C. E. MEAD.

EXPLOSIVE ENGINE.

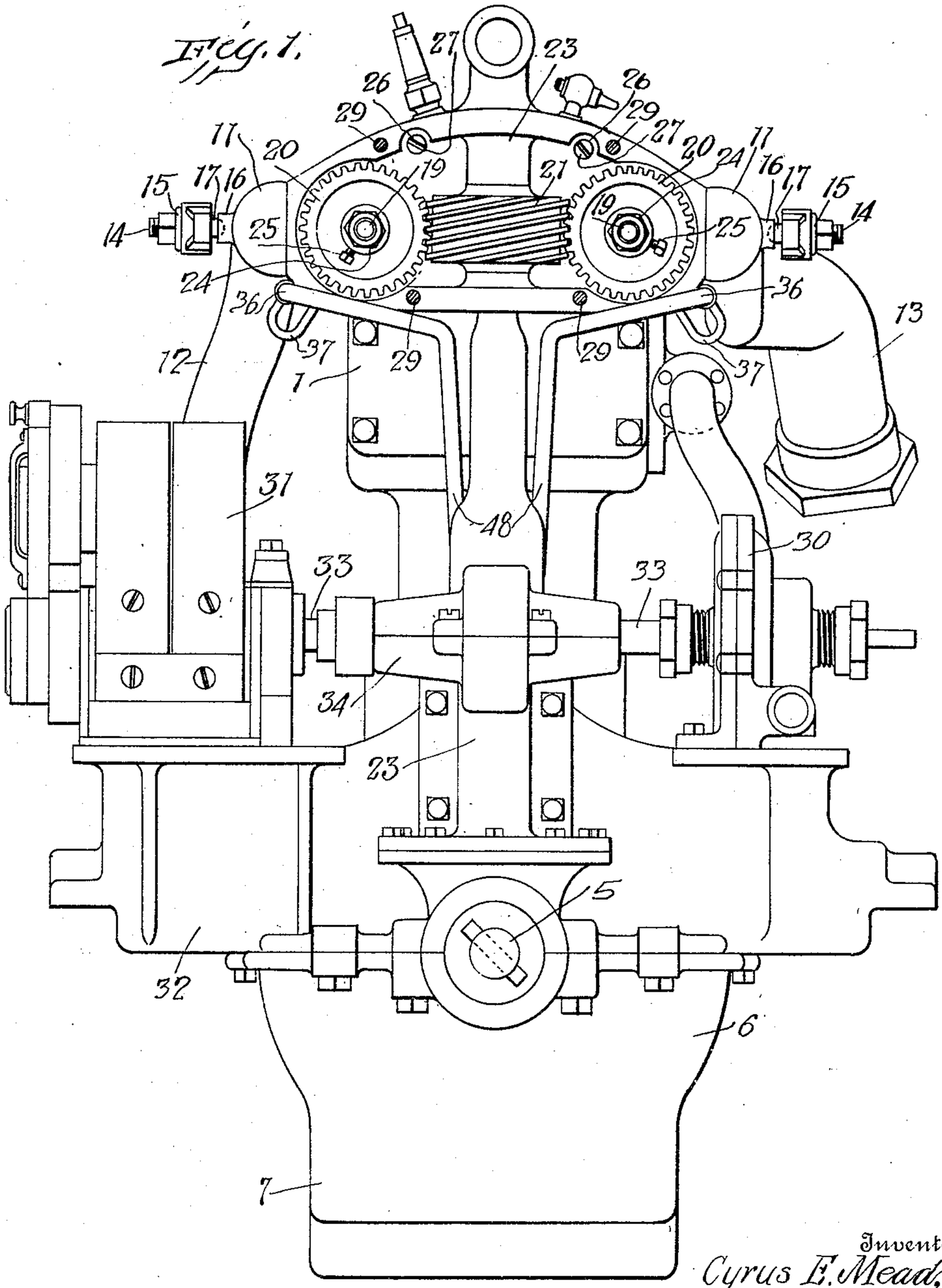
APPLICATION FILED APR. 28, 1911.

1,154,647.

Patented Sept. 28, 1915.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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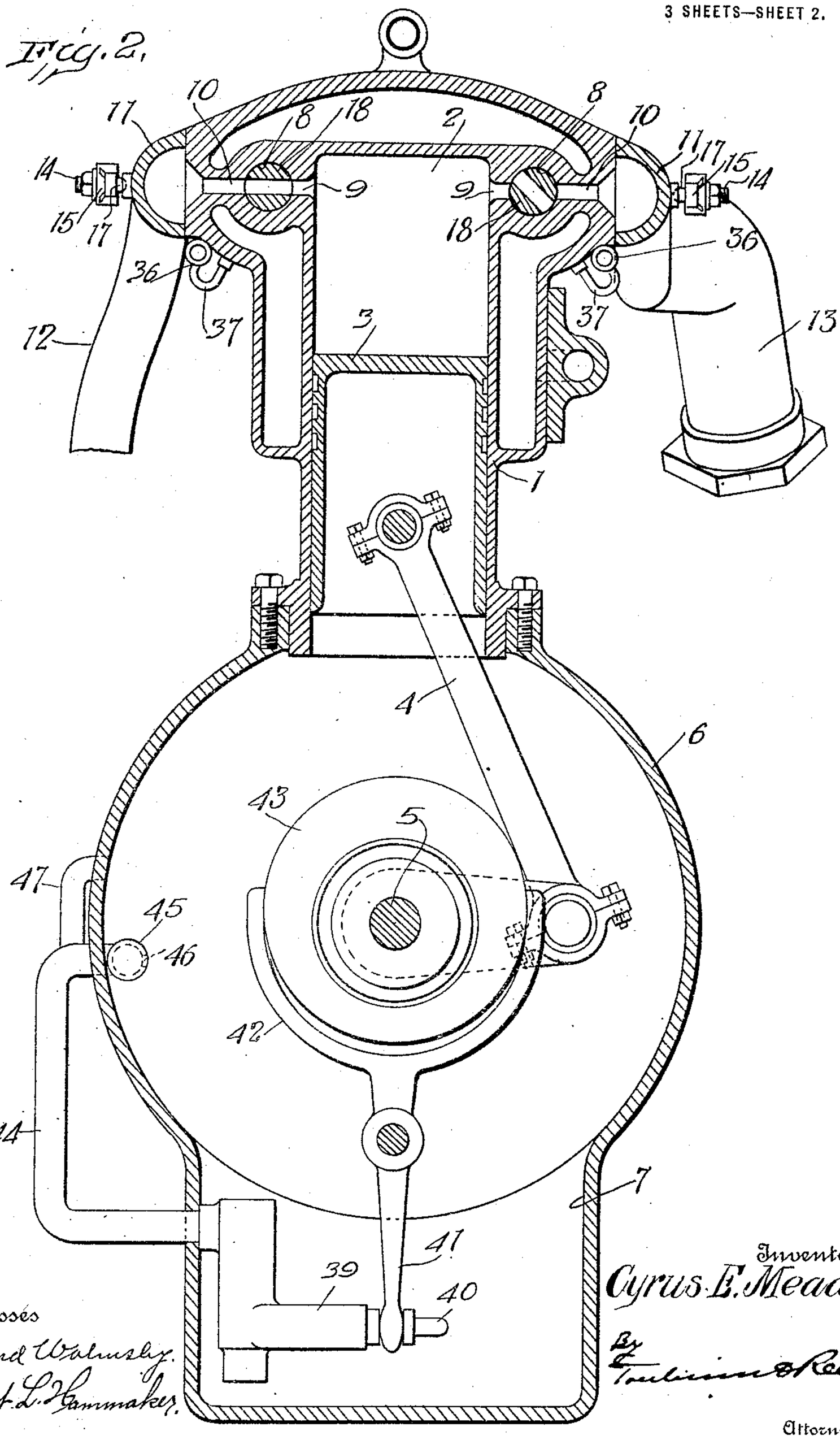
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

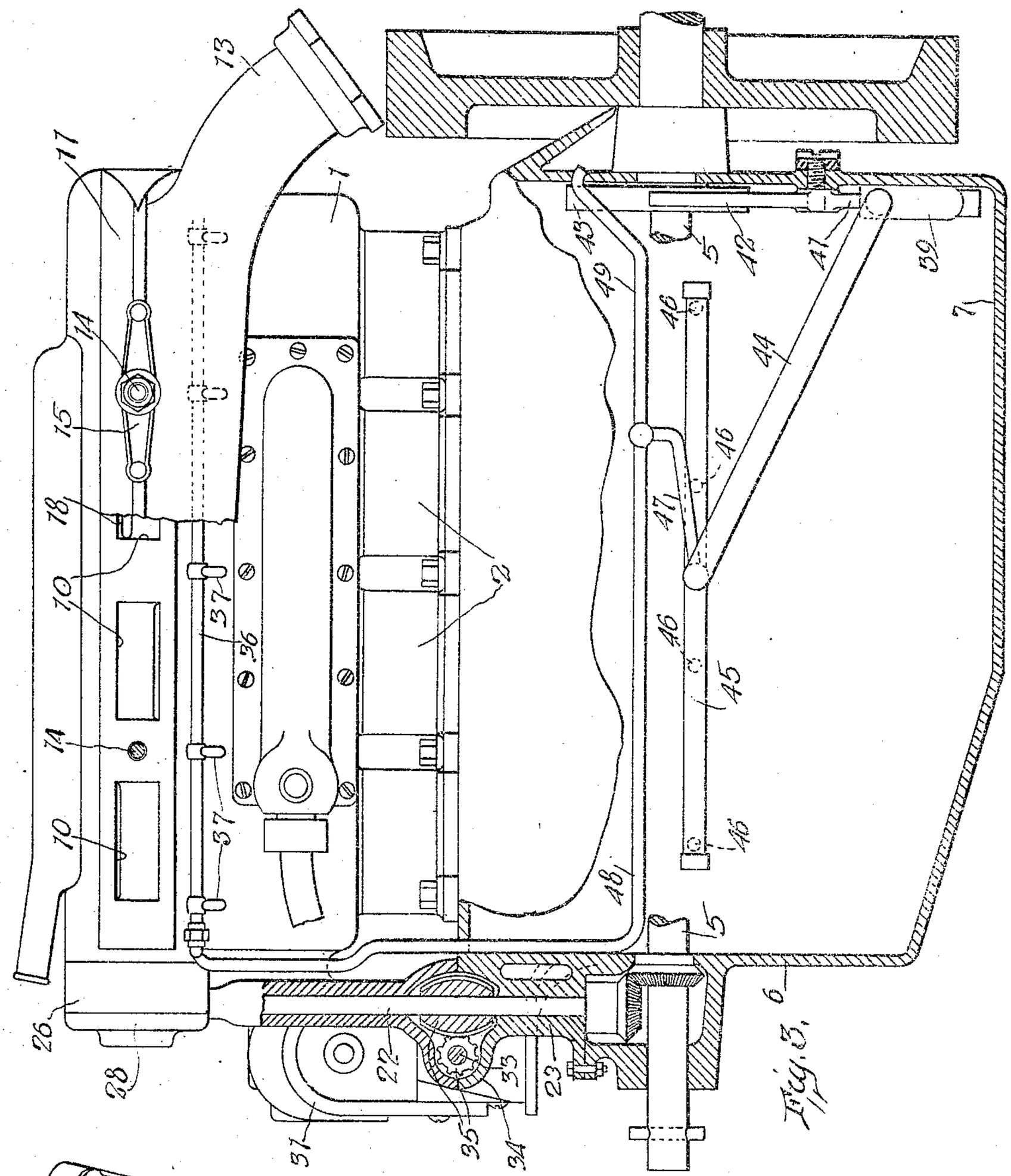

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

CYRUS E. MEAD, OF DAYTON, OHIO, ASSIGNOR TO THE MEAD ENGINE COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO.

EXPLOSIVE-ENGINE.

1,154,647. Specification of Letters Patent. **Patented Sept. 28, 1915.**

Application filed April 28, 1911. Serial No. 623,846.

To all whom it may concern:

Be it known that I, CYRUS E. MEAD, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to explosive engines and is in the nature of an improvement upon the engine shown and described in Patent No. 921,264, granted to me May 11, 1909.

The object of the invention is to provide an engine of the type shown in that patent of a simplified construction, embodying a minimum number of moving parts and having these parts of such a character and so arranged that there will be little liability of their becoming disarranged or broken.

To this end it is a further object of the invention to form the valve chambers or longitudinal bores wholly within the body portion of the engine casting; to provide removable conduits communicating with the ends of the outer ports of these valve chambers; to provide a simplified connection between the engine shaft and the rotary valves; and also to provide simplified means for adjusting the valves to regulate the angular relation of the corresponding ports of the two valves.

It is also an object of the invention to provide means for lubricating the rotary valves.

In the accompanying drawings, Figure 1 is a front elevation of an engine embodying my invention with the cap of the gear housing removed; Fig. 2 is a vertical sectional view taken transversely of the engine and centrally of one of the cylinders thereof; Fig. 3 is a side elevation of the engine; and Fig. 4 is a detail view of one of the valve members.

In these drawings I have illustrated one embodiment of my invention and have shown the same as comprising a body portion or casting 1, in which are formed a plurality of cylinders, in the present instance, four, as indicated at 2. Mounted in each cylinder is the usual piston 3 connected by a piston rod 4 with a crank shaft 5 mounted beneath the cylinders and arranged longitudinally to the engine in the usual manner. The crank shaft is inclosed in a crank casing 6 extending from the lower ends of the cylinders completely about the shaft and of a size large enough to allow for the movements of the cranks. The crank casing is preferably provided with a depressed portion 7 to form a receptacle, as will be hereinafter described.

The upper part of the body portion or casting 1 is preferably enlarged to provide lateral projections extending longitudinally to the engine on each side thereof and having formed therein longitudinal bores 8 extending for substantially the full length of the engine and constituting valve chambers. Each valve chamber or bore 8 has along its inner side a series of ports 9 corresponding in number to the number of the cylinders 2 and placing each valve chamber in communication with the respective cylinders. Each valve chamber is also provided along its outer side with a corresponding series of ports 10 extending through the outer portion of the casting 1 and communicating with inlet and exhaust conduits, respectively. These ports may be placed in communication with the conduits in any desired manner but, in the present instance, I have shown elongated hollow caps 11 secured to the sides of the casting, inclosing the outer ends of the several ports 10 in the respective sides thereof and connected with inlet and exhaust pipes 12 and 13, respectively. Any suitable means may be employed for rigidly securing the caps 11 to the casting, but, as here shown, I have provided each side of the casting with a plurality of bolts 14, the inner ends of which are rigidly mounted in the casting itself and which extend outward through the adjacent portions of the respective caps 11. Clamping bars 15 are mounted on the bolts 14 and have laterally extending arms adapted to engage lugs 16 arranged on the caps on opposite sides of the respective bolts 14. The outer ends of the clamping bars 15 are provided with inwardly extending rounded projections 17 adapted to engage the projections 16 of the cap, thereby making the clamping bars self centering. Nuts on the ends of the bolts clamp the parts together.

Mounted in each of the valve chambers 8 is a rotary plug valve 18 of a length substantially equal to the length of the valve chamber and having a series of through and through ports corresponding in number to the number of cylinders in the casting 1.

These ports are preferably arranged diametrically to the respective valves and adapted to register simultaneously with the adjacent ports in the valve chamber, these ports being preferably arranged on diametrically opposite sides of the valve chamber. Rotary motion is imparted to the valves 18 from the engine shaft 5. As here shown each valve member has at its forward end a reduced portion 19 on which is mounted a gear 20. These gears mesh with a worm 21 arranged between them and mounted on a vertical shaft 22 which is journaled in bearings 23 on the engine and the lower end of which is connected by suitable gearing 24 with the shaft 5. Any suitable means may be provided for adjusting the valves relatively one to the other to regulate the angular relation of the corresponding ports therein. In the present instance the reduced portions 19 of the valves are tapered and the gears 20 are clamped tightly thereon by nuts 24 and are further held in their adjusted positions by means of set screws 25. By loosening the pinion the valve can be adjusted to the desired position, and, when the pinion is again secured thereto, the valve will be maintained in its adjusted relation to the other valve. This form of adjustment is a very simple one and is highly efficient in practice. The gears 20 and 21 are preferably entirely inclosed in a housing, which, as constructed in the present engine, comprises a flange 26 detachably secured to the adjacent end of the engine. Preferably this housing or flange is shaped to conform to the contour of the corresponding portion of the body portion or casting 1 of the engine and is secured thereto by bolts 27 extending through the same and into the casting 1. The width of the flange is sufficient to entirely inclose the gears and a cap 28 is provided for inclosing the outer end of the housing and may be secured thereto in any suitable manner, as by means of screws 29. The vertical shaft 22 is also utilized for driving a pump 30, which is connected with the water cooling system of the engine, and a magneto 31. Both of these devices are mounted upon the base of the engine, indicated at 32, and are directly connected to a transverse shaft 33 mounted in a transverse bearing 34 carried by the engine base 32 and connected with the vertical shaft 22 by a worm and worm wheel gearing 35. I have also provided means for lubricating the rotary valves 18, and, as here shown, this means consists of an oil distributer 36 arranged along each side of the casting 1 and communicating with the respective valve chambers at intervals by means of feeders or conduits 37. If desired the valve members may be provided with annular grooves adjacent to the conduits 37 to receive the oil and facilitate the distribution thereof. In the present engine I have provided the exhaust valve with these annular grooves, as indicated at 38, but have omitted them from the inlet valve, this valve being less likely to heat and requiring less lubrication than the exhaust valve. The distributers 36 are connected with a pump 39 which is actuated from the engine shaft 5. As here shown this pump has its intake end arranged near the bottom of the oil receptacle 7 and comprises a horizontal cylinder and a plunger, the rod of which is indicated at 40 and is connected to the lower end of a rock arm 41, the upper end of which is bifurcated to form a yoke 42 having arms embracing a cam 43 carried by the shaft 5, whereby each rotation of the shaft 5 will impart one reciprocation to the plunger of the pump. This pump is connected by a main 44 with a distributing pipe 45 having a series of discharge openings 46, by means of which the oil is spurted upon the wrist pins which connect the rods 4 with the cranks of the shaft 5. The main 44 is connected by means of pipes 47 and 48 with the distributers 36. A branch pipe 49 leads to the rear bearing for the crank shaft.

From the foregoing description and the accompanying drawings it will be apparent that I have provided an explosive engine utilizing solid rotary valves having through and through ports which register with the ports in the valve chambers; that these rotary valves are actuated through gearing which is entirely inclosed in a housing and is, in turn, actuated from the engine shaft. Consequently, the valves and their operating mechanism have no exposed movable parts and the engine as a whole is of a very compact construction comprising a minimum number of moving parts. By forming the valve chambers entirely within the body of the engine casting and providing detachable conduits to connect the same to the inlet and exhaust pipes, respectively, I am enabled to practically eliminate leakage and to maintain a uniform bearing for the valves which cannot be done where the valve chamber is in two parts and these parts are bolted together. It will also be apparent that I have provided a very simple yet adequate means for lubricating the valves.

While I have here shown and described one embodiment of the invention it will be understood that this embodiment is chosen for the purpose of illustration only and that I do not wish to be limited to the details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an explosive engine, the combination, with a body portion having a cylinder

and provided with valve chambers, and a port connecting each chamber with the cylinder, of a rotary inlet valve having a through-and-through port and mounted in one of said chambers, a rotary exhaust valve also having a through-and-through port and mounted in the other of said chambers, a rotative device mounted on each valve, and a shaft rotatively connected with the engine shaft, extending between said rotative devices on the valve and connected therewith to rotate said valves.

2. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers, and a port connecting each chamber with the cylinder, of a rotary inlet valve having a through-and-through port and mounted in one of said chambers, a rotary exhaust valve also having a through-and-through port and mounted in the other of said chambers, a gear on each valve, and a shaft having one end extending between said gears and carrying a gear which meshes with each of said valve gears.

3. In an explosive engine, a body portion having a cylinder and provided with valve chambers arranged on opposite sides of and communicating with said cylinder, a rotary plug valve mounted in each of said valve chambers to control the communication between the same and said cylinder and having parts projecting beyond the end of said body portion, a gear mounted on the projecting part of each of said valves, a gear arranged between and meshing with the first-mentioned gears, and a housing secured to said engine and inclosing said gears.

4. In an explosive engine, a body portion having a cylinder and provided with valve chambers arranged on opposite sides of and communicating with said cylinder, a rotary plug valve mounted in each of said valve chambers to control the communication between the same and said cylinder and having parts projecting beyond the end of said body portion, a gear mounted on the projecting part of each of said valves, a gear arranged between and meshing with the first-mentioned gears, said body portion having a longitudinally projecting flange extending about said gears, a cap, and means for securing said cap to the outer end of said flange.

5. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers, of rotative devices connected with the respective valves, and a shaft rotatively connected with the engine shaft, extending between said rotative devices and connected therewith to rotate said valves.

6. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers, of a gear mounted on each valve, and a shaft having one end extending between said gear and carrying a gear which meshes with each of said valve gears.

7. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers, and having a part projecting beyond the end of said chamber, of worm gears secured to the ends of the respective shafts, a vertical shaft mounted on the end of said engine, a worm mounted on said shaft, arranged between said worm gears and meshing therewith, an engine shaft, and a connection between said engine shaft and said vertical shaft.

8. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers and having a part projecting beyond the end of said chamber, of worm gears adjustably mounted on the projecting ends of said valves, a worm arranged between and meshing with said worm gears, and means for rotating said worm.

9. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers and having a part projecting beyond the end of said chamber, of a gear mounted on the projecting end of each of said valves, a second gear arranged between and meshing with the first-mentioned gears, and a housing secured to said body portion and inclosing said gears.

10. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers and having a part projecting beyond the end of said chamber, of a gear mounted on the projecting end of each of said valves, a second gear arranged between and meshing with the first-mentioned gears, said body portion having a longitudinally projecting flange extending about said gears, a cap, and means for securing said cap to the outer edge of said flange.

11. In an explosive engine, the combination, with a body portion having a cylinder and provided with valve chambers communicating with said cylinder, and a rotary valve mounted in each of said chambers and having a part projecting beyond the end of

said chamber, of a gear mounted on the projecting end of each of said valves, a second gear arranged between and meshing with the first-mentioned gears, a housing secured to said body and inclosing said gears, a vertical shaft rotatably mounted on the end of said body portion and carrying said last-mentioned gear, and a crank shaft arranged beneath said body portion and connected with said vertical shaft.

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

CYRUS E. MEAD.

Witnesses:

J. EDWARD SAUER,

G. E. DECKER.