W. R. FASEY.

ENGINE.

APPLICATION FILED OCT. 8, 1915.

1,298,191.

Patented Mar. 25, 1919.

3 SHEETS—SHEET 1.

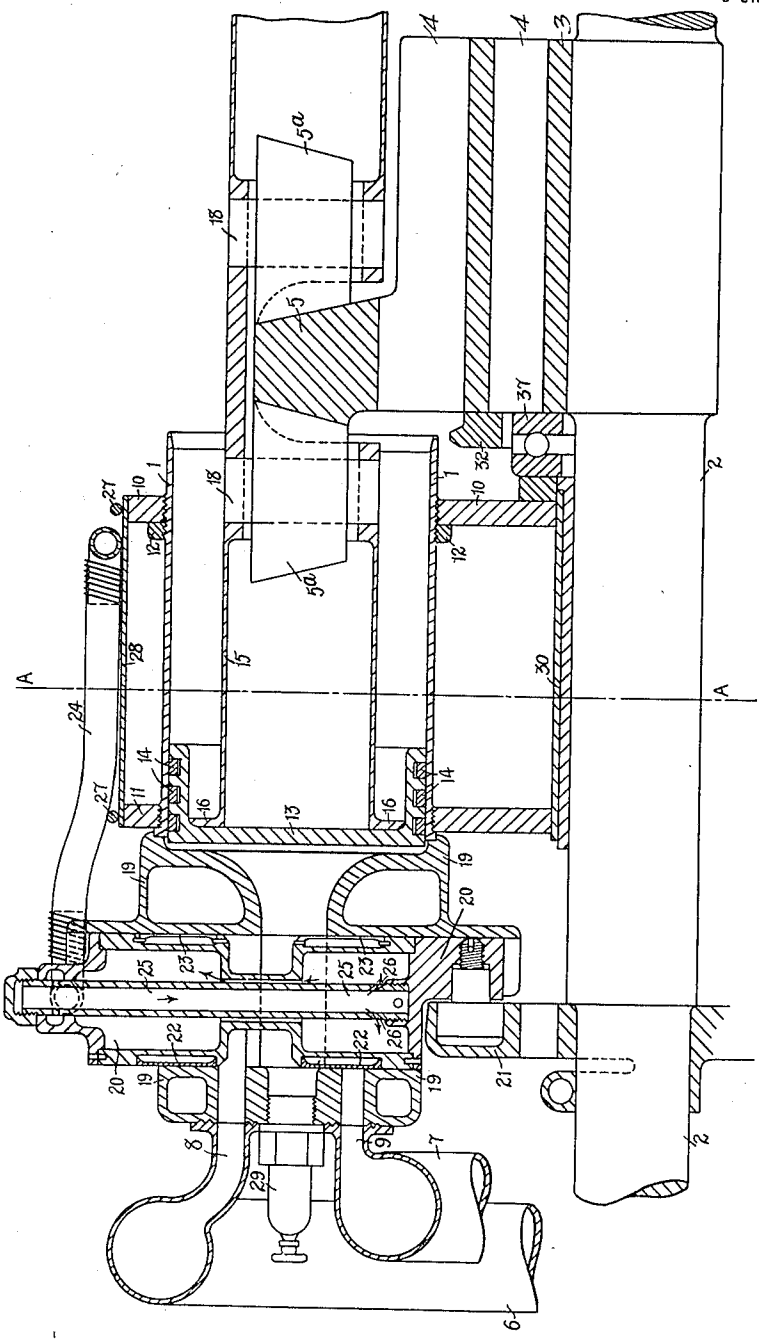

FIG. 1

Inventor:
William Robert Fasey.
By: [illegible]
Atty.

W. R. FASEY.

ENGINE.

APPLICATION FILED OCT. 8, 1915.

1,298,191.

Patented Mar. 25, 1919.

3 SHEETS—SHEET 2.

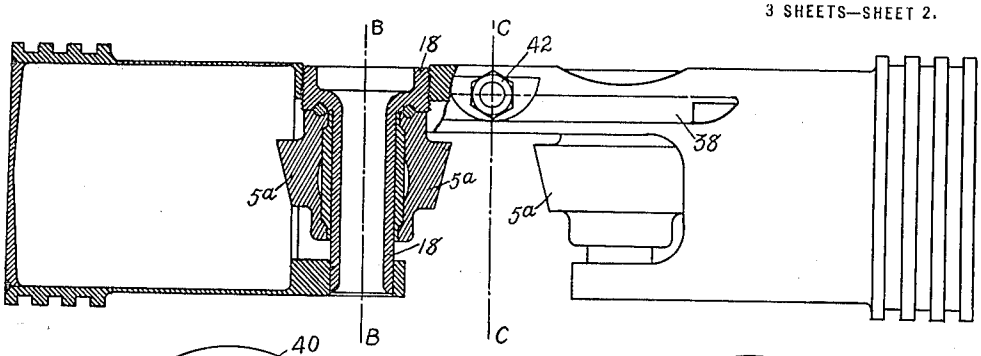

Fig. 7

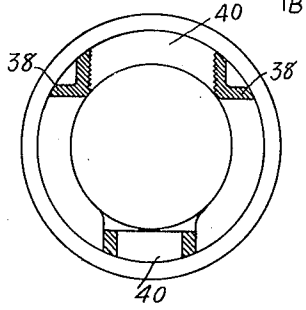

Fig. 4

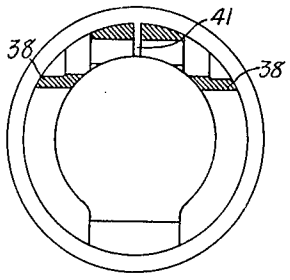

Fig. 8

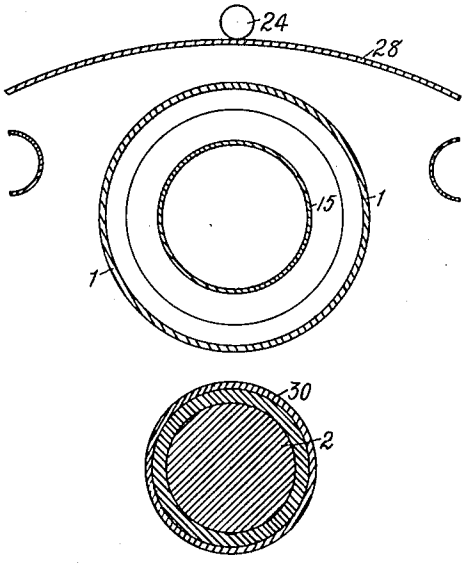

Fig. 2

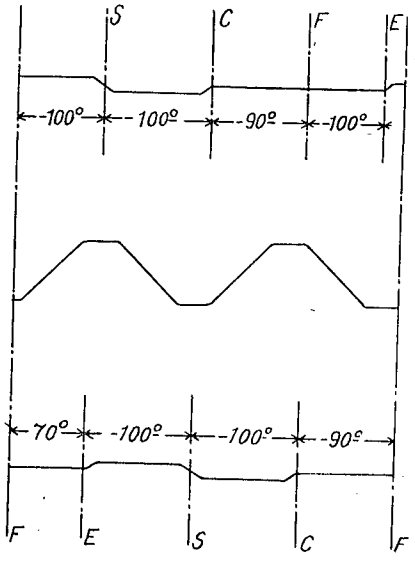

Fig. 6

Inventor:
William Robert Fasey
By: D. Inger
Atty.

W. R. FASEY.

ENGINE.

APPLICATION FILED OCT. 8, 1915.

1,298,191.

Patented Mar. 25, 1919.

3 SHEETS—SHEET 3.

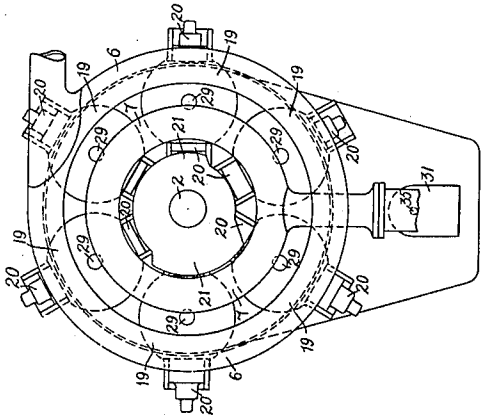

Fig. 4

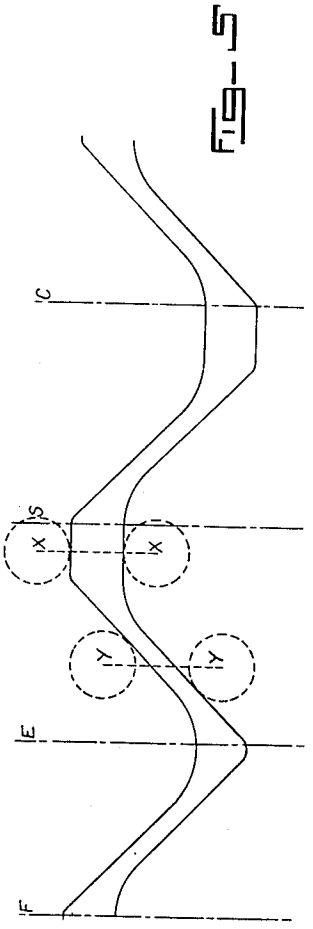

Fig. 5

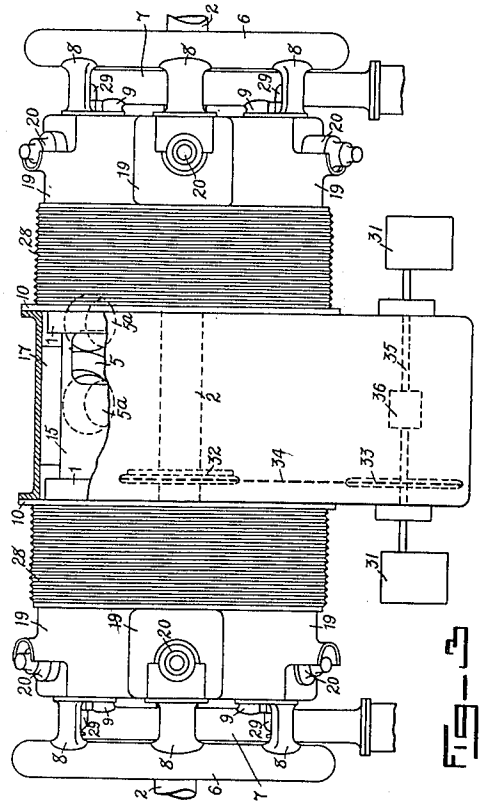

Fig. 3

Inventor:
William Robert Fasey
By: F. K. Singer
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM ROBERT FASEY, OF SNARESBROOK, ENGLAND.

ENGINE.

1,298,191. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed October 8, 1915. Serial No. 54,854.

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, England, have invented certain new and useful Improvements in and Connected with Engines, of which the following is a specification.

This invention relates to improvements in and connected with engines, and has particular reference to internal combustion engines where the reciprocation of the pistons is converted into rotary motion by coöperation with a cam path located in a plane at right angles to the line of reciprocation of the pistons.

The object of the present invention is to provide an engine of this character which can be conveniently manufactured, which will be compact and light and efficient in its operations and which will be capable of being effectively water cooled.

The invention consists broadly of a particular construction of engine having a cam driving mechanism consisting of a rib on both sides of which rollers carried by the pistons coöperate, this rib being so formed as to insure that the rollers will at all times maintain contact with it.

Among the important features of the invention may be mentioned the employment of annular inlet and outlet pipes common to and communicating with a plurality of cylinders arranged around the axis of the apparatus, the provision of a valve actuating cam centrally of each group of cylinders and operating the valves successively. According to the preferred construction these valves are sliding piston valves and the valve actuating cam is centrally mounted and its curvature is such as to insure the proper sequence of operations. Other details of importance consist of the particular construction of the cylinders and pistons designed for lightness and strength.

In the accompanying drawings I have illustrated the preferred embodiment of my invention wherein cylinders are arranged in directly opposite groups at both ends of the apparatus the pistons being arranged in directly opposed pairs adapted to operate in unison.

In these drawings Figure 1 is a longitudinal sectional view of one cylinder and the associated parts.

Fig. 2 is a section on line A—A of Fig. 1.

Fig. 3 is a side elevational view of the complete engine.

Fig. 4 is an end elevational view thereof.

Fig. 5 is a development of one form of the cam rib.

Fig. 6 is a diagram showing the relation of the valve cams to the cam rib.

Fig. 7 is an elevational view partly in section of the piston structure I prefer to employ with the rollers in place.

Fig. 8 is a section on line B—B of Fig. 7 with the roller and gudgeon pin removed, and

Fig. 9 is a section on line C—C of Fig. 7.

Referring to these drawings the numeral 1 designates the cylinders which are arranged around the central shaft 2 in groups. The central shaft 2 carries a rotor 3 integral with or keyed to it and this rotor is provided with borings 4 to reduce its weight. In this example the cylinders remain stationary and the rotor rotates and this rotor has a peripheral rib or driving cam 5, which preferably takes the particular curvature shown in Fig. 5 for a purpose which will hereafter appear. With this rib the rollers 5^a coöperate in a manner which will be understood by those conversant with this type of apparatus. Each group of cylinders is provided with an annular exhaust pipe 6 and an annular inlet pipe 7, connections 8 and 9 respectively connecting these pipes to each of the cylinders. The cylinders being arranged in a circle and firing successively set up a whirling motion on the exhaust and inlet gases leaving and entering the cylinders through the annular pipes, and this whirling can be utilized to produce pressure on the induction pipe and some degree of vacuum in the exhaust pipe which will greatly facilitate the induction of the combustible charge and exhaust of the products of combustion. The details of construction and arrangement will be best understood upon reference to Figs. 1 and 2. The numerals 10 and 11 designate disks which are bored or drilled and internally screw threaded, and the cylinders 1 are screwed into these disks and locked in position by nuts 12. Within the cylinders 1 hollow pistons 13 reciprocate and these pistons are provided with the usual packing rings 14. The piston rod 15 may consist of a tubular structure having flanges 16 at each end and these flanges are secured to the piston heads by means of rivets or other devices. The tubular structures 15 each connect a

pair of pistons and the structures are thickened at their central parts and cut away or shaped to accommodate the rollers 5^a which are mounted to rotate upon hardened gudgeon pins 18. Guides such as 17 are provided to maintain the tubular piston rod structures 15 in position and to take up the stress. The piston may be made in one with the tubular structure. Such an arrangement is shown in Figs. 7, 8 and 9. In this case the whole piston structure is formed from hollow bars and is machined and drilled so as to provide space for the rollers 5^a and moreover guide ways or slides 38 are cut upon which the supporting ribs 17 run. The gudgeon pins 18 are supported in the openings 40 and a slot 41 is cut and a bolt and nut device 42 provided to permit of adjustment and locking of the rollers 5^a and the securing of the gudgeon pins in position as will hereafter appear. The rollers 5^a are given conical form as shown and engage the cam rib 5 which is located between them. This cam rib is so constructed as regards its thickness at different parts that the rollers 5^a maintain contact with it throughout the whole of the piston stroke. This will be best understood upon reference to Fig. 5 where it will be seen that the straight parts of the rib are thicker than the sloping parts and the differences are such that although the distance between the rollers remains constant these rollers are in contact with the rib at all positions. That is to say, the line X—X joining the center of the rollers and drawn through the straight part of the cam is exactly the same length as the line Y—Y parallel to it and drawn through the sloping part of the cam and similarly all lines parallel to X—X or Y—Y through the rib will be of equal length but at all these positions the rollers will maintain their proper contact. Although this feature of maintaining the rollers in contact is illustrated in connection with a cam rib for operating with cylinders at one end only, it will be readily understood that exactly the same considerations are involved in the construction of a perfectly symmetrical cam rib of curvature substantially as shown in Fig. 6. If desirable, means may be provided for adjusting the rollers upon the rib. A convenient arrangement is shown in Figs. 7, 8 and 9. By slacking the bolt 42 which passes through the slotted part 41 of the structure the gudgeon pins 18 can be adjusted to carry the rollers 5^a into correct adjustment and the tightening up of the bolt 42 will bind the gudgeon pins 18 firmly in position again. The cylinders are closed by cast heads 19 and it may be here mentioned with this exception the cylinders and other parts of the engine can be and preferably are made of steel. These cylinder heads which are of course provided at each end are formed to accommodate the piston valves 20 each one of which controls the inlet and exhaust ports of a cylinder. Upon the central shaft 2 of the apparatus, valve controlling cams 21 are keyed one at each end of the engine and in their rotation these cams operate the valves of each cylinder successively to give the desired sequence of operation.

In Fig. 1 the valve is shown in the extreme exhaust position and it will be clear that when in its central position closing both the inlet and exhaust ports the firing and compression will be effected, while its extreme position in the other direction will correspond to the induction period of the cycle. The piston valves are made tight by means of ordinary split junk rings 22 and by arranging the split 23 in the position shown the pressure set up by combustion will tend to expand this ring and insure a tight joint. The valves are water cooled, the cooling water circulating, for instance, from the flexible pipes 24 through the rods 25, through the passages 26 into and through the hollow pistons which constitute the valve and this circulation is clearly indicated by the arrows.

The cylinder structures can be provided with a water jacket 28 which surrounds them, and may be held in position by the bands 27 or electrically welded or otherwise secured. Sparking plugs 29 are provided for each cylinder and housed in the valve casing. It will be understood from the foregoing that the valves are operated by the cam 21 positively in both directions and by reason of their construction will be practically noiseless in operation. The disks 10 and 11 can be strengthened by tubular struts and the central tubes 30 perform the double functions of supporting stays for these cylinder disks and they also form bearings for supporting the shaft 2.

Each group of cylinders has associated with it a magneto 31 and these are driven from the shaft 2 preferably by means of chain wheels 32 and 33 and a chain 34. The same shaft 35 which drives the magnetos may also be utilized to drive the water circulation pump or pumps and also a pump 36 for purposes of forced lubrication, this pump sucking up the oil from a sump or reservoir and delivering it to the various parts of the engine requiring to be lubricated. Thrust bearings 37 are provided for taking up the thrust of the rotor.

The operation of the engine, which will be best understood upon reference to Figs. 5 and 6, is as follows:—

Assuming one of the cylinders is about to fire the valve 20 associated with that cylinder will, by reason of the curvature of its valve cam, be in its mid position closing both the inlet and exhaust ports. The power stroke is effected along the part of the cam

rib between the lines F—E which correspond in the example illustrated to a movement of 80° of the rotor. When the power stroke has been accomplished the valve cam 21 will move the valve 20 to the extreme position on one side where the exhaust port is fully open and exhaust will now take place during the period of the travel of the rollers 5^a relative to the part E—S of the cam rib. In the example illustrated this exhaust occurs over a period of 100° of the rotation of the rotor. Upon the conclusion of the exhaust function the valve 20 will be moved back again by the cam 21 to its extreme position in the direction opposite to that of exhaust, which position corresponds to the inlet being fully open. Induction of the charge takes place during the travel of the rollers 5^a relative to the position S—C of the cam rib which in the example illustrated corresponds to a period of 100° of the revolution of the rotor. Immediately after this induction period the valve 20 is closed by the cam 21 and compression of the charge takes place during the period the rollers 5^a are moving relative to the part C—F of the cam rib which corresponds to the remaining 80° of the rotation of the rotor. The firing position has been reached again and the valve 20 will remain in the closed position until the firing stroke is completed.

The foregoing cycle is, of course, in respect of one cylinder and it will be understood that all the cylinders perform the same function in proper sequence. The foregoing cycle is the preferred arrangement when cylinders are located at one end only, the cam path shown in Fig. 5 being specially designed for this purpose. It will be remembered however that in the embodiment of my invention illustrated in Figs. 1–4 the piston of each cylinder at one end of the machine is coupled to the piston diametrically opposite it at the other end and therefore the two pistons must operate in unison. To accomplish this I propose to employ the perfectly symmetrical curvature as illustrated in Fig. 6 which also shows the curvature of the valve controlling cams in relation to the cam path. With this symmetrical curvature it is preferable to provide for firing or power periods of about 70° of the rotation of the rotor, exhaust and induction periods of about 100° and this would leave a compression period of about 90° although, of course, the actual compression can only take place during the movement of the piston. With cylinders arranged at both ends the firing or power stroke of the cylinders on one side corresponds to the compression stroke of the cylinder opposite to it and the exhaust, induction and compression strokes of one cylinder correspond to firing, exhaust and induction respectively in the opposite cylinder.

It will be understood that the foregoing is given by way of example and may be varied in matters of detail without departing from the spirit and scope of the invention. In particular the cylinders may be the rotating part and the member carrying the cam rib the stationary part. Moreover, although I prefer to employ the sliding piston valves hereinbefore described, puppet valves may of course be substituted.

It should also be mentioned that although described as a four cycle engine the principles are equally well adapted to two cycle practice and two cycle engines may be constructed in accordance with the invention.

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

1. An internal combustion engine comprising cylinders arranged parallel to a central shaft, pistons reciprocating in the cylinders, a pair of rollers carried by each piston, a central shaft, a member rotatable relative to the cylinders, a cam rib on the periphery of said relatively rotatable member with which the rollers carried by the pistons coöperate, said rib being so shaped as to insure the maintenance of contact between the rollers and the cam rib at all positions of said rollers relative to said rib, and means for adjusting said rollers to said rib, substantially as specified.

2. An internal combustion engine comprising opposing groups of cylinders arranged in directly opposed positions, pistons in pairs, each pair operating in unison in a pair of directly opposed cylinders, a split hollow tubular structure connecting each pair of pistons, openings in said tubular structure, gudgeon pins screwing into said openings, rollers rotatably mounted upon said gudgeon pins, a bolt and nut bridging said split whereby said gudgeon pins can be locked in position in said openings, a member relatively rotatable in respect of the cylinders and located centrally between the two groups of cylinders, a cam rib on said relatively rotatable member, said cam rib being so shaped as to insure the maintenance of contact between the rollers and the cam rib at all positions of the rollers relative to said rib, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM ROBERT FASEY.

Witnesses:

VINCENT HUGHES,

EDWARD A. EVE.