feeders will reach such ports as Nipe, Baracoa, Gibara and Manzanillo, connecting them with the interior and affording an outlet to deep water shipping points for the plantations along the lines.

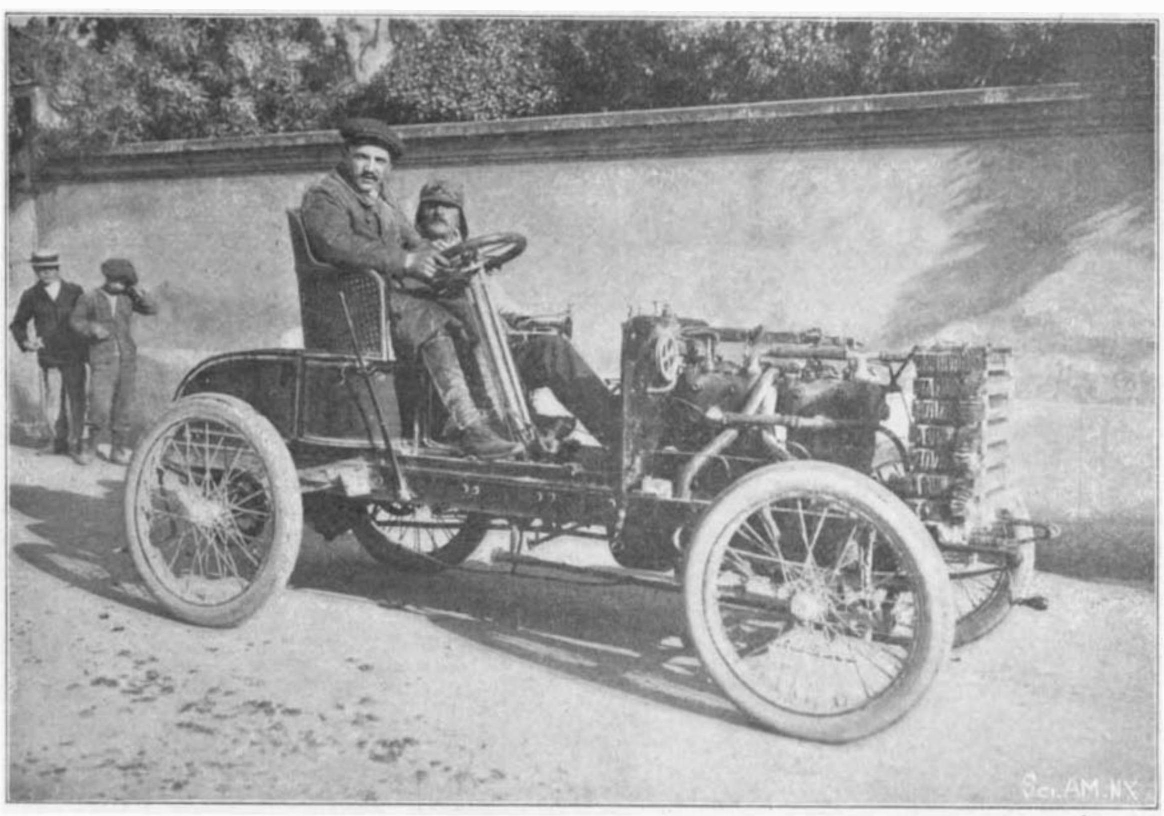
The Cuba Company, as the Van Horne syndicate is known, has carried on its construction work in the face of many difficulties, not the least of which was found in an inability to secure a governmental franchise or even a permit for construction, and the consequent necessity of purchasing outright a private right of way. However, the same energetic tactics which characterized the construction of the Canadian Pacific Railroad were adopted, a working force which at times exceeded 6,000 men was employed, and at certain portions of the route the line was carried forward at a rate considerably in excess of a mile a day. The construction of this new railroad has been thoroughly in accord with the latest approved modern practice in every respect. Although it has been necessary to provide an immense number of bridges, owing to the volume of water which falls during the rainy season, steel construction has been employed exclusively, and the rolling stock and equipment is identical with that to be found on the most important railroads in the United States.

THE NICE-TURBIE RACE.

BY OUR PARIS CORRESPONDENT.

After the suppression of the Nice-Abbazia race, which was to have been the main event of the season at Nice, the chauffeurs had to fall back on the Nice-Turbie hill-climb and the Rothschild Cup to try their new racing machines which had cost so much labor in the preparation. The Turbie hill-climb is a severe test for the machines in more ways than one. The road starts from Nice and winds up the mountain side to the village of La Turbie, situated at the summit. Not only is the grade very steep but the route is unprotected by curbing on the outer side and is on this account quite dangerous. Several racing-cars met with accidents here, and one was smashed to pieces; however, no one was seriously hurt. The race took place in a heavy fog, which was a disadvantage, as it prevented the racers from making their best time. At the top were assembled a large party of chauffeurs about the chronometer station. The heavy-weight caravan had already climbed up the slope and the vehicles were drawn up in line to await the finish before descending to Monte Carlo. The start was chronometered by M. Tampier and the racers started at 3-minute intervals. The record was made by Mr. Stead on a 40-horse power Mercedes machine, which covered the distance of 15.5 kilometers (9.6 miles) in 16 min. 37 3-5 sec. Next came Gabriel on a 30-horse power Darracq, in 16 min. 50 3-5 sec. One of the engravings shows the Mercedes racing machine, mounted by Mr. Stead and in the second will be seen Gabriel in his light weight racer. The Mercedes and Darracq machines carried off the honors of the race, as three of the former made the best time in the automobile class, and six of the latter came first in the light vehicle class. Osmont, on a De Dion motocycle, held a very good place. The Mercedes machines are built at the Daimler works at Canstatt (Alsace), and these powerful racers continue to be formidable competitors to the French machines. The same holds good in the heavy weight class, where a Daimler hauling wagon made one of the best records in the Paris-Nice concourse. At La Turbie was noted a novel type of electric automobile made by Lohner & Porsche, of Vienna, which will be described later.

40-Horse Power Mercedes Machine (Daimler System)—Winner in Automobile Class.

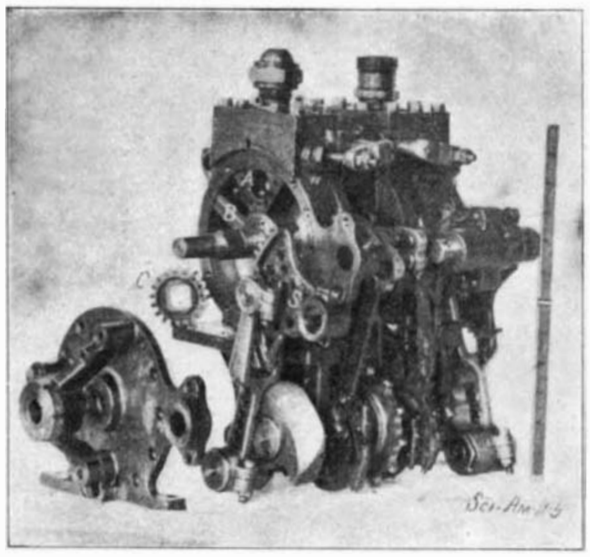


30-Horse Power Darracq Machine—Winner in Light Vehicle Class.

NICE-TURBIE HILL-CLIMBING CONTEST.

AN OSCILLATING COMPOUND STEAM ENGINE OF NOVEL DESIGN.

The compactness of the engine shown below is readily seen by comparing it with the foot rule standing beside it. Occupying as it does, less than one cubic foot, it nevertheless has abundant power to pull a 1,000-pound automobile out of a mud hole or send it quickly up a steep ascent; for although normally the engine develops but 4 horse power, by a simple changing of valves accomplished instantly by the movement of a special handle, the cylinders may both be made to take high pressure steam, thus more than doubling the power and enabling the engine to develop 9 horse power.



THE STOWELL OSCILLATING COMPOUND STEAM CARRIAGE ENGINE.

The illustration shows plainly the piston and cylinder construction. The engine is built on similar lines to most rotary engines as far as these parts are concerned. The piston consists of a flat blade, *B*, secured to the shaft and adapted to oscillate between the faces of the abutment, *A*, through five-sixths of a revolution. The steam enters through ports in the abutment not shown in the cut, which direct the jet upon the outer end of the blade, thus obtaining the greatest leverage possible from the initial pressure. The inlet and outlet of the steam is controlled through ordinary slide-valves, links and eccentrics. A special packing is employed on the valve stems, which causes little or no wear and assures a tight joint. The engine is protected against steam leakage at all points where such leakage could possibly occur, by spring-pressed metal packing strips. The blade, *B*, has two pairs of L-shaped packing strips, spring-pressed both sidewise and endwise; the abutment, *A*, holds a packing-strip in its lower face, which is pressed downward against the shaft; and two rings on the ends of the latter within the cylinder, make a tight joint between it and the cylinder walls. It will be seen, therefore, that steam leakage is effectually guarded against, even after the engine has been in use for some time and the parts have become worn.

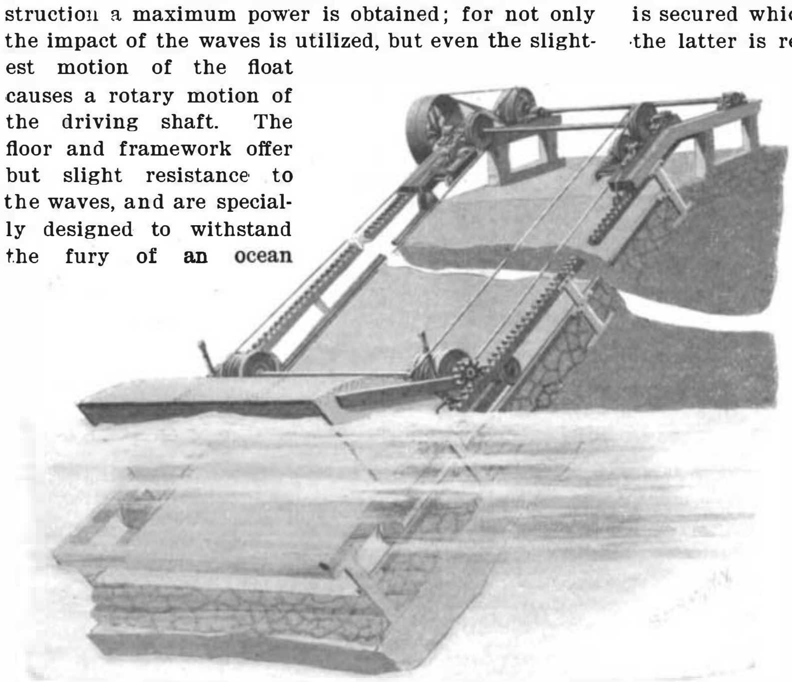
The long stroke—8 inches—obtained in this engine is one of the main points gained by the use of the rotative principle followed in its design. It will be observed, also, that with this construction the amount of steam required to fill the exceedingly short ports is greatly reduced as compared with other slide valve engines of corresponding length of stroke, and the waste of steam is thus brought to a minimum. The 8-inch stroke of the piston is reduced to a 3-inch stroke on the crank-shaft by means of the pinion, *C*, and segment, *S*, which are made of harveyized steel and phosphor bronze respectively. The pinion, as is seen, is squared on the shaft, while the segment and connecting rod are heavy and substantial, and abundantly able to transmit the power for which they were designed. Suitable counter-weights on the cranks balance the piston, connecting rods and segments. The segments are pivoted on eccentric studs so that any wear of the gears may be taken up. The low-pressure cylinder is of the same diameter as the high-pressure one—5 inches—but is twice as wide, having a cross-section of 2 inches. The steam exhausts from the high pressure cylinder through the large hole in the center of abutment, *A*, whence it passes to the low-pressure cylinder. By means of the afore-mentioned transforming device for which patents are now pending, the low pressure cylinder is instantly available for high-pressure steam by a simple turn of a handle, thus giving a steam carriage equipped with this engine an advantage similar to that employed by using two gears, without the corresponding complications.

The compactness of the engine is such that it can be completely housed in the carriage body; and while on the road, should it be necessary to take it apart for examination or repair, the entire crank-shaft, connecting-rods, segments, eccentrics, etc., can be removed at one stroke, by loosening the eight cap-screws in the main bearings and removing the eccentric bearing pins of the segment and the pins upon which the links slide—less than a dozen nuts and screws in all.

The engine is the invention of Mr. B. F. Stowell, of Springfield, Mass., and is at present being manufactured by the Waltham Watch Tool Company, of that city. It has been given some severe tests as to its strength, power, economy, and wearing qualities, and has demonstrated its efficiency in these respects. The manufacturers, in introducing it, are confident that it will fill a long-felt want for a substantial, economical, and simple steam motor for automobiles and all light power purposes, and they believe the principle to be equally well adapted to engines for heavy service.

WAVE AND TIDE MOTOR.

Man's progress toward utilizing the wonderful power of the ocean should be followed by the public with great interest; for the energy stored up by the motion of tides and waves is being used increasingly for operating machinery. Most wave motors are worked by the striking power of the waves. We show here a motor which is designed not only to utilize the impact of the water, but also its buoyant power, thus making use of the rise and fall of tides. The motor is mounted on a foundation situated at the water's edge and consisting of a smooth inclined floor. A float is arranged to slide up the incline under the action of the waves and to return by gravity, it being mounted on wheels which travel between guide rails on the framework at each side. In order to transmit the up-and-down motion of the float to a main shaft, the following device is provided: Cables are fastened at one end of the float and, passing over pulleys at the top of the incline, are brought back and secured to drums on the float. As the float moves up or down the incline, the cables are wound on the drums by the rotation of pinions which are secured to the drum shaft and which engage the racks on the framework at each side. As the cables are wound up, they cause the pulleys at the top of the incline to rotate first in one direction and then in the other, according to the travel of the float. In order to compensate for the expansion and contraction of the cables, they are made to pass over loose pulleys mounted in suitable guideways on the side frames. Weights are hung to these pulleys and draw them downward, thus maintaining a constant tension on the cables. In order to utilize the power thus far gained, it is necessary to transmit the alternating rotation to a driving shaft traveling in one direction only. To this end two pulleys are secured to one end of the pulley shaft and connected by belts to pulleys on the driving shafts, one of the belts being crossed. The latter pulleys are so connected by pawl and ratchet mechanisms to the driving shafts that first one and then the other will act to drive the shafts in a single direction. A flywheel may be attached to the shaft to steady the rotary motion. If desired any number of floats may be connected to a line of shafting, each transmitting power independently. It will be seen that by this construction a maximum power is obtained; for not only the impact of the waves is utilized, but even the slightest motion of the float causes a rotary motion of the driving shaft. The floor and framework offer but slight resistance to the waves, and are specially designed to withstand the fury of an ocean storm—a vital point in the construction of all wave motors. Mr. W. Bochert, of Carson City, Nev., is the inventor of this motor.



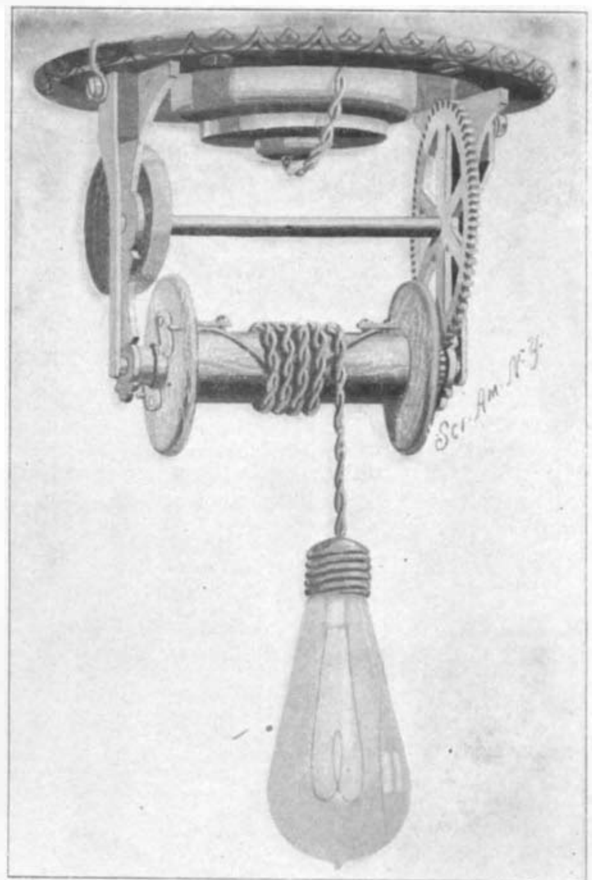
WAVE AND TIDE MOTOR OF SIMPLE CONSTRUCTION.

An Austrian millionaire named Darcy is said to have obtained a concession to work the oil belt in southwest Persia. Surveying has begun for a pipe line 360 miles long from the Kerkah Valley to Mohammerah. The oil is believed to be purer than the Russian and to be abundant.

LAMP-HANGER.

Having experienced the inconvenience of the ordinary non-adjustable electric lamp, Mr. H. J. Harrison, of Juneau, Alaska Territory, conceived of an arrangement similar to the usual shade-roller, whereby the lamp could be raised or lowered at will to any desired position without interfering in the least with the proper transmission of the electric current.

The construction of this device is shown in our illustration. Flexible conducting-cords or wires connect the lamp to a spool or winding drum on which the cords are coiled when the lamp is raised. Through wires leading into the spool, these conductors are electrically connected to conducting pins inserted into the hollow trunnions of the spool. These trunnions find bearing in the depending arms of the lamp hanger frame and are properly insulated from the pins. Connected to the poles of the electric circuit are two spring arms which bear against the projecting ends of the conductor pins and supply current to the lamp. Each spring arm is held in place by a small projection found thereon, which enters a center hole in its respective conductor-pin. Directly above the winding drum is a shaft, also mounted in the depending arms of the frame. At one end of this shaft a large gear wheel is fastened which engages a pinion on the winding drum below. At the other end a coil spring is secured which tends to wind up the drum whenever the latter is released from the retaining device. The retaining device is seen at the end of the winding-drum and consists of a notched disk held by detents just as the ordinary shade roller is held.



ADJUSTABLE ELECTRIC-LIGHT HANGER.

This construction fills all requirements. A quick, downward pull releases the holding device and permits the lamp to be raised to any desired position, where it is held by the detents entering the notched disk. No interruption in the flow of the current takes place, for the spring arms are continually bearing against the conductor pins and supplying the lamp with electricity.

The Endurance Tests and Speed Trials of the Automobile Club of America.

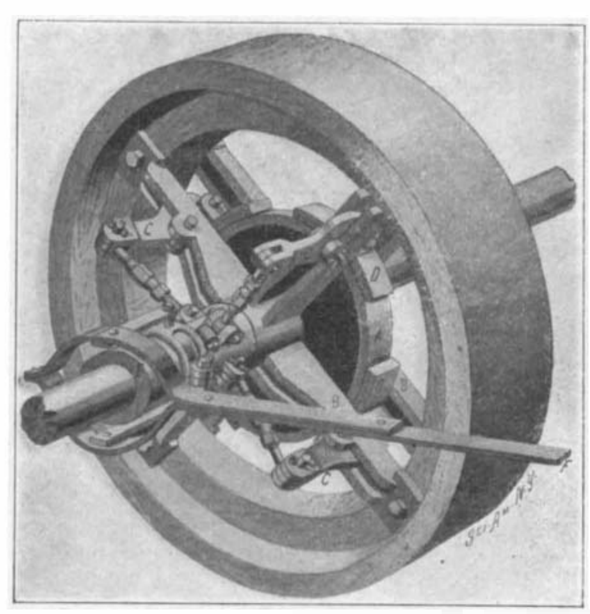
On Decoration Day the second automobile endurance tests of this year—a one hundred mile trip from New York to a point opposite Green's Farms, Conn., and return will be run off under the auspices of the Automobile Club of America. Probably not over fifty vehicles will participate in the test, as the entries have not been as numerous as was the case in the Long Island Club's run, owing, no doubt, to the fact that the Connecticut roads are by no means as smooth as those on Long Island, and the hills are much more numerous. The prohibitions the Automobile Club has made against racing have also had a salutary effect in keeping out of the contest those who go in for speed and attempt to keep in the background the real purpose of the test. It is interesting to note that whereas in the recent endurance run on Long Island, steam and gasoline machines were about evenly represented, in this run only one-fourth of the entries are steam. Another significant fact is that in both contests the electric carriage was not represented, although every inducement was made the manufacturers of such vehicles, by allowing them to change or replace batteries at suitable points *en route*. Although the electric carriage is the most perfect machine the Americans have produced, and with the present batteries is capable of being used for touring in some sections most luxuriously, no manufacturer seems willing to demonstrate its capabilities on long journeys, as has been done in France and England. A 7 horse power Baker electric has been entered in the speed trials, however, and this will be something of a novelty.

The speed trials will be held on Staten Island, May 31, on a straight course.

The time will be taken for the mile and kilometer, as covered from a flying start. It is hoped that records will be beaten and new ones made, although in the absence of some of the millionaire racers, fewer powerful machines are entered than was the case before.

FRICTION CLUTCH PULLEY.

Two Illinois inventors have just received a patent on a clutch pulley of novel design. The arrangement of the pulley permits a powerful grip on the driving shaft which may be easily thrown on or off by the operating lever. The construction is fully brought out in the accompanying illustration, in which the invention is shown as applied to a wooden pulley. A clutch disk, *A*, is secured to the driving shaft, and the pulley rim is supported by two webs, *B*, mounted at each side of this disk. These webs, as shown, have four arms each which extend from the hub portions and at their outer ends are bolted to an inner ring of the pulley rim. A series of levers, *C*, extend through, and are fulcrumed to, the spokes of one of the webs. These levers have their inner ends projecting over the clutch disk and carry clutch members, *D*, provided with working faces of leather or analogous material. The working faces are dovetailed into place, and when worn out may be easily removed and replaced by others. The outer ends of the levers are connected by rods and turnbuckles in such a manner as to form toggles which are actuated by sliding the sleeve, *E*, on the driving shaft. This is accomplished by operating the lever, *F*, which is connected with a collar mounted on the sleeve. By throwing the toggles the clutch members, *D*, may be engaged with the disk and thus the wheel or pulley will be fastened to the shaft. Upon disengaging the clutch members from the disk, the pulley will be rendered loose. When thrown out of engagement, not only the pulley itself stands still, but also the clutch devices, and therefore the parts are exposed and may be adjusted at will, notwithstanding that the driving shaft may be turning rapidly. Proper adjustment can be made of the toggles by turning the turnbuckles. The disk, *A*, serves the secondary purpose of holding the pulley on the shaft, it being necessary to fasten the disk only to the shaft. The parts of the pulley are then assembled about the disk and thus held in place. The inventors of this device are Messrs. T. J. O'Brien and H. L. Allen, Cairo, Ill.



POWERFUL FRICTION CLUTCH PULLEY.

A combined pilot buffer and coupler has been designed and patented by W. H. Lewis, superintendent of motive power, and C. A. Seley, mechanical engineer of the Norfolk & Western system. The coupler is of the standard M. C. B. form and the shank is cored out longitudinally to form a recess for the reception of the buffer springs.