its length over all is $131 / 2$ feet. It is proposed to have one of these cars running between the Garden and the Sixtyninth Regiment Armory during the show week. An electric hotel bus somewhat similar in design is another of the models manufactured by this concern. The company also makes a 3-ton gasoline truck, having the same power plant as the 16 passenger wagonette. This truck will travel 10 miles an hour at high speed. It is fitted with a stationary or removable top, as the purchaser may desire. A novel feature of this truck is sand boxes and valves for sanding the road in front of the rear wheels, should this be found necessary.
the 1906 white steam machines
The new White steam car has a very much lengthened wheel base and a roomy side-entrance tonneau body. The power plant is practically identical with that used last year, the compound two-cylinder vertical engine being placed in front under the bonnet, and the flash generator being situated under the forward seat. The car is fitted with bevel-gear drive and disconnecting clutch, for the purpose of allowing the engine to run idle for a few moments at the start. In connection with this clutch a secondary gear is provided, by which the car can be run at half speed when the engine is making its full number of revolutions. This lower gear can ke used whenever the road conditions necessitate slow traveling and increased power. Ball bearings are used in the engine, transmission, rear axle, and wheels. The engine is lubricated by a belt-driven oiler located on the dash. The crankcase is filled with oil, and the splash from the cranks is relied on for oiling crankshaft bearings. The low speed, bevel, and differential gears all run in oil. This thorough lubrication of all wearing parts is a point which has received special attention with the new models. The engine of the 1906 car is rated at 18 horse-power. There are several forms of closed bodies constructed by this company, any one of which can be used upon the standard chassis. This chassis consists of an armored wood

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Runs the Age-measure of Your Life; up or down? Are you climbing to middle-life or slipping down life's slope toward old age ? In either case you are growing older each day. Every day provision for your family becomes more necessary, because every day reduces the unknown quantity of opportunity by twenty-four hours.

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Make the future safe for yourself and your family by a Life Insurance policy in

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Incorporated as a Stock Company by the State of New Jersey

## JOHN F. DRYOEN, President Home Office: NEWARK, N. J.

frame 13 feet 5 inches in length, and carrying at its front end the motor, which is directly connected to the rear axle by a universally-jointed propeller shaft. Two powerful brakes are provided; one a foot-brake, acts upon the flywheel by means of expanding shoes, while the other, the hand brake, is connected with expanding shoes within the hub drums of the rear wheels. The wheel base of this chassis is $91 / 2$ feet. It is fitted with 34 inch wheels having 4 -inch tires, and the weight of the complete touring car is 2,275 pounds.

THE DECAUVILLE MODELS FOR 1906
In the Decauville exhibit at the Madison Square Garden Show will be found repre sentatives of the five models constructed for 1906. All are built upon the patented frame, in which a steel pan stamped in tegrally with the side bars of the frame supports the engine and gear case. The engine has four vertical cylinders cast integrally in pairs, with valve chambers on opposite sides. It is automatically oiled through a sight-feed lubricator, and is fitted with high-tension ignition by means of a magneto or batteries. The carbureter is of the automatic type con trolled by the speed of the engine. Gasoline is supplied by pressure from the gasoline tank. A honeycomb radiator fitted with a fan, and having its water circulated by means of a positively-driven gear pump, is used on all the cars. All of the driving gears are inclosed and run in oil. The five different sizes of cars are fitted with $12-16,16-20,26-28,30-35,45-60$ horse-power engines. The two larger cars are fitted with side-chain drive, while the three smaller ones have shaft drive. The lowest-powered car is capable of a speed of from 30 to 35 miles an hour, while the 60 -horse-power machine will travel from 50 to 60 miles an hour. The Decauville Company's exhibit of foreign cars is one of the most complete at either show
the new darrace light touring car.
In view of the fact that the Darracd machine won the Vanderbilt cup, and that an extremely high-powered racer has been built recently with a view to captur ing the two-mile-a-minute trophy at Or mond, a brief description of the light Darracq touring car, marketed in this country by the American Darracq Co. will no doubt be of interest. A 20-32 horse power model has a four-cylinder verti cal engine of 112 millimeters bore by 120 millimeters stroke, the cylinders be ing cast in pairs. The engine drives a three-speed sliding gear transmission, which is in turn connected through the usual universally-jointed propeller shaft and bevel-gear drive to the live rear axle The three forward speeds and one reverse are obtained with a single lever. The clutch used in the engine flywheel is a leather-faced cone, having four springs beneath the face to allow of easy engage ment. The clutch pedal is connected with the throttle in such a way as to clos this when the clutch is disengaged. The throttle lever is located on a stationary sector in the steering wheel. The car is fitted with internal expanding brakes on the propeller shaft and rear wheels. Th engine is lubricated by splash, the leve in the crankcase being maintained by a small paddle pump, driven off the cam shaft, and which sends oil through sigh feeds on the dash to the crankcase Either high-tension ignition by coils and accumulators, or low-tension magneto ig nition is used. The wheel base of the ma chine is 120 inches. It is fitted with $880 \times 120$-millimeter tires in the front and rear; and the speed it is capable of mak ing is in the neighborhood of 50 miles an hour.

THE FOUR-WHEEL DRIVE TRUCKS.
In our Automobile Number last year we illustrated a new form of gasoline truck, in which all four wheels wer driven from suitable countershafts con nected with a three-speed transmission The Four-Wheel Drive Company, of Mil waukee, Wis., have improved this truck, and have now brought out a model in

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HIGH CLASS TOURING CARS MADE AND TESTED IN THE BERKSHIRE HILLS


THREE MODELS
16 H. P. $\$ 2,000 \quad 25$ H. P. $\$ 2,500$
$\mathbf{4 0}$ H. P. $\mathbf{\$ 4 , 5 0 0}$ The car that will do in the Berkshire Hills will do anywhere on this earth Berkehire Cars are a modern, up-to-date American product DOUGLAS ANDREWS COMPANY, Selling Agents 1623 Broadway, NEW YORK
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Take a Trip to the Tropics On one of the perfectly equipped "Ad Steamships of the

## United Fruit Company

They afford the most delightful salt water trip of the winter months. Within 24 hours after leaving, you are in the accommodations in Jamaica satisfy every desire.
Weekly Sailings from Boston and Philadelphia. Steamships "Brook line" and "Barnstable" weekly from Baltimore
Round Trip, \$75 and \$45
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For this and complete information For this and complete information, write to one of these addresses.
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5 N . Wharves, Philadelphia 104 East Pratt Street, Baltim 321 St. Charles Street, New Thos. Cook \& Sons A
For Shakespeare's Seven Ages Horlick's Malted Milk is used in thous-
ands of homes as an invigorating and healthands of homes as an invigorating and health-
fultable drink. More wholesome than tea,
coffee coffee or cocoa. An ideal nutrient for the
infant, the growing child, and the aged. A refreshing and nutritious luncheon for every member of the family. Prepared by simply
stirring in water. with the extract of choice malted cereals, with the extract of choice malted cereals,
elaborated to powder form. Also in Lunch
Tablet forn chol Tablet forn, chocolate flavor. A healthful
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## "FOLLOW THE FLAG"

There is nothing more assuring to the traveler than his knowledge of the fact that he is traveling on a firm roadbed upon which is laid the heaviest of steel rails, made true in all their curves, and that the train which carries him is of the highest standard of excellence known to railroads and is being guided to its destination by experienced minds. These are the conditions which become apparent to the frequent traveler on the Wabash Line and which have made that line justly famous.

The aggressive management, at all times alert to the needs of the public, carry passengers in through cars between

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MAGIC $\begin{gathered}\text { Stage Illusions and Scientific Diver- } \\ \text { sions, including Trick Photography. }\end{gathered}$

which all four wheels are shaft-driven through bevel gears. The dispensing with chains on a vehicle of this size and construction should be a valuable feature, as such a machine has to go through all kinds of weather and traverse bad road surfaces, and the four long chains heretofore employed were apt to stretch and become clogged with mud. The new trucks are made in several sizes. The drive by all four wheels gives them great tractive power, and makes them able to extricate themselves from almost any position without difficulty.
The Swinehart Solid Cushion Tire. The Swinehart tire, which was illustrated in our last automobile number, has been used with success by an increasing number of automobilists during the past year, and almost all of these testify to its good qualities as regards resiliency and speed. While it is generally conceded that with an ordinary solid tire a speed of 15 miles an hour is about the limit, several users of the Swinehart tire have traveled in the neighborhood of 40 miles an hour without serious results or great discomfort, and have proved that this tire is applicable to the heaviest and fastest vehicles, as well as to the runabout and light touring car. The large number of testimonials from users of the tire apparent ly show that the great troubles of shaking to pieces of the car and crystallization of the parts from excessive vibration are not what they were thought to be. The tire is constructed on very different lines from the ordinary solid tire, it hav ing concaved sides, a rigid tread, and a clincher flange on the bottom. The latter makes it possible to use the tire with the ordinary clincher rim employed with pneumatics. The tires are constructed with rather soft rubber, which has great resiliency; and it is due to this fact and to their peculiar shape that they ride much more easily than the ordinary solid or cushion tire. For the automobilist who wishes to be free from the thought of puncture, there is no better substitute for a pneumatic tire than that made by the Swinehart Company.

A Useful Ignition Battery.
An improved form of storage battery for ignition purposes is made by the Witherbee Igniter Company, of this city. The plates are assembled in separate compartments formed by division walls in the containing hard-rubber case, and the lugs are connected to suitable binding posts in the cover. The latter is sealed in the case by a soft rubber edge, and its overlapping top is bolted to flanges on the latter. The new battery has a new form of plate connection in-
side, and all metal parts that might cause a short-circuit should water accumulate on the top, have been dispensed with. A new form of vent having a large chamber for the separation of the gas from the acid is fitted. The battery is one of the neatest at present upon the market.

A CLEVER MECHANICAL AND ELECTRICAL AUTOMATON.
(Continued from paige 46.)
scending and terminating on the right side at a level with the terminal on the left. Upon this track travel fourteen ballbearing swinging carriages, their movements being controlled by an electric motor. The carriages are filled with dry storage batteries, the conibined weight of which is sixty pounds. These batteries are shifted from one side to the other of the body by means of an electric motor controlled by a mercury governor.
At the back of the figure is the switchboard containing the rheostat, fifteen switches, three single Ievers, and three automatic brakes, besides several other ingenious devices for directing the movements.
The connections are made, the current switched on, and at a given number of degrees or steps regulated by the cent ered gear-wheel, workiing on the cam of ered gear-wheel, working on the cam of
the motors, the weights are released from


OSCAR LEAR
FRAYER-MILLER AUTOMOBILES
Four-Cylinder, 25 H. P. $\$ 3,000$ Six-Cylinder, 40 H. P. $\$ 4,000$

The Car
that is cooled through
Air Jackets.


Economical,
Noiseless, Speedy, Successful always.

Holds numerous records-among others, 3,202 miles in 6 days 15 hours 29 minutes (record), the last 1,866 miles without stop of engine (record).

OSCAR LEAR AUTOMOBILE CO.
Columbus, Ohio
Frayer-Miller Auto Co.
Broadway and 65th St., New York, N. Y.
Compormia
DOCTOR'S STANHOPE

16 H. P. $\$ 1400$.

Chassis is the same as used in our Model Four Light Touring Car which carried five people in the New York Motor Club's recent Economy Test and defeated every touring car entered, winning the McMurtry Gold Medal, two First Class Certificates and one other Medal. THE E. H. V. COMPANY, MIDDLETOWN, CONN.
their normal center and rapidy descend into the abdominal cavity on the right, causing the figure to lean forw control ling the left limb being in full operation throws its member forward, the figure being in such a position that this free and rapid movement swings it round to the right; at the same instant the mercury governor, finding its level, forms an elec tric contact, setting in motion the motor which rapidly draws the weights back to the line of gravity and causes the figure to regain its equilibrium. By changing the gear wheel, which controls the number of steps, the distance traversed is in reased or decreased.
The figure also writes its name, "Enigmarelle," upon a blackboard. The ar rangement by which this is done is said to be a series of electro-magnets in the shoulder. These attract an armature in the upper arm and cause the latter to make certain strokes.
The method by which the crowning feat, that of riding a cycle, is accomplished is similar to the walk. At a given number of revolutions the weights again descend into the abdominal cavity, but in this instance on the left, causing the cycle and figure, which are attached, to lean toward the center, at an angle of about 40 deg. with the perpendicular, so that the figure, like a coin or wheel, starts round a circle. The arm locks the handlebar at an angle such that the bicycle will turn the circle desired and the feet revolve the pedals and drive the machine in the gulation manner
[The photographs of this automaton were submitted to the managers of a well-known New York theatrical enterprise and they at once stated that they had seen the automaton in London and that there was really a man concealed in the midst of this aggregation of machin ery.-Ed.]

A $4,000-\mathrm{mile}$ road test of pneumatic and solid tires will be started by the Automobile Club of Great Britain Febru ary 1. A complete set (four tires) of each make represented will be placed on an automobile of the weight which such tires are intended to carry. The four main classes are cars weighing, with oc cupants, $1,500,2,400,3,000$, and 4,500 pounds respectively. There will be a spe cial class for armored, or otherwise pro tected, tires. Such tires are to be used on cars of 3,000 pounds weight. In awarding the prizes the size, weight, and price of the tires in relation to the weight carried will be considered. The rules are very strict, and an accurate account will be taken of any extra tires, tubes, or protective devices supplied to the competitors during the course of the test. Any parts replaced are considered as worn out, and charged against the competitor. In the event of a set of tires lasting out the test, the competitor has the privilege of continuing this test at an expense of $\$ 10$ a day for the use of the car. The test will be continued under the auspices of the club.

INDEX OF INVENTIONS
For which Letters Patent of the United States were Issued for the Week Ending January 2, 1906.

ANDEACH BEARINGTHATDATE

$\begin{array}{r}808,696 \\ 808,893 \\ \hline 88\end{array}$

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was demonstrated in the most convincing manner at Indianapolis, November 16-17, 1905, when a National Stock Car made 1094 3-16 Miles in Twenty-four Hours, Breaking the World's Record by 78 9-i6 Miles.
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