THE TYGARD RECIPROCATING-CYLINDER DOUBLE-ACTION GASOLINE MOTOR.

Our illustrations show very well the general appearance and constructional details of a novel gasoline motor that was exhibited by James W. Tygard, of Plainfield, N. J., at the recent Automobile Show. The inventor made use of a 3-horsepower de Dion motor as a basis for his new engine. He removed the cylinder of the former, and bolted to its crank case instead the square casing of aluminium that contains the reciprocating cylinder and its stationary piston. The upper portion of the new motor, which replaces the de Dion cylinder, consists of three parts—an outer casing bolted to the crank case, and containing at its lower end a slide for a cross-head; a stationary piston fitted with two rings at each end, and supported in trunnions in the center of the casing; and a long cylinder slotted on its sides in the center part, so as to be movable on the piston without interference from the trunnions of the latter. This cylinder is made up of two pieces of steel tubing of ⅛-inch wall, lapped together at the center of the piston, and held tightly to each other and their respective cylinder heads by six rods that pass alongside of them and through the heads. A cross-head is attached to the lower end of the cylinder, and this, together with the piston, acts as a guide for it. The connecting rod of the motor is fitted to a wrist pin in the cross-head.

The motor piston, instead of being flat at each end, is cupped out and fitted with exhaust, inlet, and spark ports opening from the round center chamber or valve seat, into each cylinder space. These ports are 90 deg. apart, and a glance at the end view of the piston in Fig. 4 will show them to the reader as white slits on each side of the center. By their use the gas enters and leaves the cylinder directly through the head, or through what corresponds to the head in an ordinary motor. The spark also occurs in this place, with the result that the quickest possible inflammation of the gas is obtained, while the full force of the explosion is obtained directly against the piston, with the least possible loss of heat. Within the center chamber of the piston is a rotary valve, that makes one revolution to every two of the motor crank shaft. This valve is a hollow shell, with ports and two central transverse partitions, that divide it into three chambers. One of these serves as an inlet and the other as an exhaust outlet, while into the middle one there extends a tube with two notches on its end, which, in conjunction with a stationary steel wire that rubs over the projections and falls into the notches, forms a reliable igniter of the simplest possible construction. The valve is slightly tapered, and is well lubricated by oil fed to it through tubes that lead to holes seen in the trunnions on each side of the piston (Fig. 4). Other oil pipes distribute oil on the sides of the piston, as shown in Fig. 2, while the cross-head is oiled by splash lubrication from the crank case. The rotary valve is turned by a Renold silent chain. It is readily removable, as is also the igniter. The latter can be taken out by unscrewing the two nuts on the upper end of the valve stem, Fig. 3. The central steel wire, which has its inner end bent somewhat like a fishhook, is connected through the coiled spring on it to the wire from the battery. This spring also passes through an insulated cross-piece connecting two studs, which are screwed into a movable collar on the right-hand end of the piston trunnion, as shown in Figs. 2 and 4. The coil spring is stretched sufficiently to keep the inner hooked end of the central igniter wire in contact with the notched end of its tube. The wire is insulated from the tube by fiber bushings. A small metal piece seen on the wire just above the two nuts has a pin projecting from it. This pin contacts with a projection on one of the two studs, which keeps the igniter wire from turning. As the notched tube containing the igniter wire turns with the valve, the wire, being held stationary, has the notches revolved against its hooked end, with the result that every time one or the other of the two notches wipes past it, a large primary-current spark ignites the charge in the proper cylinder space. The collar into which the studs are screwed is threaded on the trunnion, and by rocking it by means of the small handle, the time of the spark can be varied. The cast-iron heads of the cylinder are U-shaped in cross section, and fit closely into the hollowed-out piston when compressing a charge. Compactness is gained by this arrangement, besides very little of the cylinder wall being exposed to the hot, burning gases. The cylinder wall is perforated in the center portion, which is never off the piston, in order to aid in cooling the latter. This is accomplished by the pumping action of the rapidly-moving cylinder drawing in air and expelling it at every stroke, as well as by the suction of the air for the carbureter, which is taken from around the piston through the pipe coming out from the trunnion on the sprocket side of the casing. The pipe on the other or front side (Fig. 1) is that for the exhaust. The inlet pipe is connected to the center of the rotary valve on the sprocket end. The valve is of cast iron turning in a steel casing, and having 1-16-inch end play. The single, stationary, double-ended piston is well shown in Fig. 3, where the two packing rings are visible at the end of the piston, disclosed to view by the removal of the upper half of the cylinder. The bore of the cylinder is 2¾ inches, and its stroke is 3 5-32. The power of the motor has been about doubled, with the addition of one-fifth its weight. The total weight at present is 120 pounds.

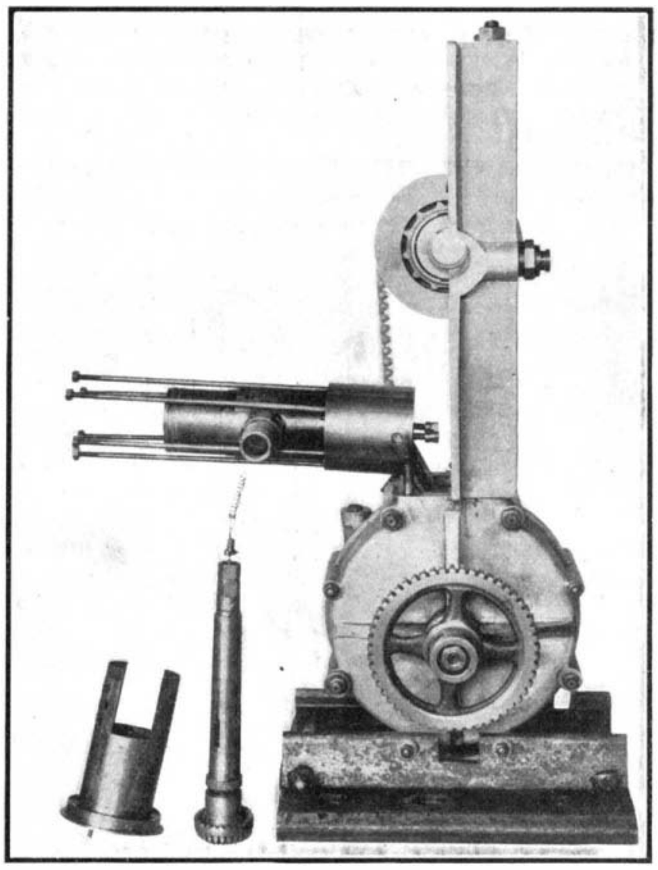

Fig. 3.—Motor With Half of Cylinder and Rotary Valve Removed.

The motor operates on the regular four-cycle principle, two impulses one-half revolution apart being obtained every other revolution. The air cooling is effective on this sized motor; while another valuable feature is that by opening a cock in the upper cylinder head, which can be done while the motor is running, it can be run on the lower cylinder only, thus developing but half its power, and running at half its regular fuel consumption with full compression in one cylinder. The rotary valve forms a positively-actuated valve of the simplest possible construction, the wear of which will be little or nothing, as it practically runs in oil. This type of valve advantageously replaces a suction-operated inlet valve and a mechanically-operated exhaust valve, since it does away with the throttling effect of the former, and saves the power lost in raising the latter against the exhaust pressure. Its rotary action is noiseless at all speeds. A company is being incorporated to manufacture this motor at Plainfield, N. J.

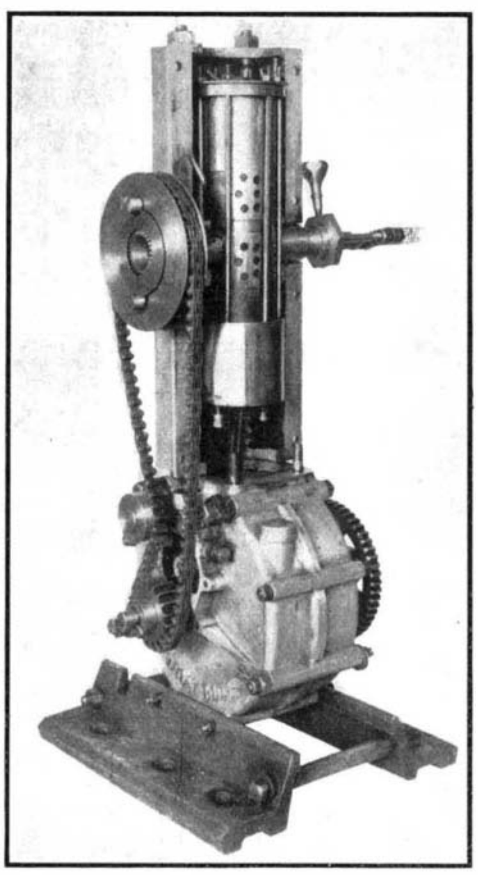

Fig. 2.—Motor With Half of Cylinder Casing Removed.

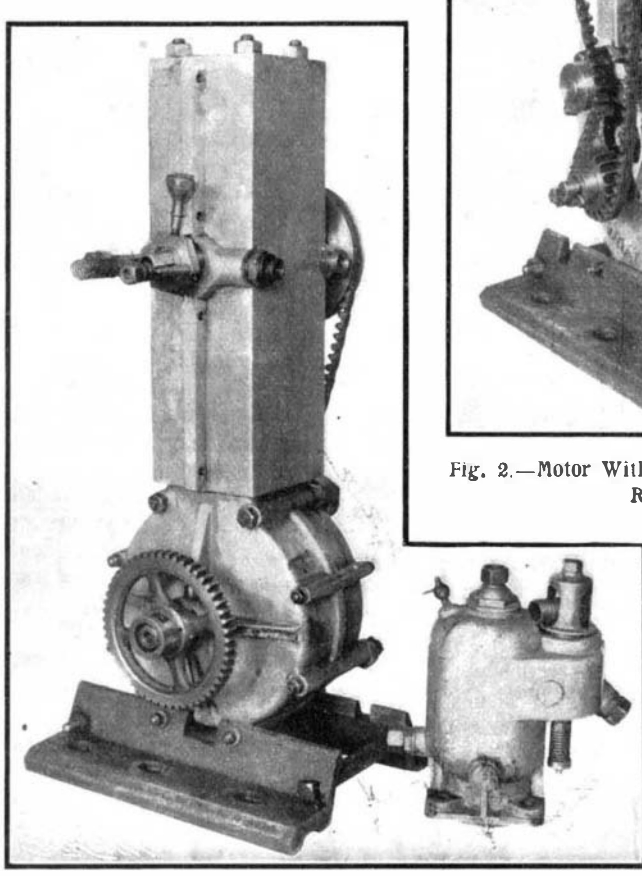

Fig. 1.—Tygard Motor Complete, With de Dion Cylinder Beside it.

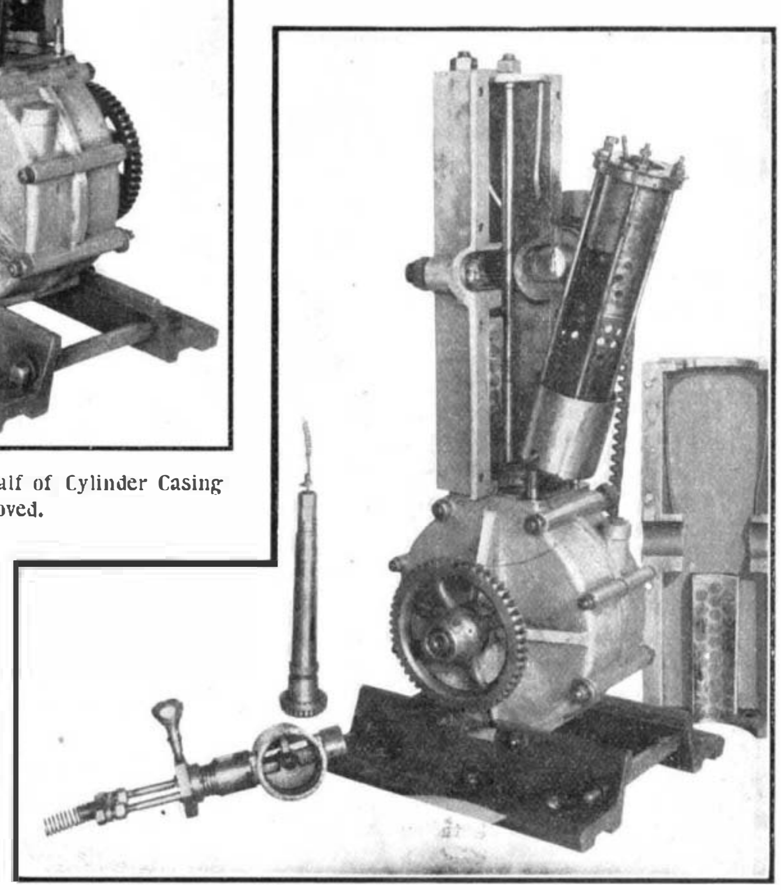

Fig. 4.—Motor With Piston Removed.

In the end view of piston, which is seen in foreground, two slots indicate the valve ports.

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Automobilists if they desire to be rendered free from tire troubles should see that their tires are properly and fully inflated, as many of the troubles experienced in this direction are to a great extent attributable to insufficient inflation. The object of a pneumatic tire is to support the weight of the vehicle acting on the rims of the wheels upon a cushion of compressed air. If, therefore, a tire is not fully inflated, the weight instead of being supported upon the compressed air, is borne by the rim, and the tire is consequently jammed between the ground and the rims of the wheel, with the result that it is rapidly destroyed. The edges of the outer cover of the tire are cut away, or there is an undue wear upon the external rubber layer at the points where the latter comes into contact with the edge of the rim and the inner tube. The latter is consequently being nipped continuously, with the result that it is soon punctured with a number of minute holes and is quickly decomposed. A fully inflated tire, on the other hand, affords a thick cushion of compressed air between the rim of the wheel and the ground, and although the outer covering may be worn away through friction with the road, the inner tube is preserved, while greater comfort and ease in riding are obtained.