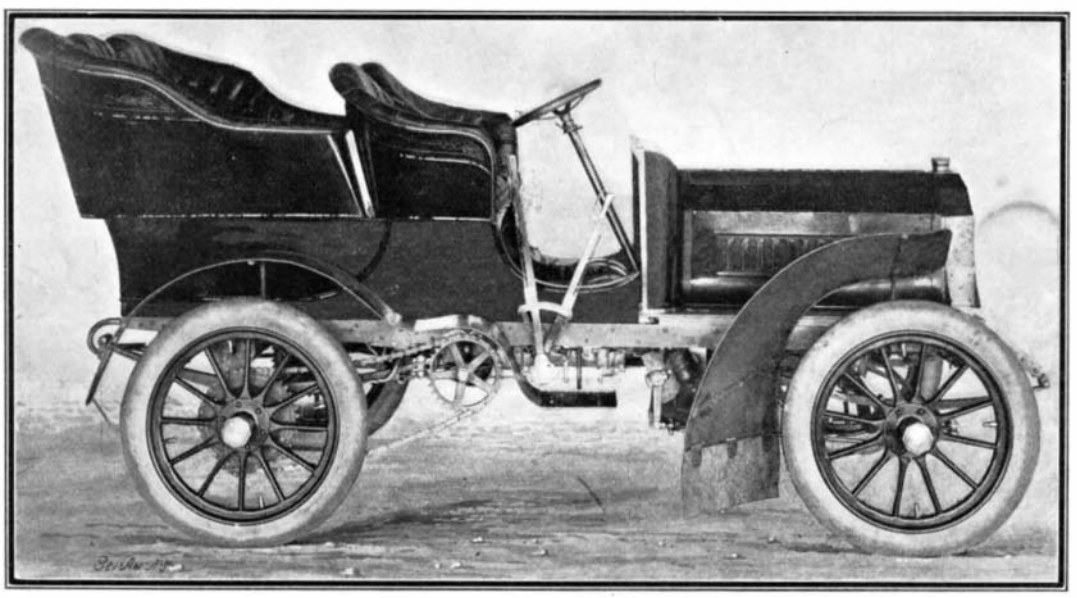
THE THOMAS TRIPLE-CYLINDER TOURING CAR.

One of the most progressive automobile firms in this country is the E. R. Thomas Motor Company, of Buffalo. Starting with the manufacture of motor bicycles, in which it soon made a good name for itself, this company entered the automobile field two years ago with a horizontal, single-cylinder car, which, as built the past year, had several novel improvements. After considerable experimenting with two-cylinder motors, the company built a three-cylinder, which, being well designed and constructed of the best material procurable, should give excellent satisfaction in service.

The advantages of the triple-cylinder motor have been long upheld in this country by Mr. Charles E. Duryea, who has used this type of engine successfully for the past seven years; while in France, Panhard & Levassor brought out last year a triple-cylinder car, and the declaration in favor of the three-cylinder engine by this well-known firm has had much to do in drawing the attention of automobilists to its advantages. These are—reduction of one-fourth the working parts necessary with a four-cylinder motor; nearly as constant torque as with four cylinders, an impulse being had every two-thirds revolution instead of every one-half revolution; and almost perfect balance, making the use of counterweights unnecessary, and yet providing without them an exceedingly smooth-running, vibrationless motor. Furthermore, a triple-cylinder motor furnishes more power for a given weight than any other, and it is largely owing to its use that the Thomas car is constructed with a weight of but 83 pounds per horse power.



THE THOMAS 24 HORSEPOWER TRIPLE-CYLINDER TOURING CAR.

The new Thomas machine has several improvements in the mechanism of the car itself, besides the triple-cylinder motor that drives it. Among these should be mentioned a novel flywheel clutch, with which there is never any end thrust while the clutch is engaged; a new adjustable worm-gear steering device, having the worm curved to conform with the sector, so that it bears against it throughout its whole length; an arrangement for shifting the secondary shaft of the transmission gear, so that it will not revolve when the high speed is thrown in; individual brakes on each half of the differential countershaft, and a safety ratchet device in the hubs of the rear wheels, by which they can be locked, and thus prevent the machine from running down hill backward should the brakes give out or fail to work.

By referring to the cut of the chassis, the reader can see the general arrangement of parts, as well as a few details of the same. The clutch ring, *R*, is seen bolted to the flywheel, with the cone clutch, *C*, within and pressed out against *R* by means of a coiled spring which surrounds and bears against the flywheel hub. *C* is mounted on a short shaft, the forward end of which telescopes into the end of the crank shaft, while the other end connects with the main transmission drive shaft (*C*, Fig. 1) through a universal joint. A ball thrust bearing on the forward side of *C* takes up the thrust of the clutch spring when the clutch is thrown out. When the clutch is in, there is no thrust to be taken care of, as the spring presses against the flywheel on one end and against the clutch cone, which is against the clutch ring, on the other. The leather of the cone clutch is attached in properly-spaced squares, and there are several spring-pressed plungers that engage first when the clutch is thrown in, thus causing it to take hold easily and without a jerk. The clutch is operated by the shipper and pedal, as can be readily seen.

The three small cuts show the details of the countershaft end with its wide, dust-proof, Hyatt roller bearing, sprocket, brake drum, and universal joint; a rear wheel, with the sprocket mounted on a cast-steel drum between the two sets of adjustable Timkin rollers; and the worm-gear steering device, completely incased, and with the worm conforming to the shape of the sector. The construction of this device, and the method of taking up wear, may be described as follows:

The steering shaft, to which the worm is secured, is tapered one-half the length of the worm, which has a corresponding taper, and is further provided with a key, so that, when worn, if it is pressed on the shaft, and locked with jam nuts, it is impossible to work loose. When the worm shaft has been adjusted to position, it is then locked with the set screw and jam nuts on the bottom.

The sector is made of hard bronze, and is securely attached to the spokes of its hub with bolts, nuts, and cotter pins. The hub is of steel, keyed and brazed to the cross shaft. To this shaft the lever arm is attached outside the casing by means of a taper Woodruff key and nut, the last of which is secured with a cotter pin.

The construction of the sector in two parts permits of adjustment to compensate for any wear, by simply loosening the bolts, moving the sector toward the worm until all lost motion is taken up (provision for which is made by the holes in the spokes of the hub being slightly elongated), and then tightening securely. This type of worm and gear will not, it is claimed, require adjustment for an entire season.

The transmission gear of the new Thomas car has all the latest improvements. As usual with this type of gear, there is a square main shaft, *A*, on which slide the two gears, 4 and 6. This shaft is round at its forward end where it telescopes into the shaft, *C*, which acts as a bearing for it. It is supported near its other end in a suitable bearing, and it has a driving bevel gear, 8, keyed on and bolted to a flange near this end. Gears 4 and 6 are slid by means of a shifting fork which is moved by the rod, *R*. In the position shown, which gives the low speed, the drive is from 1 to 2 and from 3 to 4. By sliding 4 and 6 to the right, the middle speed, 1, 2, 5, 6, is obtained. Sliding 4 and 6 still further to the right causes the tapered miter gears, *a*, *b*, to mesh and drive the shaft *A* direct, which gives the high speed. As the rod, *R*, moves

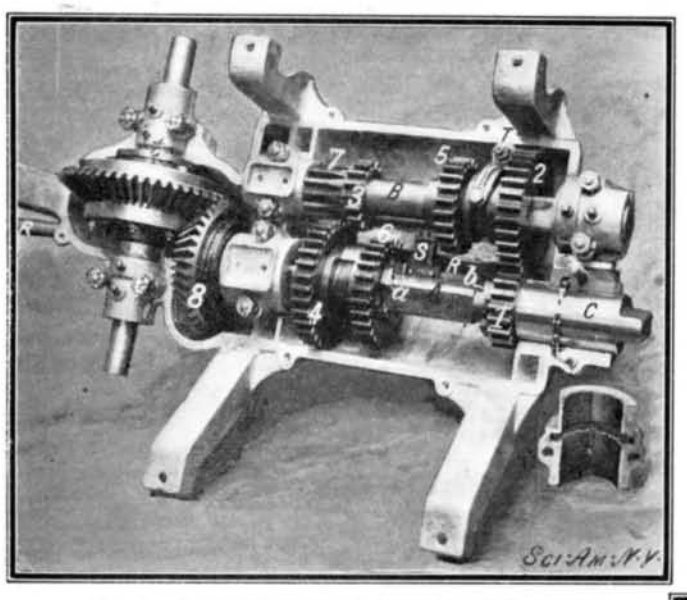


Fig. 1.—THOMAS SLIDING-GEAR TRANSMISSION.

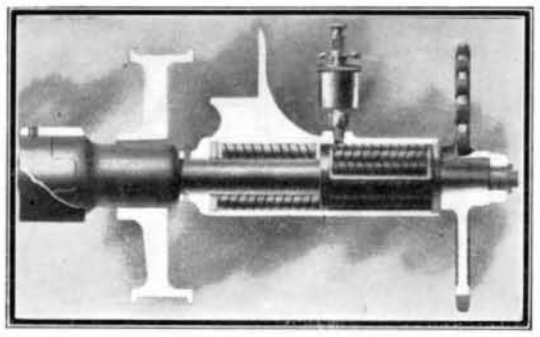


Fig. 3.—HYATT ROLLER BEARING ON COUNTERSHAFT.

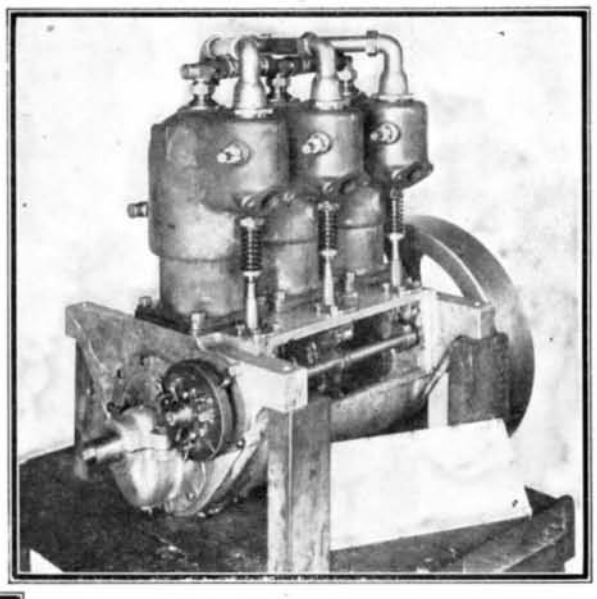


Fig. 2.—THOMAS TRIPLE-CYLINDER MOTOR.

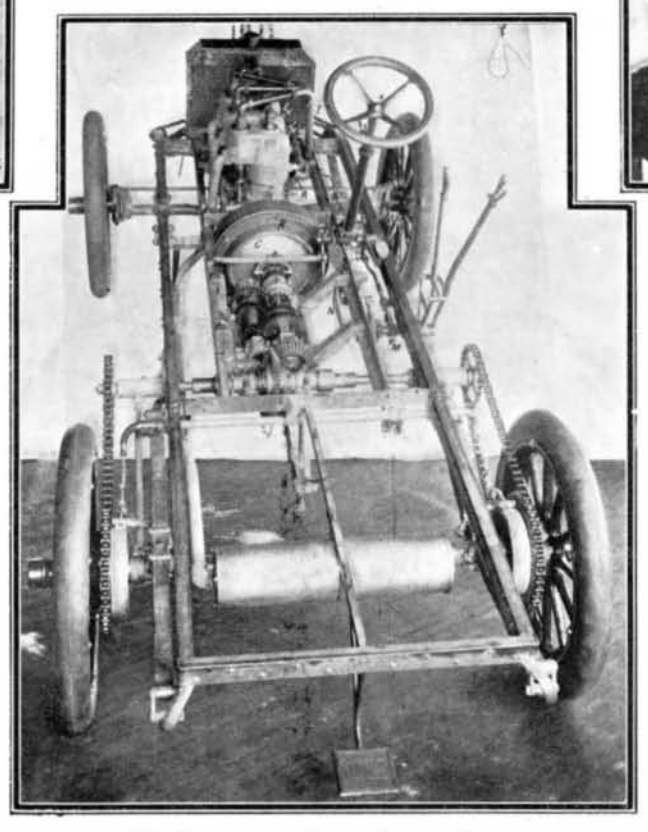


Fig. 6.—CHASSIS OF THOMAS CAR.

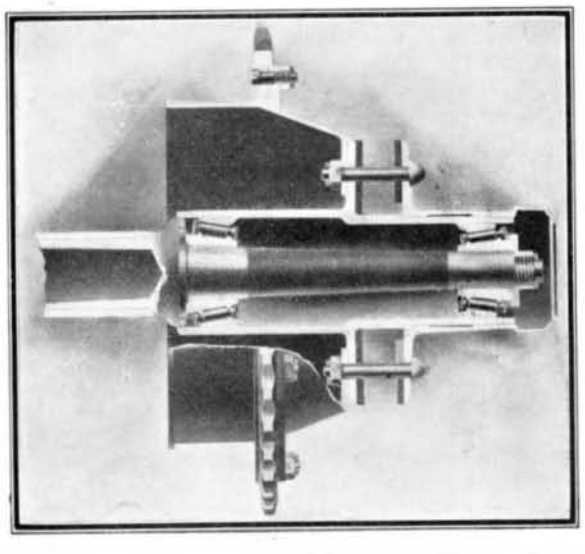


Fig. 4.—TIMKIN ROLLER BEARING IN REAR WHEEL HUB.

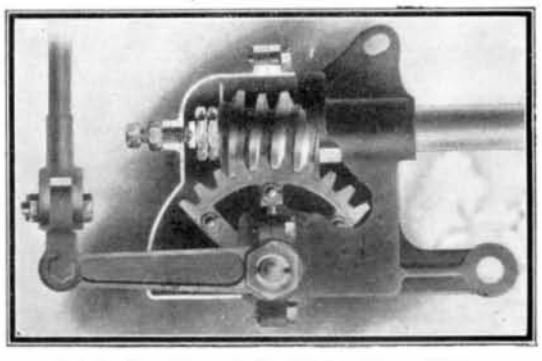


Fig. 5.—WORM GEAR STEERING DEVICE.

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when throwing in the high speed, it causes the toothed segment, *S*, to mesh with and turn a pinion on the end of the shifting fork lever, *T*, with the result that the gears 2 and 5 are moved to the right, so that they mismatch with 1 and 6, thus allowing the shaft, *B*, to remain idle. This is a refinement of the transmission gear which is found on but few cars as yet, but which will doubtless soon come into vogue, as it causes the machine to run very quietly on the high gear. The reverse is had by gear 4 meshing with an intermediate pinion below the gear 7 and in mesh with it. Chain oilers like that shown on the opened bearing of the transmission are used on all six of its bearings, as well as on the two end bearings of the motor crank shaft. These oilers consist of a small chain that dips in an oil well and, as it is carried along by the rotating shaft, brings the oil up on it. The three-cylinder motor is fed from a single carbureter of the constant level, spraying type, and exhausts into a single muffler in the rear. The mouth of the air suction pipe is seen at *A*, and the inlet pipe coming from the carbureter at *I*. The water pipes are seen on the top and sides of the cylinders, running direct to the honeycomb type of radiator. A belt-driven suction fan is arranged back of the radiator. The circulating pump is gear-driven from the motor crank shaft, and is of the revolving gear type. The cut of the motor, Fig. 2, shows the half-speed cam shaft that operates the exhaust valves. The inlet valves are automatic. The contact device is also seen in this picture, as well as the three spark plugs. The cranks are set at 120 deg., thus giving an explosion every two-thirds of a revolution. Adjustable bearings are provided between each crank, and are oiled by splash lubrication.

The sight-feed pressure oilers on the dash supply oil to the cylinders and end bearings of the motor, while the oil in the crank case needs renewing about once in 1,000 miles.

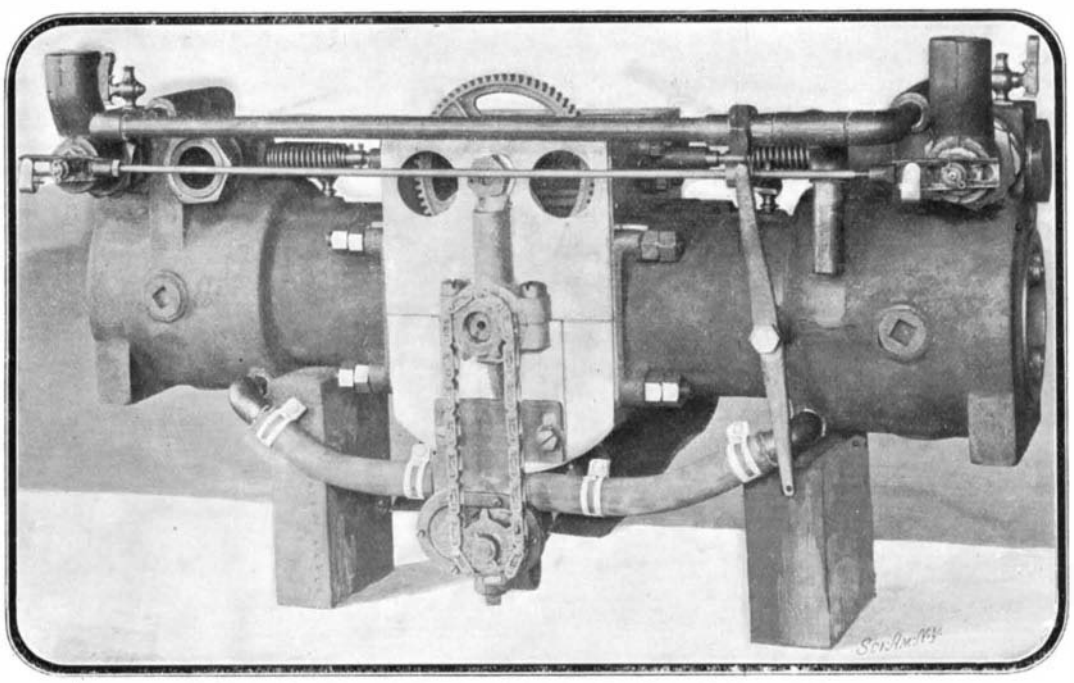
The countershaft is fitted with a band brake drum near each end, as shown in the detail picture. These drums were not in place when the photograph was made, nor was the belt-driven fan that is located behind the honeycomb radiator. Otherwise the view of the chassis is complete. The outside lever of the two shown at the side changes the gears, while the inside one applies the rear wheel brakes, at the same time releasing the clutch by means of a sector (*M*, Fig. 6) pushing a rod that depresses the clutch pedal. A longer sector, *N*, has holes in it, corresponding to the different positions of the gears. A rod rides on this sector and keeps the clutch disengaged while the gears are being changed. Not until the gears are properly in mesh does the plunger rod drop into the corresponding hole and allow the clutch to slip in. When the clutch has thus engaged, the gears can not be shifted till after the clutch has been released with the pedal. This locking device is one of the features of the car.

In closing, a word should be said regarding the workmanship and material entering into the construction of the Thomas machines. A visit to the company's factory will convince anyone that these are of the best throughout. The motor cylinders, after being cast, are tested for blowholes, and, if found perfect, are then bored, ground, and lapped. They are put in a special jig when the valve and lug holes are bored, so that these are always bored accurately, thus making the cylinders interchangeable. The gears of the transmission are all cut from solid stock, and have their teeth slightly beveled and thoroughly case-hardened. The whole mechanism of the car is assembled on a riveted channel steel frame and sub-frame of substantial construction.

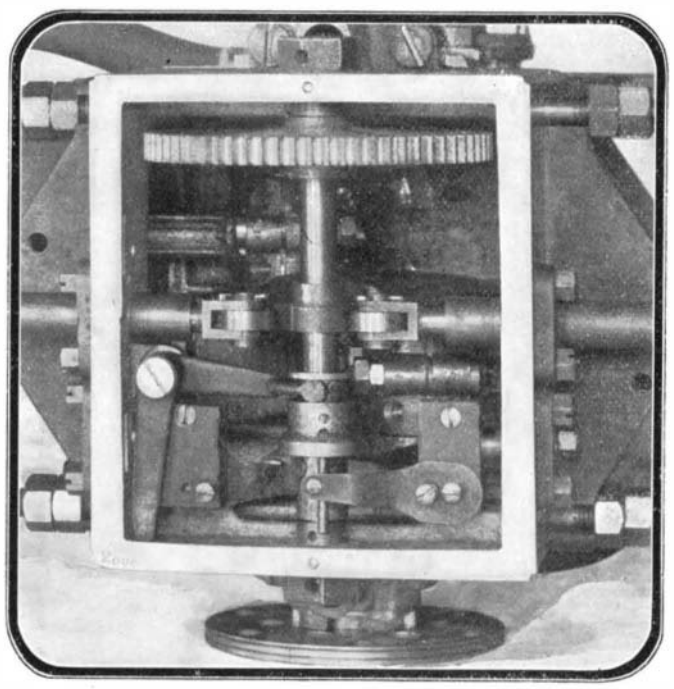
The general specifications of the car are as follows: Weight, 2,000 pounds; horse power, 24 brake; wheel base, 7 feet; tread, 56½ inches; tires, 4 x 34 Fisk detachable; speed of which car is capable, 45 miles an hour.

THE STEVENS-DURYEA GASOLINE STANHOPE.

The machine illustrated on this page is the result of many years' experience in the building of automobiles on the part of Mr. J. F. Duryea. It is a typical American runabout of the double, opposed-cylinder type, and besides its many good points and several novelties, it holds enviable records for speed, reliability, and rapid hill-climbing powers. A chassis of this type, driven by O. Nestman, made a mile on the Ormonde-Daytona beach recently in 57 1-5 seconds, thereby reducing the previous record for cars under 1,000 pounds by 9 seconds.



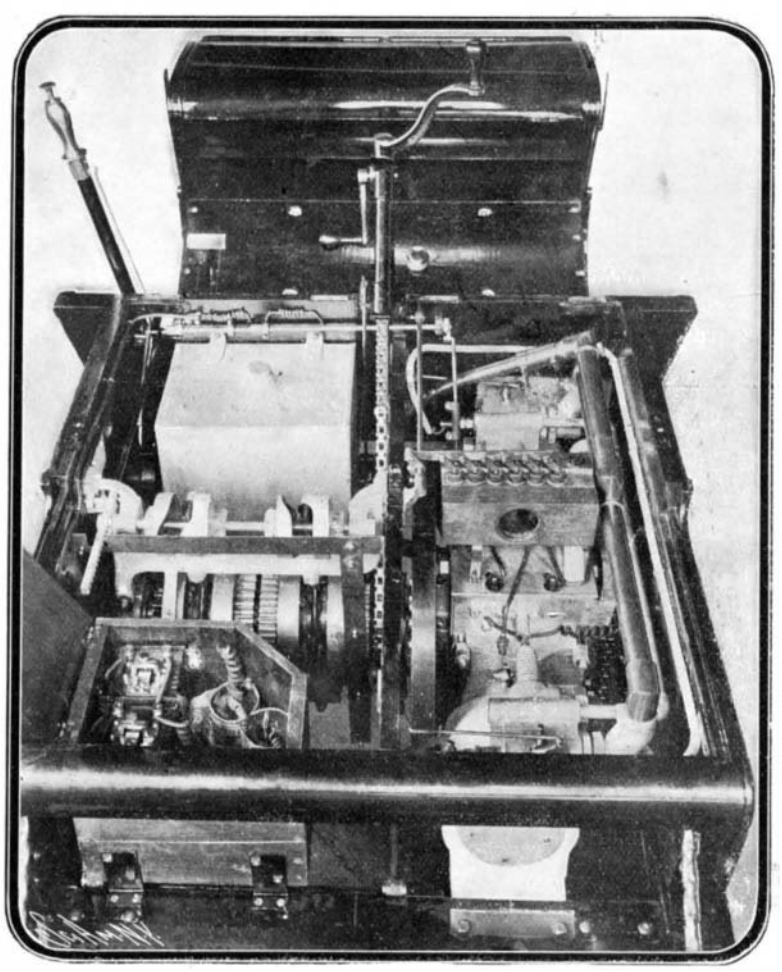
SIDE VIEW OF STEVENS DURYEA OPPOSED-CYLINDER MOTOR.



PLAN VIEW OF MOTOR CRANK CASE.

The side view of the motor shows the suction-operated inlet valves with their throttling device, consisting of long wedges that slide under washers on the valve stems and thus hold the valves from opening to their fullest extent. The wedges are connected and are operated by pressing a button in the end of the change-gear lever. The two-to-one gear can be seen projecting above the crank case, and the rotary pump driven by a chain is visible below the motor. The plan view of the opened crank case shows the exhaust valve stems fitted with rollers, and the ignition contact springs, one above and one below the cam shaft next to the bottom edge of crank case. These flat contact springs are insulated from the motor and connected to separate spark coils. Directly under the upper one in the sleeve slidable on the cam shaft by means of the bell crank in left-hand corner, is a rounded steel contact piece. A spiral slot in the sleeve and a pin on the cam shaft, projecting into this slot (seen at end of upper contact spring), makes it pos-

THE STEVENS-DURYEA ON A WINTRY DAY IN THE PARK.



ARRANGEMENT OF MECHANISM WITHIN THE BODY.

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