C. R. PRYOR.

INTERNAL COMBUSTION ENGINE.

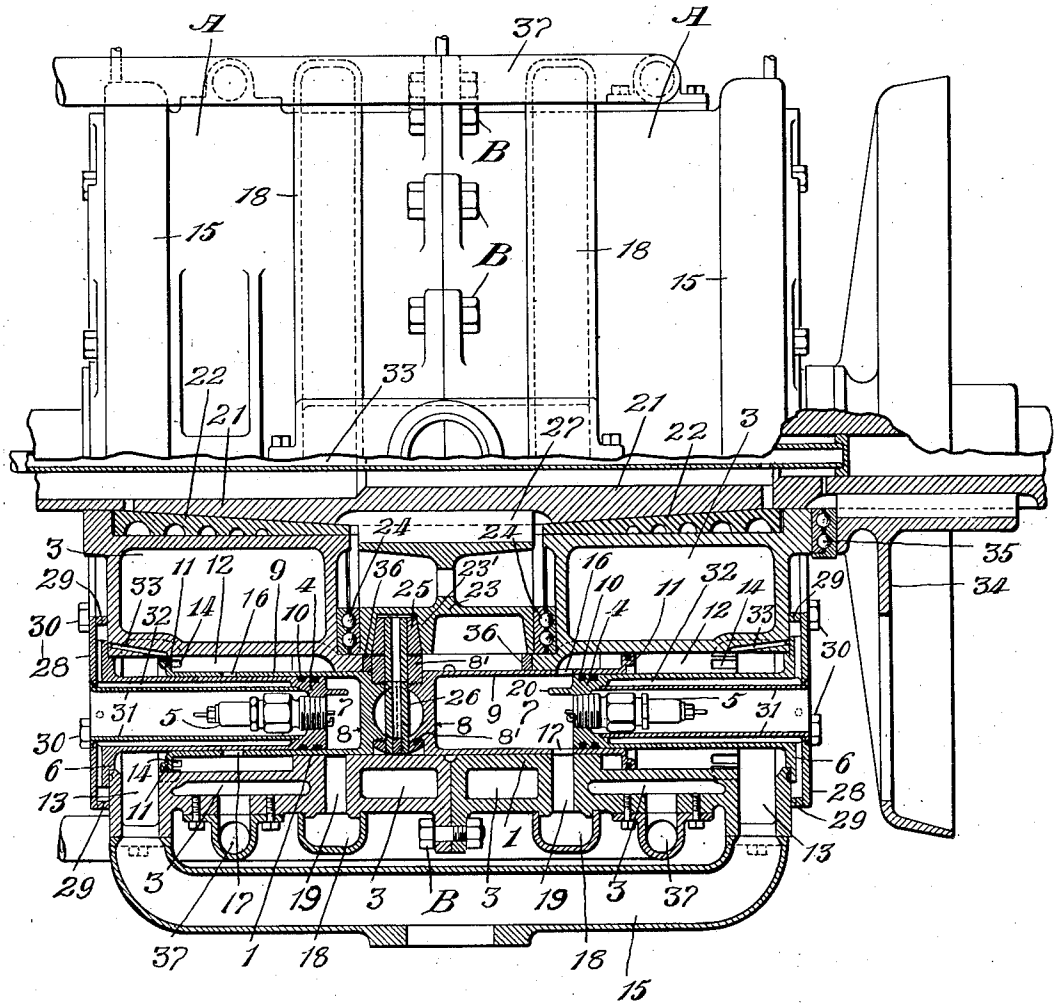
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1,427,632.

Patented Aug. 29, 1922.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

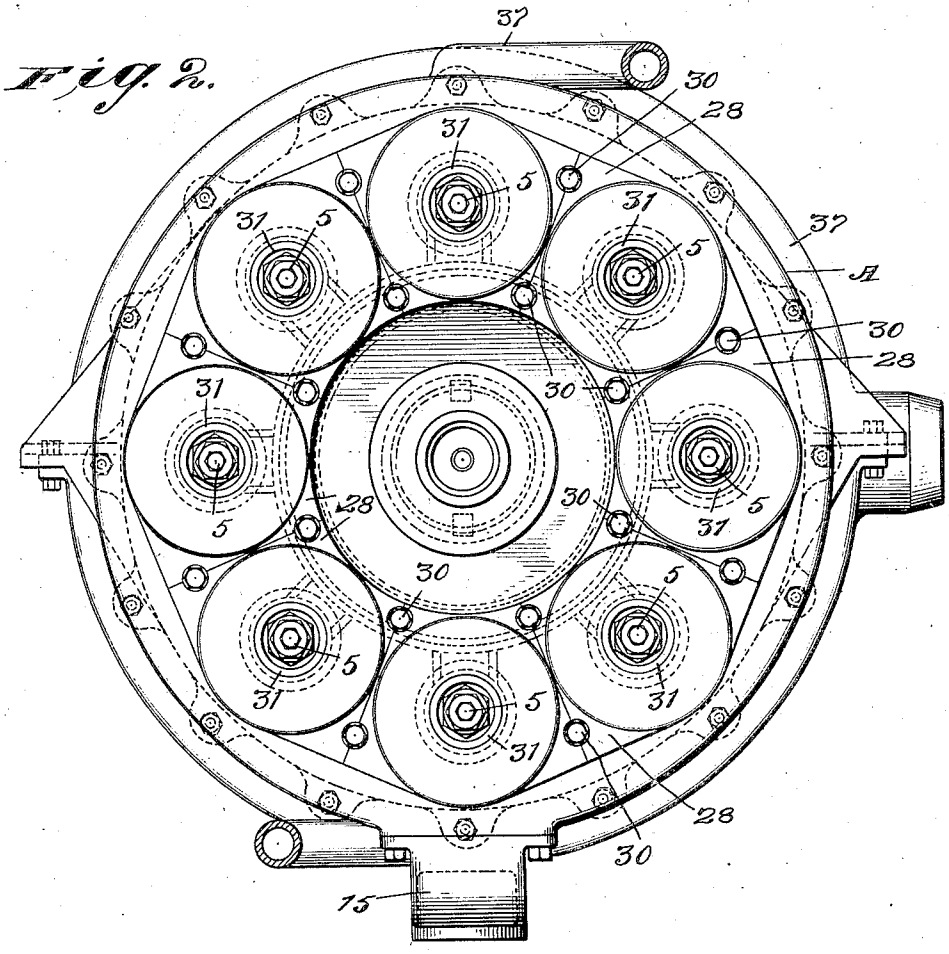
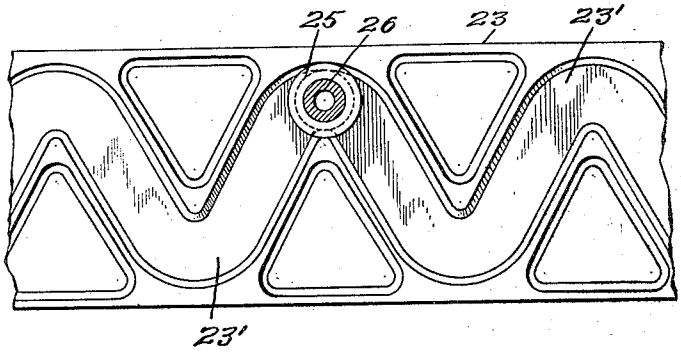


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

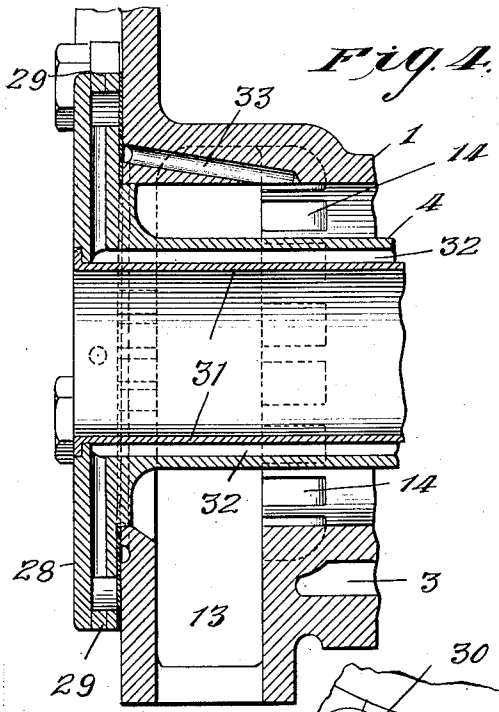
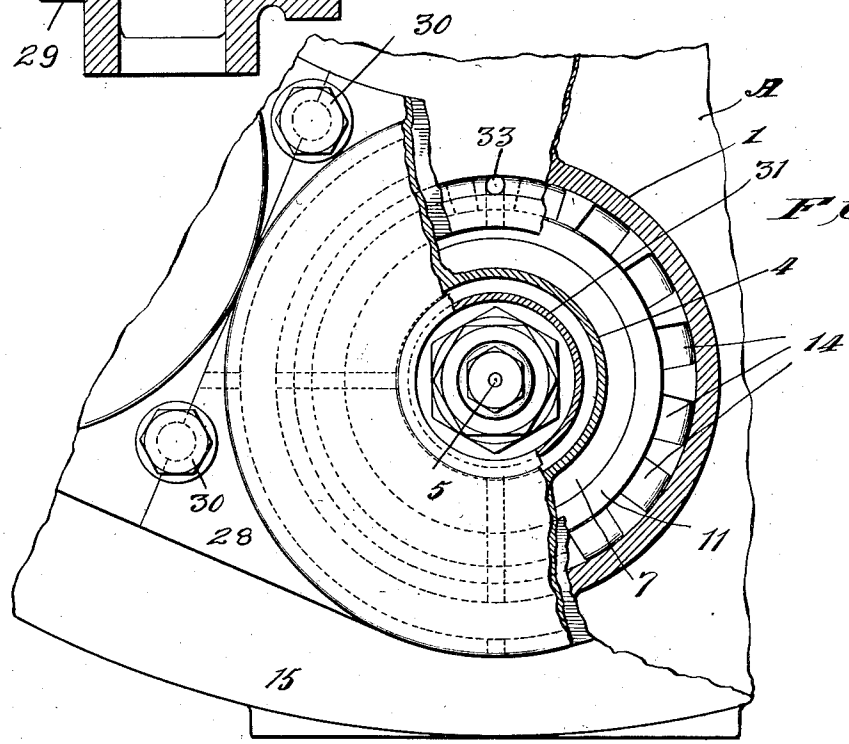


Fig. 5.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,427,632. Specification of Letters Patent. Patented Aug. 29, 1922.

Application filed August 8, 1919. Serial No. 316,152.

To all whom it may concern:

Be it known that I, CHARLES ROGER PRYOR, a citizen of the United States, and a resident of Garfield, in the county of Frederick and State of Maryland, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to improvements in internal combustion engines, an object of the invention being to provide an improved construction of engine having a rotary cam member operated by a circular series of double-acting pistons, each piston movable in a pair of aligned cylinders receiving impulses in both.

A further object is to provide an improved construction of two-cycle double-acting internal combustion engine, whereby the reciprocating cylinders serve to impart motion to a rotary member and also compress the gas and eject the same after an explosion.

A further object is to provide improved mounting for the drive shaft and cam member thereon to which is imparted motion by means of reciprocating cylinders receiving impulses in both ends.

With these and other objects in view the invention consists in certain novel features of construction, and combinations and arrangement of parts, as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings—

Figure 1 is a view partly in elevation and partly in longitudinal section illustrating my improved engine;

Figure 2 is an end view;

Figure 3 is a plan view of the cam member 23;

Figure 4 is a fragmentary view in longitudinal section, on an enlarged scale, of the outer end of one of the pistons; and

Figure 5 is a fragmentary view on an enlarged scale, partly in end elevation and partly in section illustrating the construction of the outer end of a piston.

A, A, represent circular castings which are secured together by bolts B and each casting contains a circular series of engine casings 1, the engine casings of one casting being in alignment with the casings of the other. While, of course, I may employ any desired number of cylinders, I have illustrated eight casings in each casting, making a total of sixteen casings in all.

All of the cylinders are suitably water jacketed, as shown at 3, and each casing is provided at its outer end with an inwardly projecting stationary piston 4 in which a spark plug 5 is positioned. The outer ends of the pistons 4 have annular flanges 6 fitting snugly against the outer ends of the casings, as clearly shown in Figures 1, 4 and 5.

Each pair of aligned casings 1 is provided with a double-acting reciprocating cylinder 7 having pressure surfaces 8 cooperating with the pressure surfaces formed by the pistons 4, and each cylinder at its opposite ends is made with cylindrical portions 9 fitting between the pistons 4 and the casings 1 and made gas tight by suitable packing rings 10 on the pistons. The cylinder is preferably made of two parts having its ends screwed into a ring 8′ coupling them together and held against turning movement by the pin 26.

The extreme ends of the cylinders 7 are provided with annular plungers 11, which are movable in the compression chambers 12 formed in the casings around the outside of the piston 4. These compression chambers 12 at their outer ends communicate with gas chambers 13 by means of relatively long ports 14, and suitable gas manifolds 15 supply gas to the chambers 13. The cylindrical portions 9 of the cylinders 7 are provided in one side with gas inlet ports 16 and in their opposite sides with exhaust ports 17, the former communicating with the compression chambers 12 and the latter with exhaust ports 19 in the casings. The exhaust ports 19 communicate with suitable exhaust manifolds 18 and deflectors as at 20 are located on the pistons 4 to direct the flow of gases and insure a proper scavenging of the cylinders.

21 represents a drive shaft centrally located in the casting A, A, and mounted in conical bushings 22, which latter can be adjusted or removed and replaced to take up wear. A cylindrical cam member 23 is keyed to the shaft 21, as shown at 27, and is provided in its outer face with a cam groove 23′. Ball bearings 24 are located at the sides of the cam member between the same and

the castings A, A, to sustain the longitudinal thrust on the cam member and to insure an easy running device.

The cam groove 23′ is engaged by rollers 25 carried by pins 26 mounted in the cylinders 7 so that the reciprocation of the cylinders will impart a rotary motion to the cam member 23 and shaft 21.

At each end of the engine a segmental ring 28 is located and formed with flanges 29 fitting against the casting A, and around the ends of the casings 1, these segmental rings being secured in place by means of screws 30. Each segment of each ring covers a single casing and is provided with a tubular projection 31 extending into the piston 4, whereby a water jacket 32 is formed for the piston. By reason of the segmental rings 28, each casing can be examined or the parts thereof removed and repaired by simply removing the particular segment covering the outer end thereof.

Suitable lubricant passages 33 are provided to lubricate the movable parts of the engine, and a clutch member 34 is secured on the shaft 21 and spaced from the castings A, A by means of ball bearings 35. Thrust bearing rings 36 receive the thrust of the pins 26, and suitable water circulating manifolds 37 are provided to maintain a circulation of water in all of the water chambers to cool the engine.

The operation is as follows: As the operation of all casings of the cylinders are precisely alike, the description of one operation will apply alike to all. Assuming the parts to be in the position shown in Figure 1, a movement of the cylinder 7 to the right will cause the ports 16 and 17 to close and compress the charge between the cylinder and the piston 4. During this compression stroke plunger 11 will cause a partial vacuum to be formed in the rear of the same so that as soon as the plunger reaches the ports 14 and exposes them to the chamber 12, the gas will fill the chamber 12.

When the cylinder moves to the left by reason of the explosion caused by a spark from the plug 5, the plunger 11 will compress the gas in chamber 12 until the ports 16 and 17 are opened when the gas from chamber 12 will rush into the space between the cylinder and the piston, thereby forcing out the exploded gases through the exhaust port 17 and thoroughly scavenging the engine.

This same operation takes place in every casing, an explosion taking place at the passing of every cam point during revolution of the cam member. There are six cam points in each direction making a total of twelve, and eight pairs of casings in the porticular design illustrated. There will be ninety-six impulses for a revolution of the shaft. There are four explosions at one time, two being at one end of the engine diametrically opposed, and the other two at the other end of the engine at right angles to the first-named set and also diametrically opposed.

It is evident that the rings 28 need not be in segments unless desired and the castings A—A might constitute a single part if desired.

While I have described a stationary casing carrying part and a rotary shaft it is obvious that the shaft might be stationary and the casing carrying part rotate around the shaft.

Various other slight changes may be made in the general form and arrangement of parts described without departing from the invention, and hence I do not limit myself to the precise details set forth but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of the appended claims.

I claim:

1. An internal combustion engine, comprising a casing, stationary pistons fixed in the ends of the casing, a reciprocating cylinder movable at its ends on the pistons, said cylinder composed of two members, said members having adjacent screw threaded closed ends constituting pressure surfaces, a ring screwed onto the ends of the cylinder members and coupling them together, said casing having annular compression chambers around the outside of the pistons, plungers on the ends of the cylinder movable in said compression chambers, and ports in the walls of each cylinder member registering with a compression chamber at predetermined position of the cylinder member.

2. An internal combustion engine, comprising a casing, stationary pistons fixed in the ends of the casing, a reciprocating cylinder movable at its ends on the pistons, said cylinder composed of two members, said members having adjacent screw threaded closed ends constituting pressure surfaces, a ring screwed onto the ends of the cylinder members and coupling them together, a laterally projecting pin supported in said ring, a shaft, a cam on the shaft and with which the pin engages, annular compression chambers around the outside of the pistons, plungers on the ends of the cylinder movable in said compression chambers, and ports in the walls of each cylinder member registering with a compression chamber at predetermined position of the cylinder member.

3. An internal combustion engine, comprising a casing, stationary pistons fixed in the ends of the casing, a reciprocating cylinder movable at its ends on the pistons, said cylinder composed of two members, said members having adjacent screw threaded closed ends constituting pressure surfaces, a

ring screwed onto the ends of the cylinder members and coupling them together, a laterally projecting pin supported in said ring, a shaft, a cam on the shaft and having a cam groove in its periphery, a roller on the end of the pin movable in said cam groove, said casing having annular compression chambers around the outside of the pistons, plungers on the ends of the cylinder movable in said compression chambers, and ports in the walls of each cylinder member registering with a compression chamber at predetermined position of the cylinder member.

4. In an internal combustion engine, a casing, a plurality of reciprocating cylinders each provided with inlet and exhaust ports and having a plunger at its end, a plurality of hollow stationary pistons extending inwardly from the end of the casing into the cylinders, a compression chamber surrounding each piston and in which the plunger of a cylinder works, a segmental ring secured upon the end of the casing, and a tubular projection secured to each segment of the ring and projecting into a piston to form therewith a water jacket for the same.

CHARLES ROGER PRYOR.