

C. B. REDRUP.

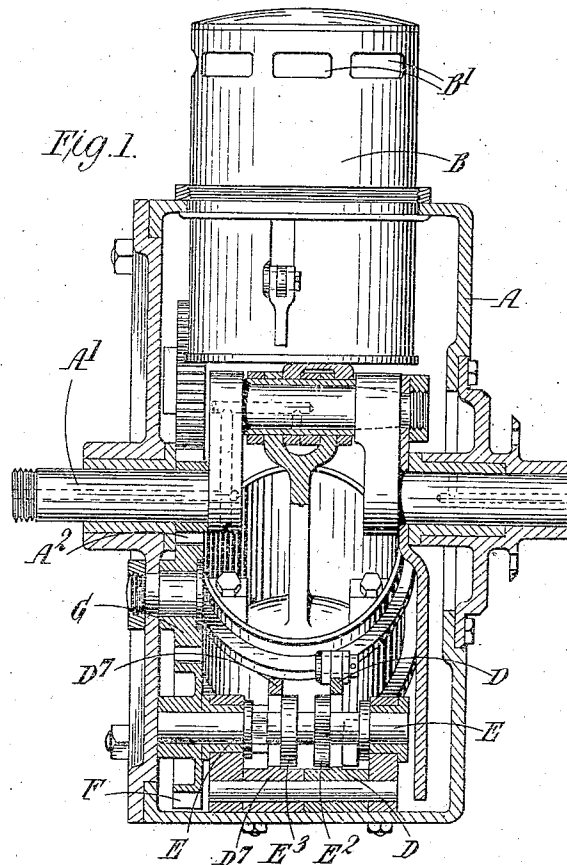
VALVE GEAR.

APPLICATION FILED AUG. 10, 1911.

1,061,868.

Patented May 13, 1913.

3 SHEETS—SHEET 1.



Witnesses
Mr. Max Small.
H. W. Primmer

Inventor:
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Attorneys

C. B. REDRUP.

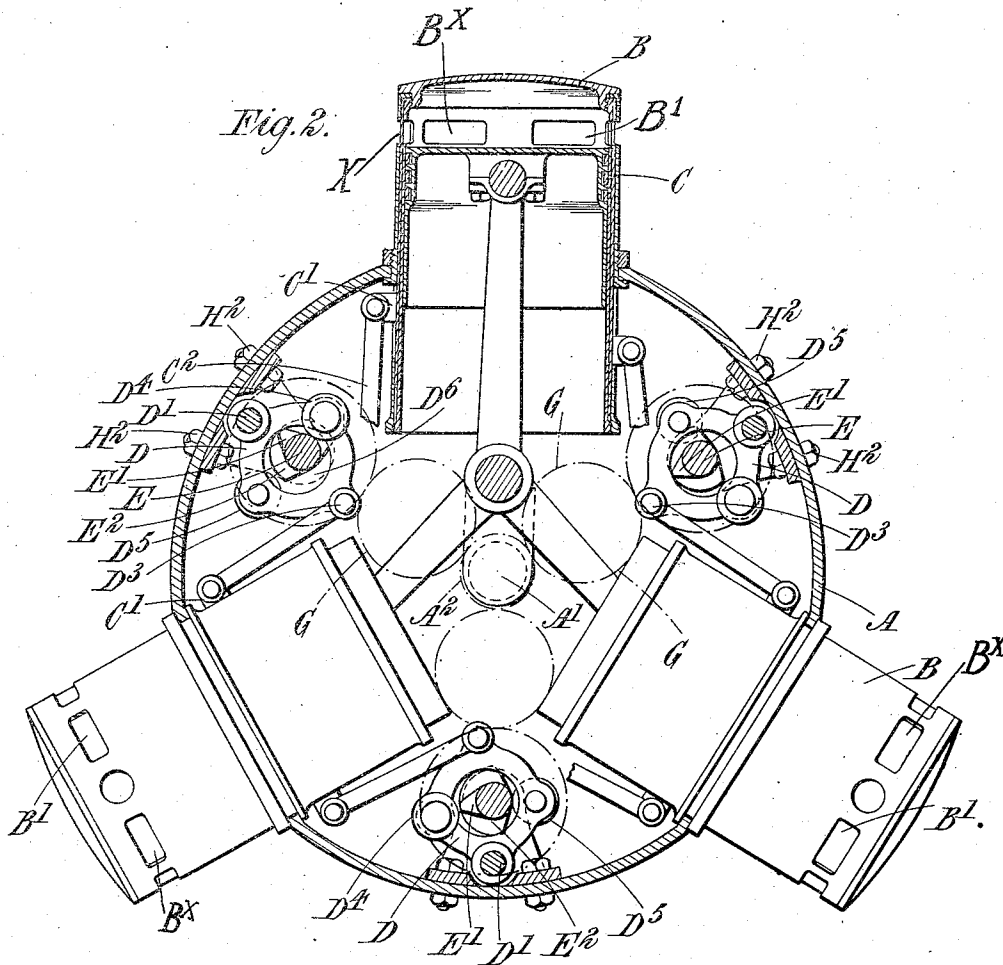
VALVE GEAR.

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Witnesses.
Mr. May D. Small
H. W. Pinner

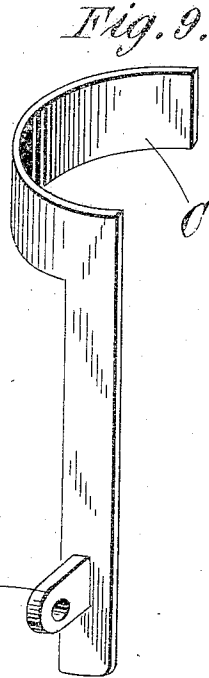
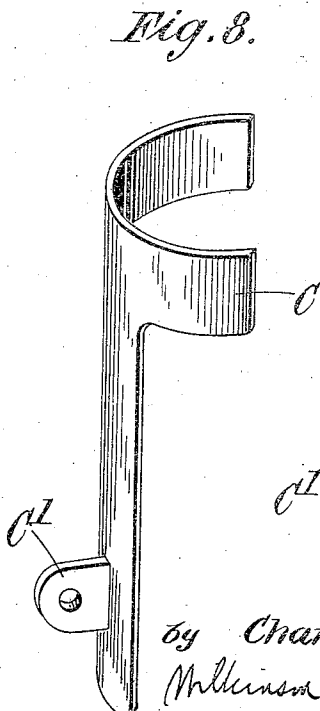
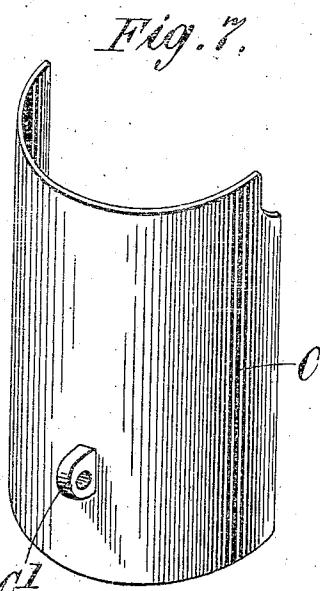
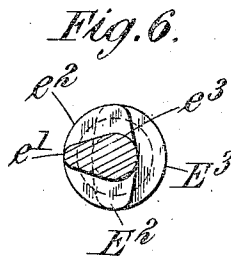
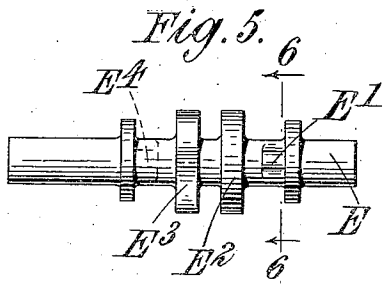
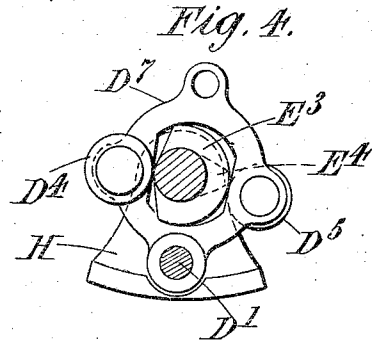
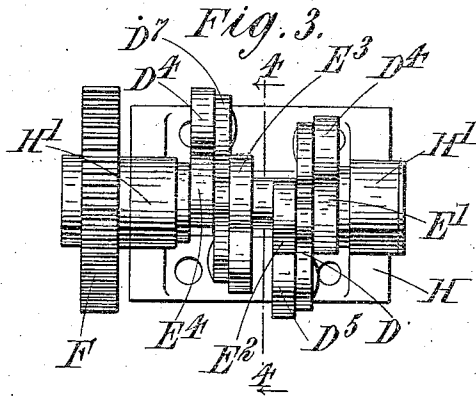
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C. B. REDRUP.
VALVE GEAR.
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3 SHEETS-SHEET 3.



Witnesses.
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H. W. Primm

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UNITED STATES PATENT OFFICE.

CHARLES BENJAMIN REDRUP, OF CANTON, CARDIFF, ENGLAND.

VALVE-GEAR.

1,061,868.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed August 10, 1911. Serial No. 643,455.

To all whom it may concern:

Be it known that I, CHARLES BENJAMIN REDRUP, a subject of the King of England, residing at Canton, Cardiff, in the county of Glamorgan, Wales, England, have invented certain new and useful Improvements in Valve-Gear, of which the following is a specification.

This invention is for improvements in or relating to valve gear for internal combustion engines of the rotating cylinder type and has for its object to provide a simple form of gear that will hold the valves always under control and not move them during the compression or firing strokes and will then quickly move them into full opening position. Thus during the compression and firing strokes the valves, which are preferably of the semi-sleeve type can remain stationary but as soon as the exhaust or inlet strokes are commenced the valves can be rapidly opened to the full extent.

According to this invention the valve mechanism for each valve comprises a rocking frame controlled by a double cam whereof the portions at greatest distance from the center of the cam-shaft are both on the same side of the shaft and cooperate with staggered portions of the frame, or parts carried thereby, that lie on opposite sides of the cam-shaft. By making half or more of such a cam concentric with the axis of its shaft the long dwell desired and then the rapid movement of the rocking frame required for opening the valves, can be obtained.

According to one method of carrying out this invention as applied to an engine having three cylinders radially disposed around and projecting partly into the crank-case, the rocking frames and their double cams are provided in pairs and disposed one pair between each two cylinders. The two pairs of cams are carried on a shaft common to both and each shaft has on it a toothed wheel. These wheels mesh with other wheels arranged around the crank-shaft of the engine and meshing in turn with a wheel thereon. All this mechanism is inclosed within the crank-chamber and the rocking frame of one pair of double cams is connected to a valve belonging to one cylinder and the rocking frame belonging to the other pair of cams on the same cam-shaft is operatively connected to the valve of the cylinder on the other side of the gear.

Preferably half-sleeve valves are employed, each cylinder having two such valves for controlling the inlet and exhaust respectively.

In the accompanying drawings which illustrate this method of carrying out the invention:—Figure 1 is a side elevation of the engine with the crank-chamber in vertical section on the plane of the crank-shaft; Fig. 2 is a view of the engine from the right of Fig. 1 with the crank-chamber and one cylinder in section on a plane at right angles to the crank-shaft; Fig. 3 is a plan of one of the valve-operating mechanisms; Fig. 4 is a section of the same on the line 4—4 of Fig. 3; Fig. 5 is an elevation of the cam-shaft shown in Fig. 3; Fig. 6 is a section on the line 6—6 of Fig. 5; Fig. 7 is a perspective view of a valve suitable for operation by this gear; Fig. 8 is a perspective view of a modified form of valve suitable for operation by this gear, and Fig. 9 is a perspective view of yet another form of valve suitable for operation by this gear.

Like letters indicate like parts throughout the drawings.

The engine has a crank-case A radiating from which are three cylinders B. Within the walls of the cylinders are mounted half sleeve valves C and X, Figs. 2 and 7, which control the inlet and exhaust ports B¹ and B² respectively near the head end of each cylinder. The valves are free to slide toward the head end and back toward the crank-chamber end first to cover and then to uncover the ports. Conduits are provided that communicate with the ports outside the cylinder, but as these form no part of the present invention they do not need to be described. Each valve C and X has a lug C¹ that projects through an opening in the outer portion of the cylinder wall and these lugs are connected by links C² to rocking frames D. Each frame is fulcrumed at D¹ to the wall of the crank-chamber and its opposite end is connected to the link C² by a pin D². On each fulcrumed frame are rollers D³, D⁴. These rollers are placed on opposite sides of a central space D⁵ provided in the frame and they are staggered relatively to each other one being on one face of the frame and the other on the opposite face.

Extending through the space D⁵ in the frame is a cam-shaft E whereon double cams E¹, E² are mounted. The portions e¹ e² of

the cams that are farthest from the center of the cam-shaft are both on the same side of the shaft and are placed centrally in relation to each other, moreover, the part e^2 of the cam E^2 and a part e^3 of the cam E^1 extend more than half-way around the cam-shaft and are concentric therewith. The cam E^1 coöperates with the roller D^4 and the cam E^2 coöperates with the roller D^5 . It will be observed that one cam is wide and the other narrow and the relative proportions are such that as the double cams rotate both rollers are kept constantly in contact or approximately in contact with their respective cams throughout the whole rotation of the cam-shaft.

Only one pair of cams E^1 , E^2 has thus far been described, but the cam-shaft E carries a second pair E^3 , E^4 that coöperate with rollers on a rocking frame D^7 . These cams and their frame are exact duplicates of those already described but they are set at an angle of 180° to the other cams so that when one pair of cams is moving its frame to the right the other pair will be moving its frame to the left. Each cam-shaft has mounted on it a toothed wheel F which gears with one of a series of toothed wheels G that are mounted around the crank-shaft A^1 of the engine and mesh with a toothed wheel A^2 thereon.

Each pair of double cams with their rocking frames are mounted on a base-plate H providing bearings H^1 for the cam-shaft and these plates are secured by bolts and nuts H^2 to the crank-case between each two cylinders. One rocking frame thus serves one valve for one cylinder and the other rocking frame one valve for the adjacent cylinder. This arrangement enables the parts to be got conveniently into the crank-chamber.

The operation of the gear is as follows:—The crank-case and -shaft may both rotate in opposite directions and the relative motion causes the intermediate gear-wheels G to be rotated about their supporting pins which communicates motion to the cam-shafts E . The two pairs of cams on each shaft will thus be carried around with the shaft and one pair being set, as already explained, at 180° to the other, will cause the rocking frames D and D^7 to rock in opposite phase thereby imparting movement to their respective valves. The long concentric portions e^2 , e^3 of the cams allow the valves to be stationary during the compression and firing strokes which is an important feature, as these valves being of the half-sleeve type they are under pressure during these periods so that any movement would result in considerable friction. As soon, however, as the valves are to be opened, these concentric portions of the cams pass from their respective rollers and the rocking frames are almost instantly brought over to the limit of their

movement for opening the valves, thus throwing them wide open at the commencement of the exhaust or inlet strokes.

Instead of the valves C and X being made in the form of a half-sleeve as shown in Figs. 2 and 7 they may be T-shaped as shown in Fig. 8, or L-shaped, as shown in Fig. 9, as only the upper portion of the valve is actually used to cover and uncover the ports.

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

1. The combination with an internal combustion engine cylinder having inlet and exhaust ports, of controlling valves for said ports; and means for actuating each of said valves comprising a fulcrumed ring having oppositely disposed rollers journaled thereon, a link connecting said ring with the valve; and a cam mounted to rotate within said ring and adapted to engage with said rollers and move the ring to actuate the valve, substantially as described.

2. The combination with an internal combustion engine having a casing, and cylinders provided with inlet and exhaust ports, of controlling valves for said ports, and means for moving said valves axially of the cylinders to open and close said ports, said means comprising annular frames fulcrumed in pairs on the casing between said cylinders, a link connecting each of said frames to one of said valves, shafts journaled in the casing and passing through said annular frames, and cams on said shafts located within the annular spaces of said frames and adapted to engage with the frames to move the same for actuating said valves, substantially as described.

3. In valve gear for internal combustion engines of the rotating cylinder type wherein the cylinders are arranged radially around the crank-case the combination of, a fulcrumed frame having an opening in it, a cam-shaft that extends through the opening in the frame, and two cams on the shaft one on each side of the frame the portions of the cams that are at greatest distances from the center of the cam-shaft being both on the same side of the shaft and the frame being provided with opposed projections one on one side and the other on the other side of the frame for coöperation with the cams which projections are so situated and which cams are so shaped that continuous control of the frame by the cams is maintained, substantially as and for the purpose set forth.

4. In valve gear for internal combustion engines of the rotating cylinder type wherein the cylinders are arranged radially around the crank-case the combination of, a fulcrumed frame having an opening in it, a cam-shaft that extends through the opening in the frame, and two cams on the shaft one on each side of the frame such cams hav-

ing the portions that are at greatest distances from the center of the cam-shaft both on the same side of the shaft, having approximately half the operative face of each concentric with the axis of the shaft such half of one cam being on the opposite side of the shaft to the corresponding half, and having the remaining portion of each shaped to give a quick full displacement to the fulcrumed frame and the frame being provided with opposed projections one on one side and the other on the other side for coöperation with the cams which projections are so situated and which cams are so shaped that continuous control of the frame by the cams is maintained, substantially as and for the purpose set forth.

5. In valve gear for internal combustion engines of the rotating cylinder type wherein the cylinders are arranged radially around the crank-case the combination of, two rocking frames spaced apart and pivoted about an axis common to both each frame having an opening in it, a cam-shaft that extends through the openings in the two rocking frames parallel to the axis about which they rock, four cams on the shaft one on each side of each frame, the cams allotted to one frame having the portions that are at greatest distances from the center of the crank-shaft both on the same side of the shaft and those allotted to the other frame having such portions both on the opposite side of the shaft, each cam having approximately half of its operative face concentric with the axis of the shaft such half of one cam being on the opposite side of the shaft to the corresponding half of its fellow cam, the remaining portion of each cam being shaped moreover to give a quick full displacement to its rocking frame, each frame moreover being provided with opposed projections one on one side and the other on the other side for coöperation with the cams allotted to it which projections are so situated and which cams are so shaped that continuous control of each frame by its cams is maintained, means for operatively connecting one rocking frame to a valve of one cylinder of the engine, and means for operatively connecting the other frame to a valve of another cylinder of the engine, substantially as and for the purpose set forth.

6. In valve gear for internal combustion engines of the rotating cylinder type wherein the cylinders are arranged radially around the crank-case the combination of, two rocking frames spaced apart and pivoted about an axis common to both and situated within the crank-case at a point that is circumferentially midway between two cylinders each frame having an opening in it, a cam-shaft that extends through the openings in the two rocking frames parallel to the axis about which they rock, four cams on the shaft one on each side of each frame, the cams allotted to one frame having the portions that are at greatest distances from the center of the crank-shaft both on the same side of the shaft and those allotted to the other frame having such portions both on the opposite side of the shaft, each cam having approximately half of its operative face concentric with the axis of the shaft such half of one cam being on the opposite side of the shaft to the corresponding half of its fellow cam, the remaining portion of each cam being shaped moreover to give a quick full displacement to its rocking frame, each frame moreover being provided with opposed projections one on one side and the other on the other side for coöperation with the cams allotted to it which projections are so situated and which cams are so shaped that continuous control of each frame by its cams is maintained, a spur-wheel on the cam-shaft, a spur-wheel on the crank-shaft of the engine, a spur-wheel carried by the crank-case and meshing with that on the cam-shaft and that on the crank-shaft, means for operatively connecting one rocking frame with a valve of that cylinder of the engine that is on one side of it, and means for operatively connecting the other rocking frame with a valve of that cylinder of the engine that is on the opposite side of it, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES BENJAMIN REDRUP.

Witnesses:

HUGH M. INGLEDEW,
GWILYM JONES.