Some Notes on the Gnôme Engine.

Various readers of The Aeroplane have from time to time asked for a simple description of the working parts of the Gnôme engine. As may have been gathered, the writer is no particular admirer of rotary engines of any kind, and firmly believes that ere long rotary engines will die a natural death. Nevertheless, the Gnôme engine has done much to advance the practice of aviation, even if it has at times confused the theory, and it is only fair, therefore, that the engine's operating principles should be placed on record in a simple form for future reference.

The following description is based on that given in that useful book, "The Art of Aviation," by Mr. R. W. A. Brewer, and the illustrations are reproduced from it by the kind permission of Messrs. Crosby, Lockwood and Co. The description, of course, refers to the ordinary 50 h.p. engine.

This has chrome-nickel steel cylinders machined, ribs and all, out of solid blocks of metal (Fig. 1). Each side of the crank chamber is made of a steel disc, and these are fixed on two dowel pins placed between the cylinders in a big ring arrangement, which is shown in Fig. 2. The cylinders fit

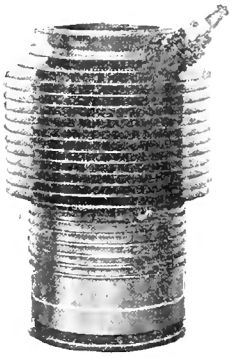

Fig. 1.

Fig. 2.

into the circular holes and are secured by steel rings fitting into grooves, these rings being held in place by the seven long bolts which hold the end plates of the crank chamber in position, one of these bolts being between each pair of cylinders. The seven connecting rods work on a single crank-pin on a stationary crank-shaft (Fig. 3).

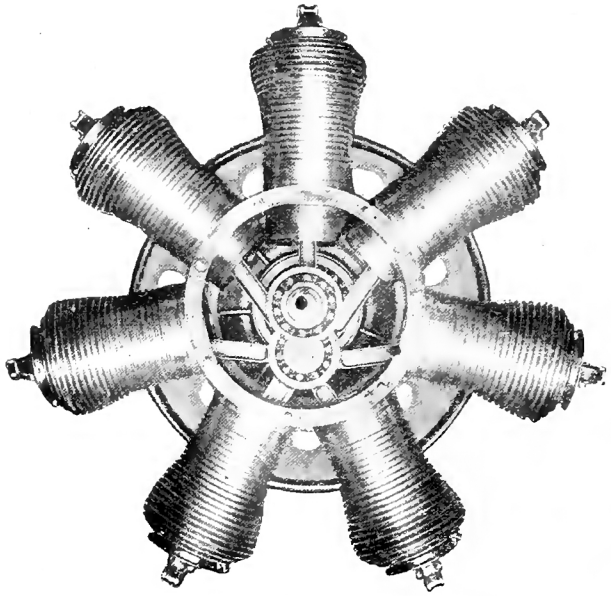

Fig. 3.

Mr. Brewer, in writing of this engine, remarks that the rotation of the cylinders causes the air to impinge on the leading side of the cylinders only, so that the trailing side of the walls is surrounded by eddies of warmer air. This tends to distort the cylinder bore from its true form when hot, so that special provision must be made for keeping a tight piston joint. Ordinary rings would be too stiff for this purpose, so a flexible joint has to be made similar in action to the cup leather of an ordinary tyre pump, the said cup being made of a light ring of L section brass. The ring is split, and makes a close joint where the ends butt, and is used simply as a jointing material. Inside this brass cup is an ordinary cast-iron piston ring, fitting in a wide groove in the steel piston. The piston itself is a fairly loose fit in the cylinder, so as to eliminate risks of seizing.

Fig. 4.

The arrangement of the connecting rods is thus: One rod has a large double disc end (Fig. 4) forming the outer race of a ball bearing running on the crank-pin. At intervals of 51½ deg. around these discs six attachment pins are held, thus dividing the points of attachment into seven equal angular intervals. The remaining six connecting rods are attached to pins at these points, and naturally their obliquity in course of revolution will be greater than that of a rigidly connected rod.

The carburettor feeds the engine through the hollow crank-shaft (Fig. 5) into the crank chamber, and each cylinder draws its mixture through an automatic valve situated in the middle of the piston head (Fig. 6). To overcome the centrifugal force

Fig. 6.

acting on these valves two counter weights are fitted, which keeps the valve on its seating at high speeds in such a way that, whatever the force acting upon the valve may be, an equal force acts upon the valve stem through the counter weight, and these are assisted by two small plate springs, which are the chief source of trouble in the engine.

Fig. 7.

The exhaust valves are situated in the cylinder head, and are operated by twin-balanced rocking levers, which are also counter weighted so as to relieve the cams of undue stresses owing to centrifugal force acting upon the valves (Fig. 7).

Lubrication is by means of a reciprocating pump forcing oil through the cam shaft into the main bearing, whence, owing to centrifugal force, it is discharged in enormous quantities into the cylinders through the inlet valves and out through the exhaust valves.

Fig. 5.

The drawbacks to the engine include its gyroscopic effect owing to its being a rotary engine, the fact that when an inlet valve spring goes wrong the next explosion is liable to fire back into the crank-case and ignite the gas there, and the further fact that the oil, owing to centrifugal force and the fact that the valves are in the pistons, is thrown out in a most wasteful manner. There are others also.

The success of the engine is due to the fact that it is even now the lightest engine per horse power on the market, judging it on its rating by cylinder capacity.