J. F. WOOLF.

EXPLOSIVE ENGINE.

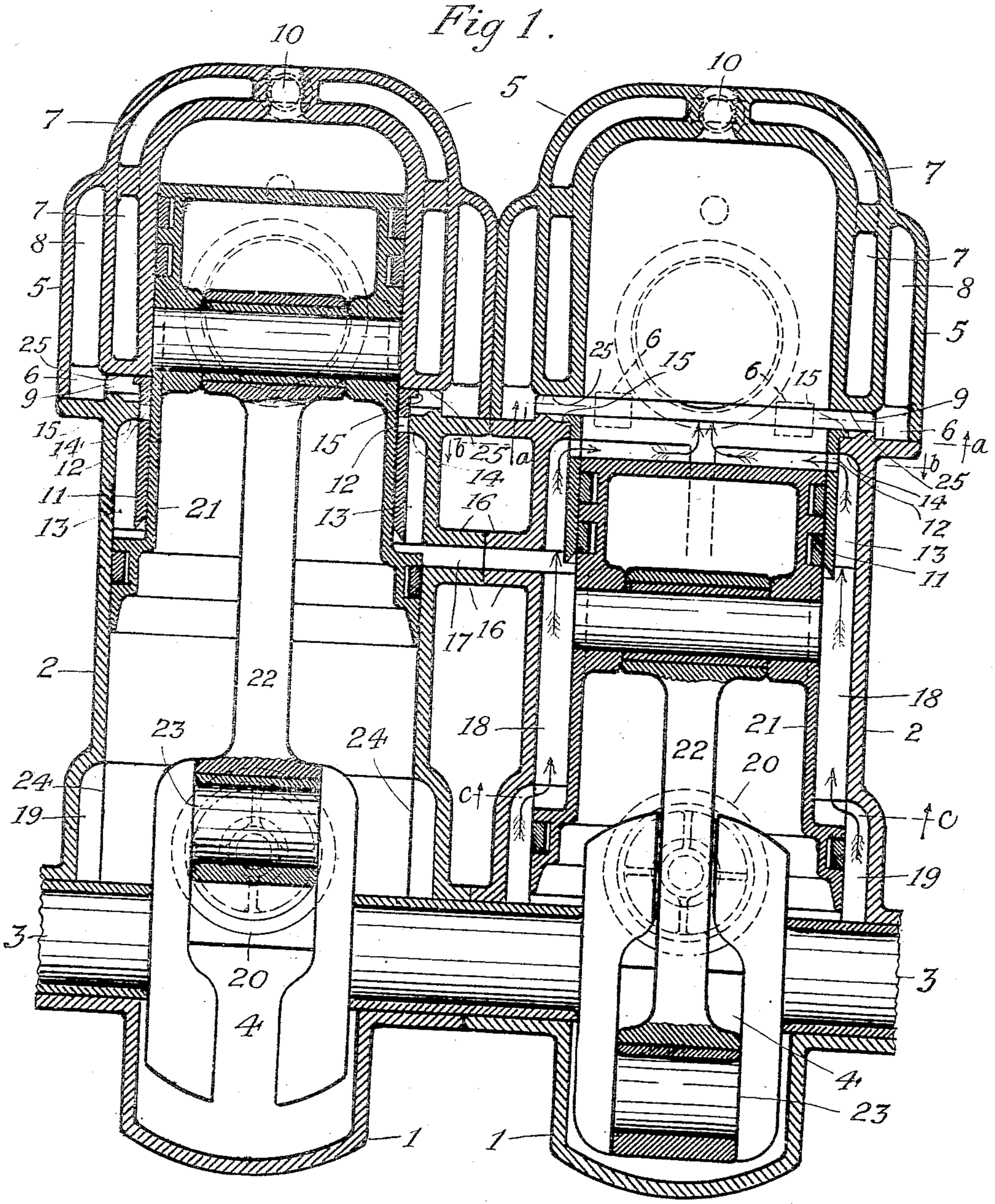
APPLICATION FILED FEB. 23, 1909.

965,975.

Patented Aug. 2, 1910.

2 SHEETS—SHEET 1.

Fig 1.



Witnesses:
Theo. Lagaard.
H. A. Bowman.

Inventor:
Jay. F. Woolf.
By P. H. Gunckel
his Attorney.

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2 SHEETS—SHEET 2.

Fig 2

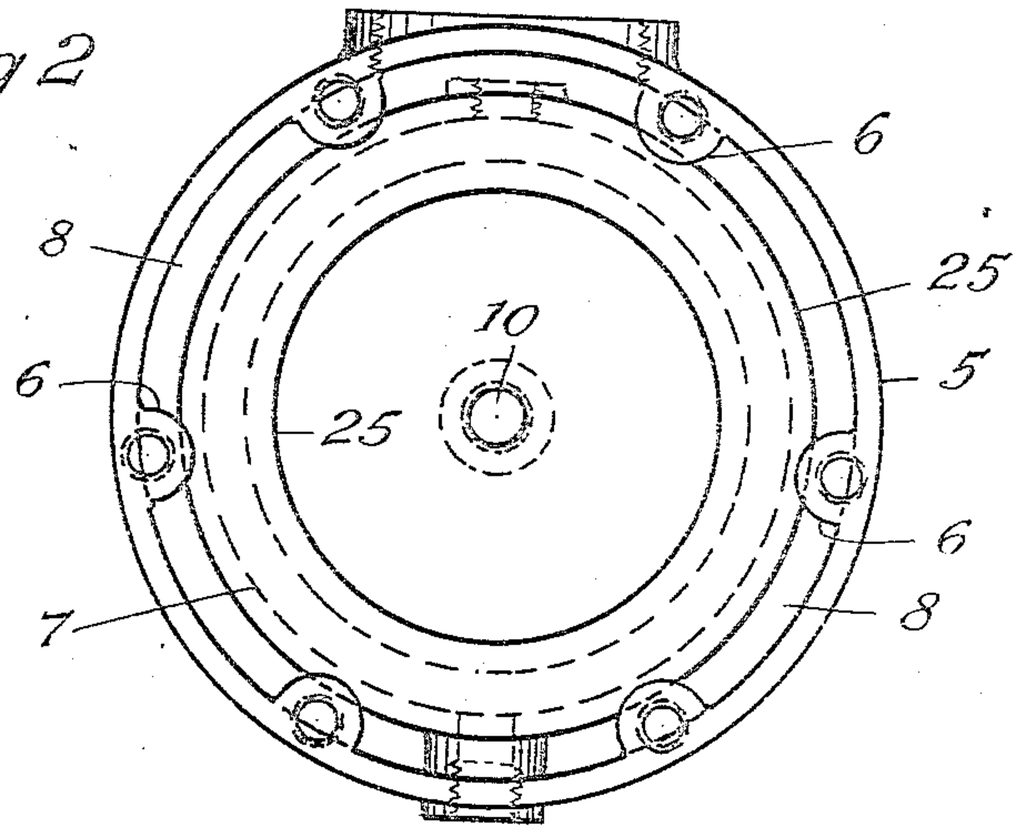


Fig 3

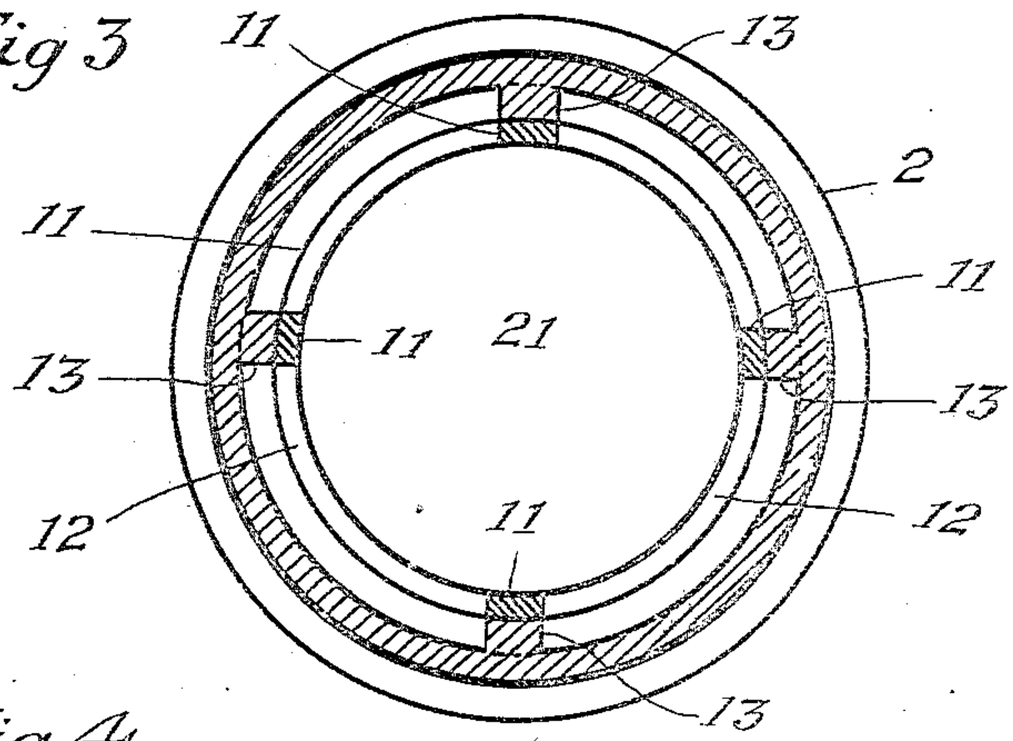
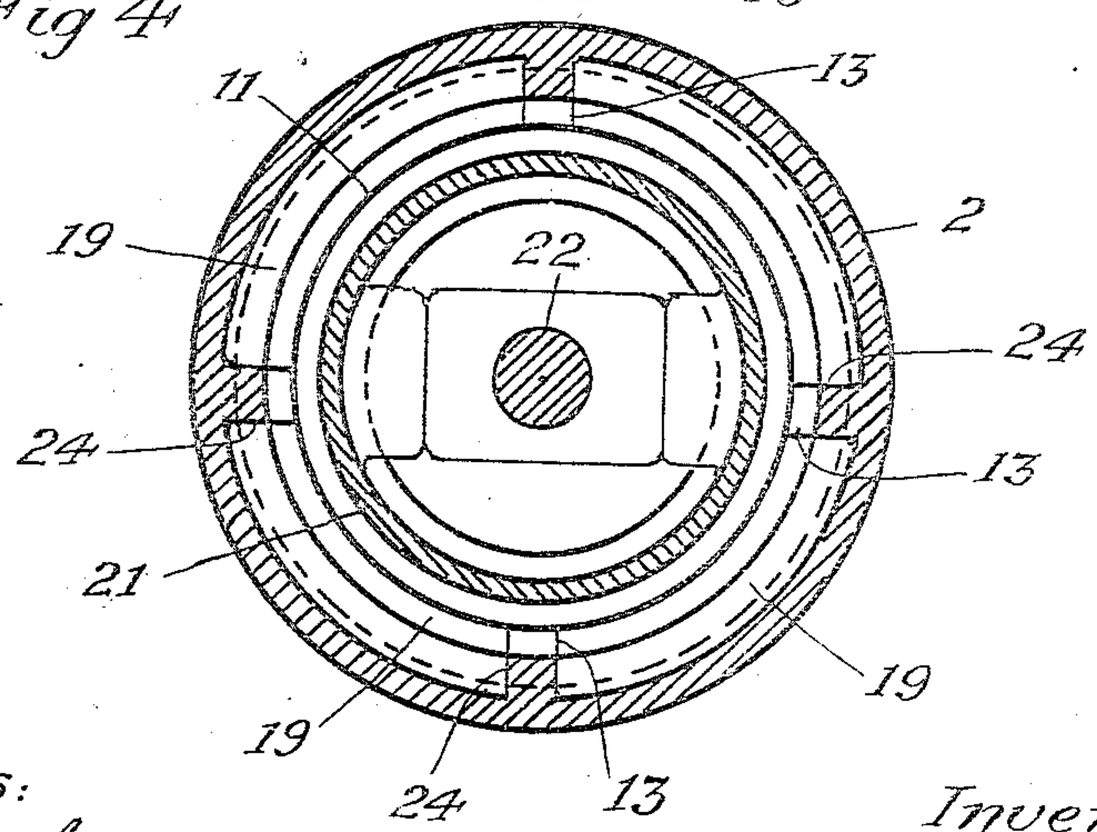


Fig 4



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his Attorney.

UNITED STATES PATENT OFFICE.

JAY F. WOOLF, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO ELLIS J. WOOLF, OF MINNEAPOLIS, MINNESOTA.

EXPLOSIVE-ENGINE.

965,975. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed February 23, 1909. Serial No. 479,504.

To all whom it may concern:

Be it known that I, JAY F. WOOLF, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification.

My invention relates to explosive engines, and its object is to provide a simple, efficient, and economical two stroke cycle explosive engine, and the improvements relate especially to the means for transfer of the gases.

The improvements are illustrated in the accompanying drawings, in which—

Figure 1 shows a central vertical section of the entire engine. Fig. 2 is a transverse section on the irregular broken line *a—a* of Fig. 1, viewed in the direction of the arrows and showing the bottom of one of the explosion cylinders. Fig. 3 is a transverse section on the line *b—b*, viewed in downward direction, and Fig. 4 is a like section on the line *c—c*, viewed in upward direction.

In such drawing 1 designates a pair of base castings, and 2 a pair of differential cylinder castings which provide the main shell or casing. These castings, 1 and 2, are of such shape that when secured together they inclose and afford a bearing for the crank-shaft 3, and also provide two crank-shaft compression chambers 4. A pair of explosion cylinder castings 5 are secured on the castings 2 and are properly centered by means of the stud-lugs 6. They are provided with the usual water-jackets 7 which are surrounded by annular exhaust chambers 8 for receiving the exhaust gases through the ports 9 afforded between the castings 2 and 5, and they are also provided with openings 10 for the usual spark-plugs, (not shown).

In the upper portions of the casing members 2 are arranged ring valves 11, which are provided with delivery ports 12, and which constitute the narrower members of the differential cylinders, the wider members being the castings 2. The upper portions of the members 2 are provided with vertical ribs 13, and bridge-walls or inward rims 14 for guiding the movements of the ring valves, and the rims serve also as stops to limit the downward movements of the ring valves which have outward flanges 15 on their upper edges for engaging the top surfaces of the stops. The pair of castings 2 are secured together by joint flanges 16 which provide a port 17 connecting the differential spaces 18 of the two cylinders; and they are also provided with ports 19 for connecting the charging chamber with the explosion chamber. The casings are provided with the usual spring seated check-valves 20.

In the cylinders are the differential pistons 21 which are connected by the rods 22 to the cranks 23 on the common crank-shaft 3. The lower and wider portions of the pistons are guided by the casings 2 and by ribs 24 provided therein, and their narrower upper portions engage the inner walls of the ring valves 11 with sufficient friction to reciprocate the latter to the limits of their movements. The play of these valves is between the rims 14 of the casings 2 and the bases 25 of the casings 5 that constitute the upper walls of the exhaust ports 9 and also serve as stops for the valves.

The cycle of actions in operation is as follows: Let it be assumed that an explosion has taken place in the left hand member of the engine and that the chamber 4 of that member is filled with gas; then the initial movement of the piston will by frictional contact carry the ring valve from its upper position there shown to its lower position, shown in the right hand member, and it will remain in that position, with the exhaust port 9 open, during the remainder of the explosion stroke of the piston; and when the piston has moved far enough to uncover that port the exhaust begins and will continue until the return movement of the piston moves the ring valve to close the port. At practically the same time that the piston head uncovers the ring valve ports 12 the wider portion of the piston will have moved past the port 19 to uncover it and allow the charging action to begin by the flow of gas through the port 19, the passage-way 18, and the ring valve ports 12, into the explosion chamber, the course being that indicated by

the arrows in the right hand member. When the piston begins its return stroke its head will lift the ring-valve in advance of it to the upper limit of the valve movement and to position to cause the cylinder rim 14 to shut off the valve ports 12 from communication with the passage-way 18 and to cause the upper portion of the ring-valve to close the exhaust port 9, before the piston head slides upwardly within the ring-valve past its ports 12. The compression of the gas in the explosion chamber will begin as soon as the ring valve is at rest and the piston moves upwardly within it. As the wider portion of the piston again covers the port 19 the gas remaining in the passage-way 18 is free to flow through the port 17 to the space 18 in the other cylinder; and a fresh charge will be drawn into the compression chamber 4 through the check-valve 20. Upon the return of the piston to the position shown in the left hand member the cycle of actions will have been completed.

Having described my invention, what I claim and desire to secure by Letters Patent is—

1. In a two-cycle explosive engine, the combination with casing members providing compression and explosion chambers and an intermediate cylinder forming a part of the compression chamber, the upper end of the cylinder being separated from an inner portion of the base of the explosion chamber casing by a circular space constituting an exhaust port, of a piston within the cylinder and casing members in position to separate the compression chamber from the explosion chamber, and a ring-valve on and slidable with the upper portion of the piston and having a projection for engaging alternately the top of the cylinder and the base of the explosion chamber casing, whereby the ring-valve is adapted to be reciprocated between the top of the cylinder and the base of the explosion chamber casing to alternately open and close the exhaust port, substantially as set forth.

2. In a two-cycle explosive engine, the combination with casing members providing compression and explosion chambers and an intermediate cylinder forming part of the compression chamber, the upper end of the cylinder being separated from an inner portion of the base of the explosion chamber casing by a circular space constituting an exhaust port, of a piston within the cylinder and casing members in position to separate the compression chamber from the explosion chamber, a ring-valve having ports for connecting the compression space with the explosion chamber and arranged on and slidable with the upper portion of the piston and having a projection for engaging alternately the top of the cylinder and the base of the explosion chamber casing, whereby the ring-valve is adapted to be reciprocated between the top of the cylinder and the base of the explosion chamber casing to alternately open and close the exhaust port, and an inwardly projecting rim on the upper portion of the cylinder past which the port portion of the ring-valve reciprocates and which serves to close said ports when the ring-valve is at the limit of its upward reciprocation, substantially as set forth.

3. In a two-cycle explosive engine, the combination with casing members providing compression and explosion chambers and an intermediate cylinder forming part of the compression chamber and having its lower portion wider than its body, of a piston within the cylinder and casing members in position to separate the compression chamber from the explosion chamber and having its lower portion wider than its body and fitting the narrower portion of the cylinder but separated from the wider portion of the cylinder by a space when the piston is near the limit of its down stroke, a ring-valve slidable on and with the upper portion of the piston and provided with ports past which the piston head slides, stops on the cylinder and upper casing member for limiting the ring-valve movements, the piston and ring-valve being arranged with reference to the cylinder to provide an intermediate fluid passage-way which the ring-valve ports connect with the explosion chamber as the piston nears the end of its down stroke, whereby the lower and wider portion of the piston controls the flow of gas from the compression chamber to said passage-way and the narrower body portion controls the flow of gas from the passage-way through the ring-valve ports to the explosion chamber, substantially as set forth.

4. In a two-cycle explosive engine, the combination with casing members providing compression and explosion chambers and an intermediate cylinder forming part of the compression chamber and having its lower portion wider than its body, of a piston within the cylinder and casing members in position to separate the compression chamber from the explosion chamber and having its lower portion wider than its body and fitting the narrower portion of the cylinder but separated from the wider portion of the cylinder by a space when the piston is near the limit of its down stroke, a ring-valve slidable on and with the upper portion of the piston and provided with ports past which the piston head slides, stops on the cylinder and upper casing member for limiting the ring-valve movements, the piston and ring-valve being arranged with reference to the cylinder to provide an intermediate fluid passage-way which the ring-valve ports connect with the explosion chamber as the piston nears the end of its down stroke,

and an inwardly projecting rim on the upper portion of the cylinder past which the port portion of the ring-valve reciprocates and which serves to close said ports when the ring-valve is at the limit of its upward stroke, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 17th day of February 1909.

JAY F. WOOLF.

Witnesses:

JNO. D. FARRAND.

CHAS. H. DIXON.