W. R. FASEY.

INTERNAL COMBUSTION ENGINE.

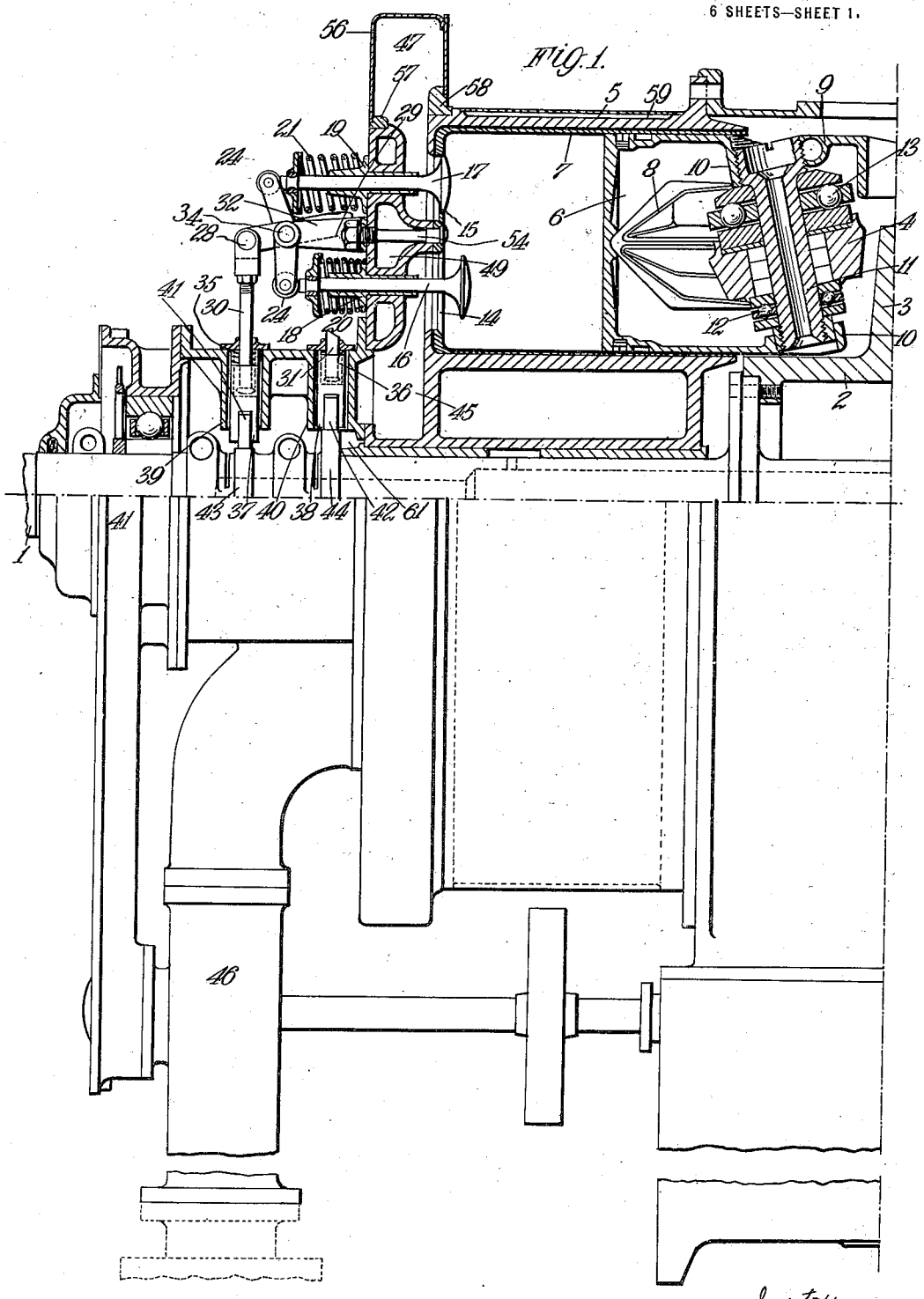
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1,375,140.

Patented Apr. 19, 1921.

6 SHEETS—SHEET 1.

FIG. 1.



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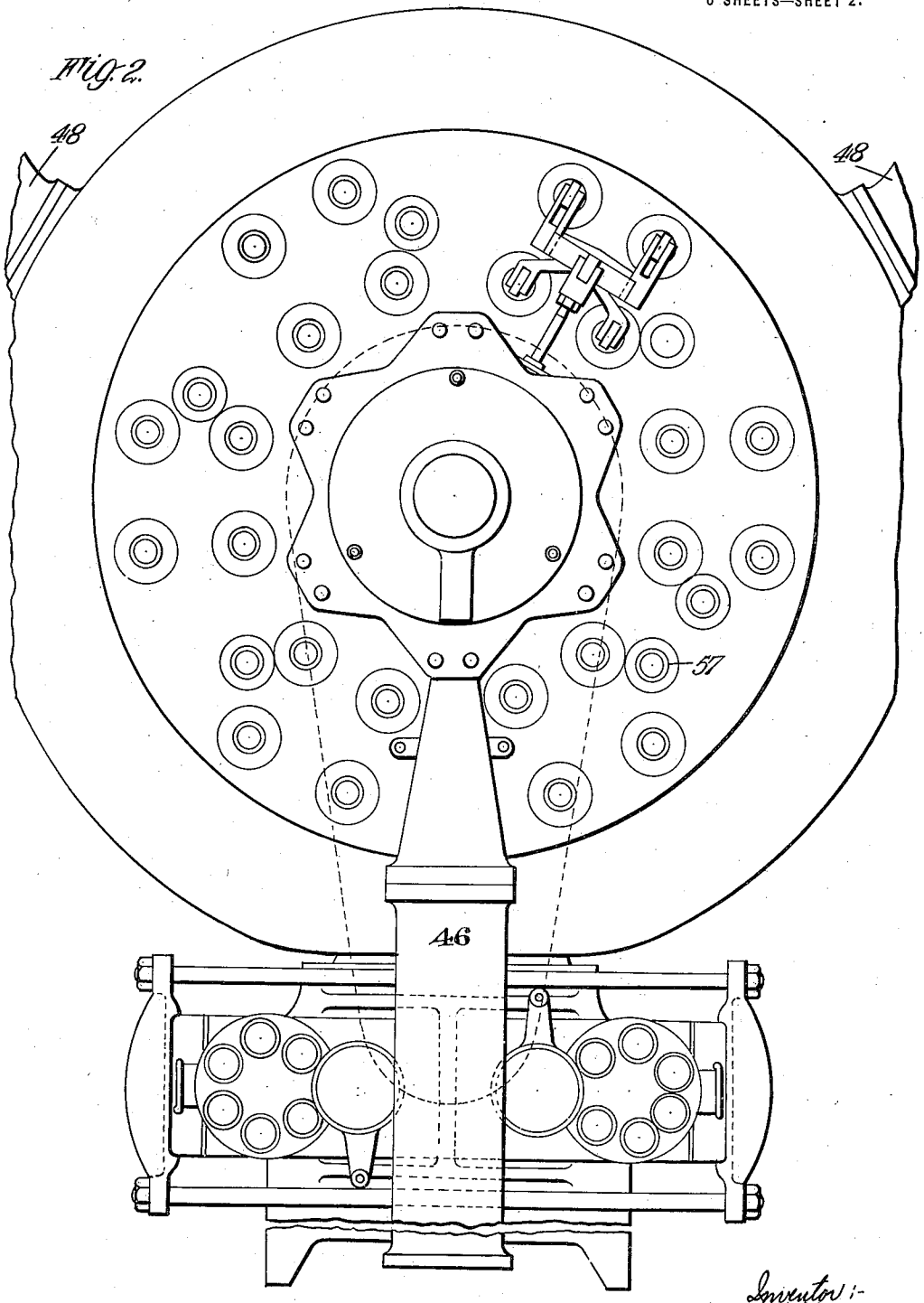
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6 SHEETS—SHEET 2.

Fig. 2.



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6 SHEETS—SHEET 3.

FIG. 3.

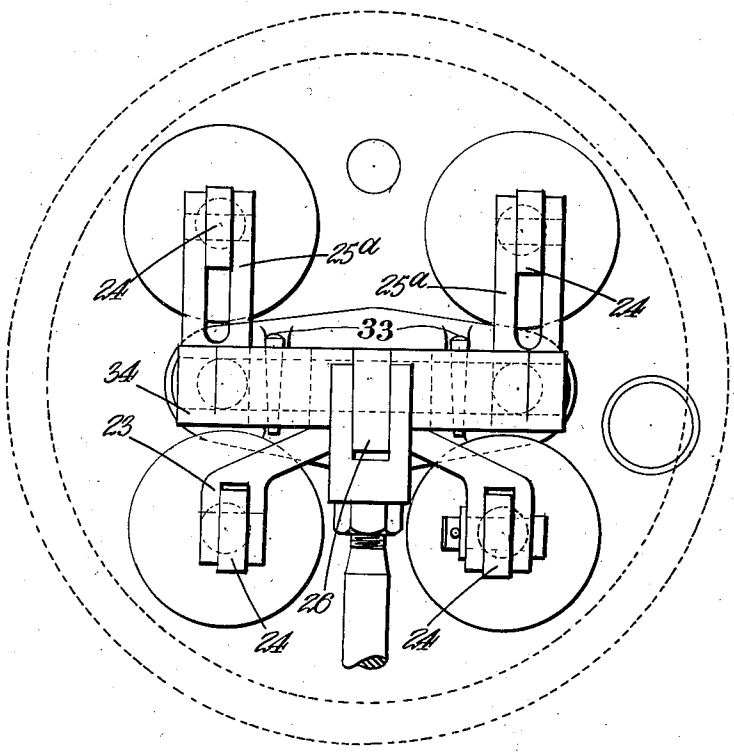
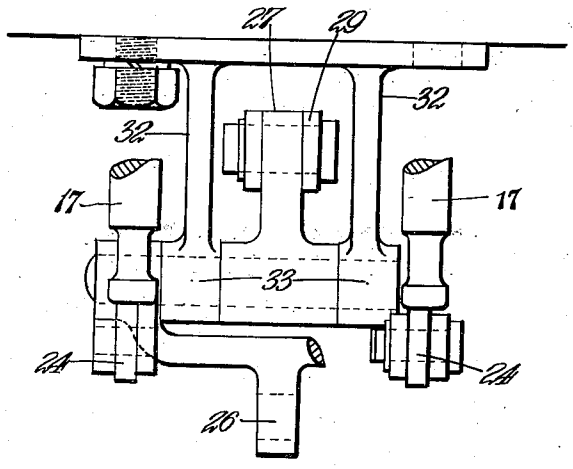


FIG. 4.



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6 SHEETS—SHEET 4.

Fig. 6.

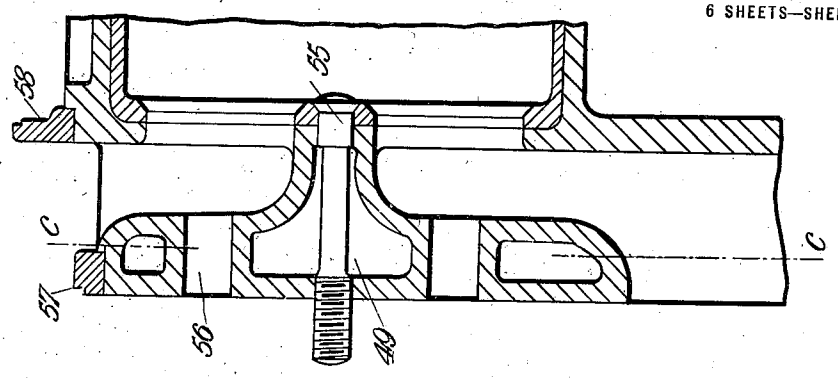
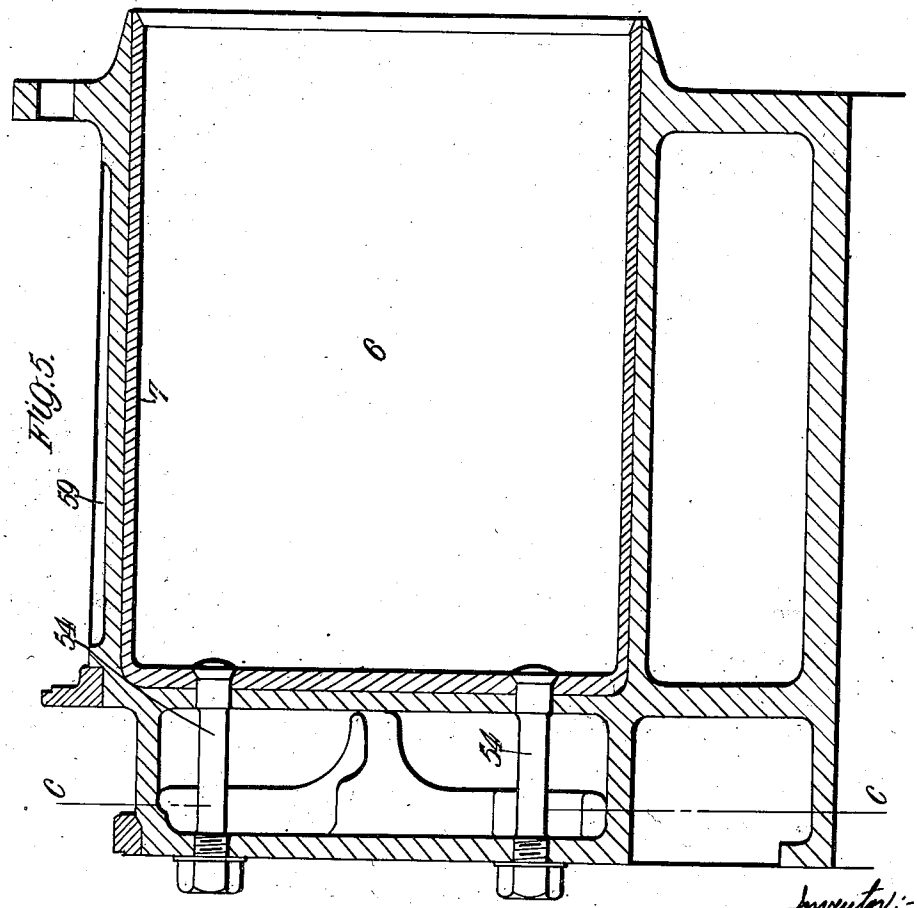


Fig. 5.



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6 SHEETS—SHEET 5.

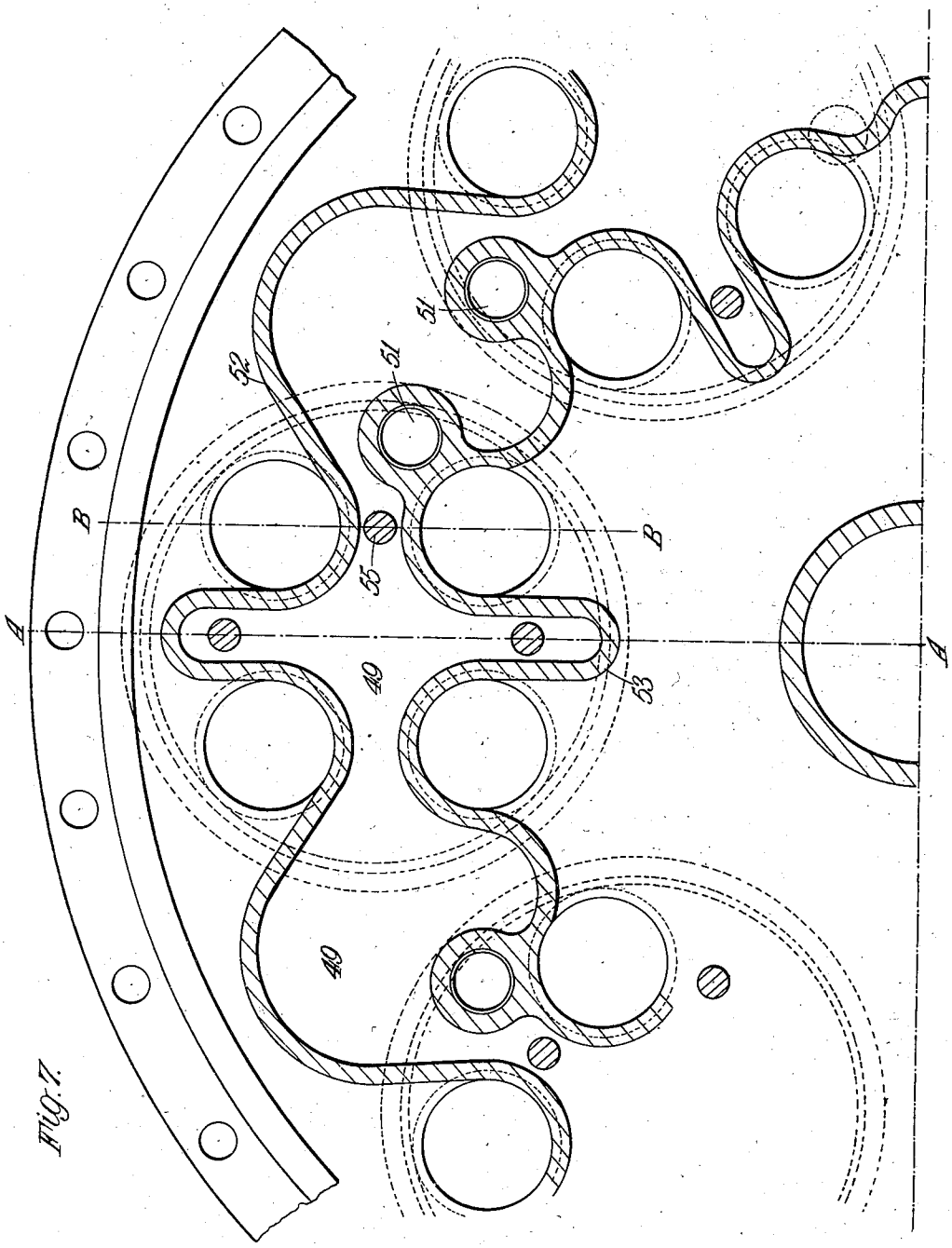


Fig. 7.

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6 SHEETS—SHEET 6.

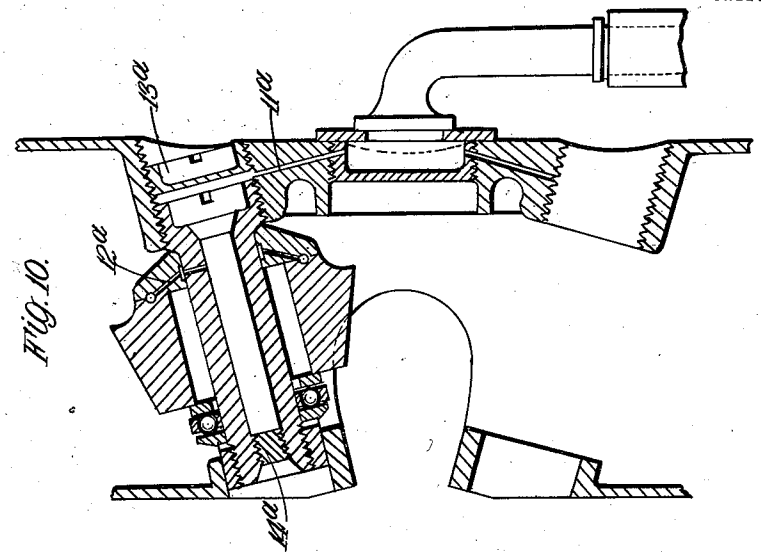


Fig. 10.

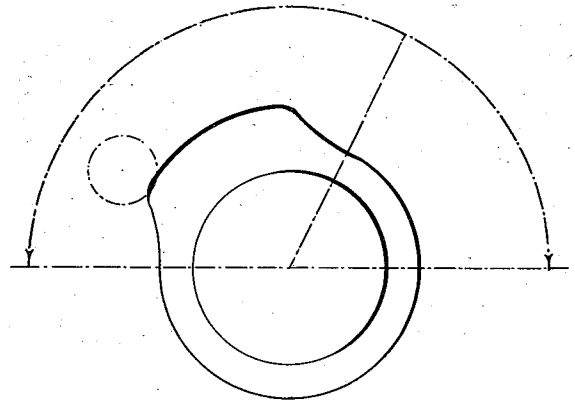


Fig. 9.

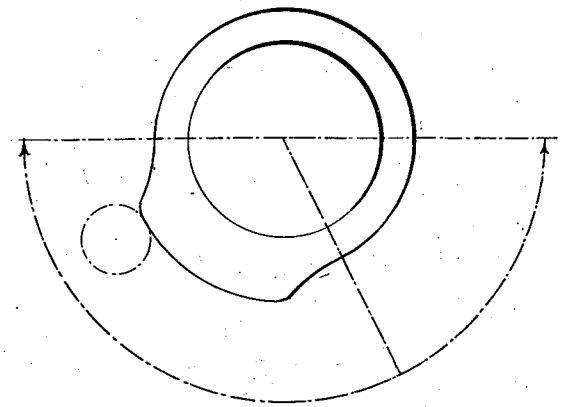


Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM ROBERT FASEY, OF SNARESBROOK, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

1,375,140. Specification of Letters Patent. Patented Apr. 19, 1921.

Application filed October 14, 1918. Serial No. 258,050.

To all whom it may concern:

Be it known that I, WILLIAM ROBERT FASEY, a subject of the King of Great Britain, and a resident of Snaresbrook, Essex, England, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines of that general character where reciprocation of the pistons is converted into rotary motion of the shaft by the coöperation of rollers carried by the pistons with a rib formed upon the periphery of a rotor.

In order to insure the satisfactory working of engines of this type there are certain conditions which must be observed. In particular it is essential that the rollers are adjusted accurately upon the cam rib and that the thrust of the rollers is in a direct line with the axis of the piston and cylinders and further the movement of the rollers upon the cam rib must approximate as nearly as possible a true rolling motion and the present invention consists of a particular construction and arrangement of engine of this type in which these desiderata are accomplished. The invention further comprises an improved arrangement of valves and operating mechanism therefor and certain improvements in the cylinder and piston construction.

In the accompanying drawings I have illustrated an engine constructed in accordance with and embodying the essential features of the invention, Figure 1 being an elevational view partly in section.

Fig. 2 an end elevational view of Fig. 1.

Fig. 3 is an enlarged end view illustrating the valve actuating mechanism.

Fig. 4 is a plan view of Fig. 3 parts being broken away for the sake of clearness.

Fig. 5 is a longitudinal section through one cylinder on the line A—A of Fig. 1.

Fig. 6 is a similar view of the cylinder end the section being taken on the line B—B of Fig. 7.

Fig. 7 is an enlarged end section, the section being taken substantially on the line C—C of Figs. 5 and 6.

Figs. 8 and 9 are detail views of the inlet and exhaust valve operating cams respectively, and

Fig. 10 is a detail view of a modified method of taking up the thrust of the rollers.

Referring to these drawings the numeral 1 designates the central shaft upon which a rotor 2 provided with a cam rib 3 is rigidly secured. With this rib 3 rollers 4 cooperate in well known manner. Preferably the rib is given the form described in the specification of my prior Letters Patent Ser. No. 54854 filed October 8th, 1915, and it will be understood that similarly pistons at each end of the apparatus are connected together in pairs and work in unison, the roller of one piston operating upon one face of the rib and the roller on the other piston working on the other face.

In the drawings one cylinder 5 and piston 6 and its associated valve mechanism is shown but it will be understood that all the cylinders and pistons are identical and the one end of the engine similar to the other it being one of the advantages of the engine that it is substantially symmetrical.

As will be seen upon reference to Fig. 2 the particular example illustrated has twelve cylinders—six at each end—and these cylinders 5 are formed of castings which for the sake of lightness are made of aluminum lined internally with steel liners 7. The pistons 6 are of hollow form and each pair of pistons consists of a single casting with a piston member at each end and the interior of the pistons may be provided with radiation ribs 8 which serve to strengthen the structure. The tubular form of the pistons is important because it provides long skirts 9 which are essential. The pistons are each provided with transverse bearing tubes 10 for the support of the gudgeon pins upon which the rollers 4 run and the arrangement is such that the rollers 4 which are of conical form are mounted at an angle so that the axis of each roller lies at an angle to the driving face of the cam rib with which it cooperates. As aforesaid it is of primary importance that these rollers should be capable of finite adjustment relative to the cam rib and this is not only important from the point of view of adjustment for wear but is also important from the point of view of initial adjustment since it is almost impossible to manufacture the parts so accurately that an absolutely true running fit is insured upon assembly.

In order to accomplish this I provide what amounts to a micrometer adjustment. The bearing tubes 10 are screw threaded and a gudgeon pin 11 screws into these bearing tubes 10 or into bushes secured in their

ends. The conical rollers 4 proper are supported upon each side by thrust bearings 12 and 13 carried upon the gudgeon pins 11 and it will be seen that by screwing the gudgeon pins a bodily movement of the roller 4 relative to the rib 3 is effected so that its periphery can be adjusted to a nicety upon the rib. The thrust bearings shown in the drawings are ball thrust bearings but in some cases a hydraulic bearing formed by a film of oil under pressure may be employed as shown in Fig. 10 where liquid under pressure preferably lubricating oil is supplied to the interior of the gudgeon pins through the passage 11^a and led to the surfaces tending to abut through the passage 12^a. It will be understood that the hollow gudgeon pins will be closed for instance by the plugs 13^a and 14^a. The disposition of the rollers 4 is such that the thrust of the pistons transmitted through the rollers to the rib takes place in a direct line with the axis of the piston 6.

Another point of great importance in engines of the type to which my invention belongs is the proper actuation and timing of the valve.

The cylinder end is provided with one or more inlet ports 14 and one or more exhaust ports 15. In the present example two of each are shown. The valves 16 and 17 controlling these ports are of mushroom type and slide through suitably supported bearings 18 and 19. They are normally biased to closed position by springs 20 and 21 and the end of each valve stem co-acts with a roller 24 carried by the bell cranks 23 and 25. In order to enable the duplicate valves to be operated in unison the bell cranks each have two arms at one end but each have only one arm 26 and 27 respectively connected at 28 and 29 respectively to their actuating rods 30 and 31 respectively. In order to enable both bell cranks to operate from the same center they are rotatably supported on a common pin 34 pinned to brackets 32 by cotters 33, the bell crank 23 actuating the inlet valves while the bell crank 25 actuates the exhaust valve. The actuation rods are controlled by springs 35 and 36 and their rods 37 and 38 which slide in guides 39 and 40 are provided with rollers 41 and 42 which coöperate with cams or tappets 43 and 44 respectively which rotate with the engine shaft and actuate the valves of all the cylinders successively and in proper sequence.

The inlet chamber 45 to which the induction pipe 46 connects and the exhaust chamber 47 to which the exhaust pipes 48 (see Fig. 2) connect are both annular and are separated one from the other by an annular water cooling chamber 49. The construction of cylinder and cylinder head by which this is accomplished is shown clearly in Figs. 5, 6 and 7.

The cylinders are cast with valve guides 50 and also with openings 51 to accommodate sparking plugs and the arrangement is such that an outer wall 52 and an inner wall 53 are provided between which the water cooling chamber 49 is located. Bolts 54 serve to hold the cylinder liner 7 securely in position while another series of bolts 55 also serve to form means for securing the brackets 32 of the valve actuating mechanism. The exhaust chambers 47 are formed by sheet metal outer casings 56 secured to rings 57 and 58 and similarly a sheet metal outer jacket surrounds the cylinder and forms an annular chamber 59. The induction pipes 46 connect up to the annular induction chambers 45 which are closed by the end castings 61. The necessary magnetos, lubricating pumps and the like accessories will of course be provided and driven in any suitable manner from the shaft 1.

What I claim and desire to secure by Letters Patent is:

1. An improved internal combustion engine having a plurality of cylinders arranged annularly, hollow pistons operating in the cylinders, adjustable rollers carried by the piston, a rotor having a shaft mounted centrally of the cylinders and having a cam rib with which the rollers coöperate, the rollers having axes at obtuse angles to the axis of the rotor and so disposed that the thrust of the rollers upon the cam rib is substantially in line with the axes of the cylinders, inlet and exhaust valves in the cylinder ends and cams common to and centrally of all said valves, said cams being mounted upon the rotor shaft, substantially as specified.

2. In an internal combustion engine, the combination of a rotor having a cam rib, a cylinder, a hollow piston in the cylinder, a gudgeon pin extending across the piston and having its ends mounted in the wall of the piston, a roller mounted for rotation on said gudgeon pin and coacting with said cam rib to rotate the rotor, said roller being mounted with the axis thereof at an angle to the driving face of the cam rib, and means for adjusting the axial position of said roller to cause the peripheral surface thereof to be adjusted relatively to the cooperating surface of the cam rib.

In testimony whereof I affix my signature.

WILLIAM ROBERT FASEY.