(No Model.)

E. W. EVANS.

GAS ENGINE.

No. 452,568. Patented May 19, 1891.

Fig. 1.

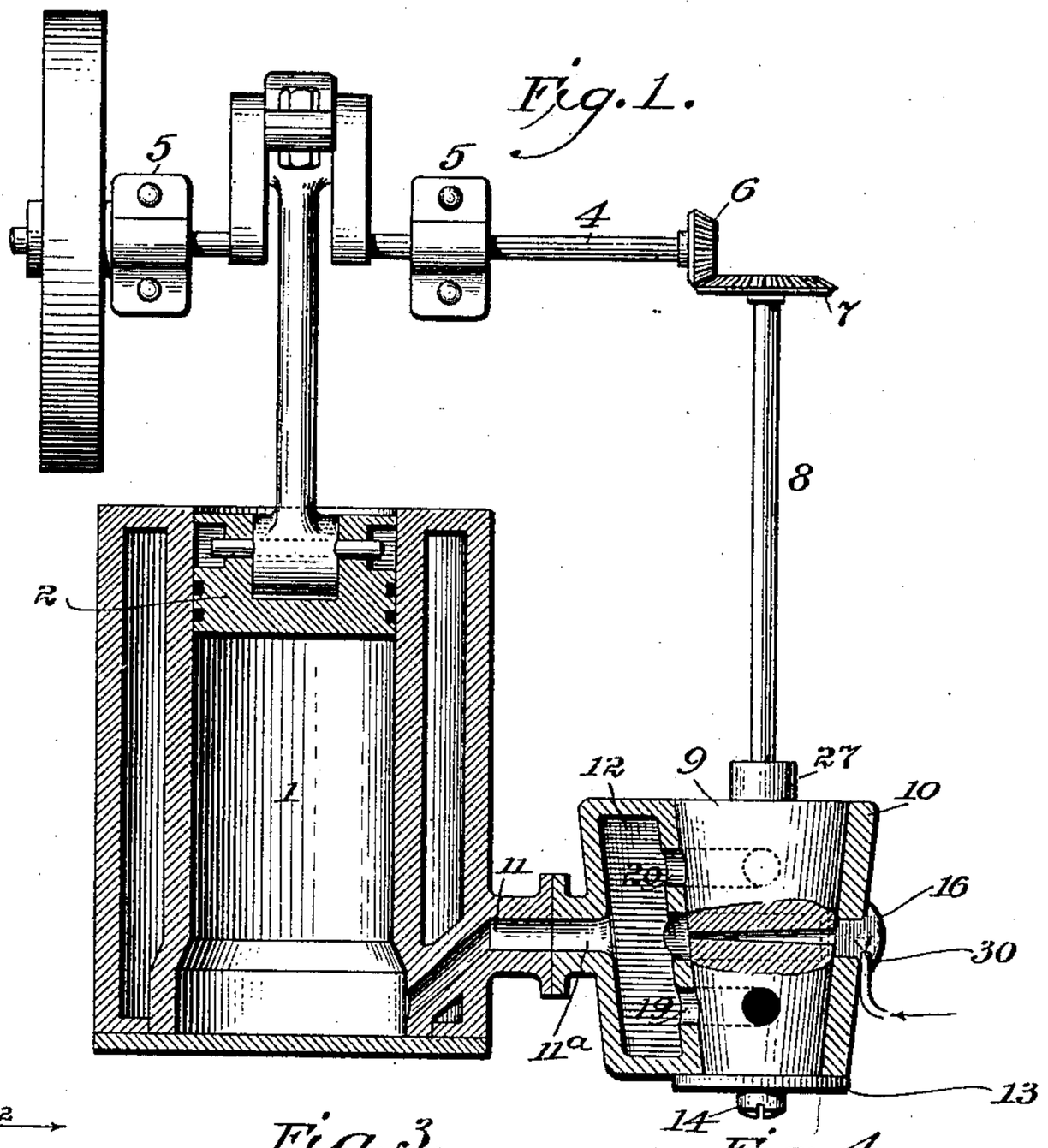


Fig. 2.

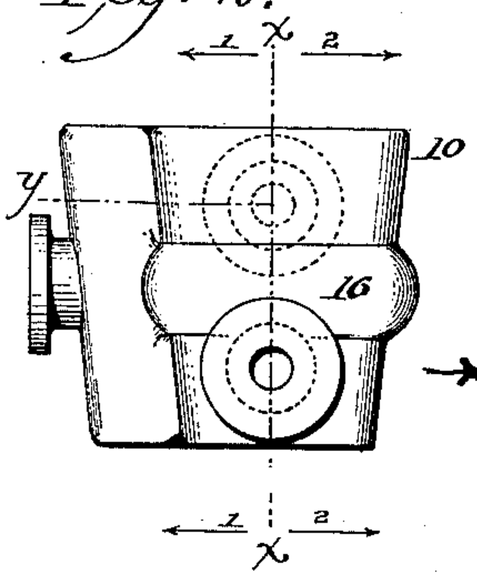


Fig. 3.

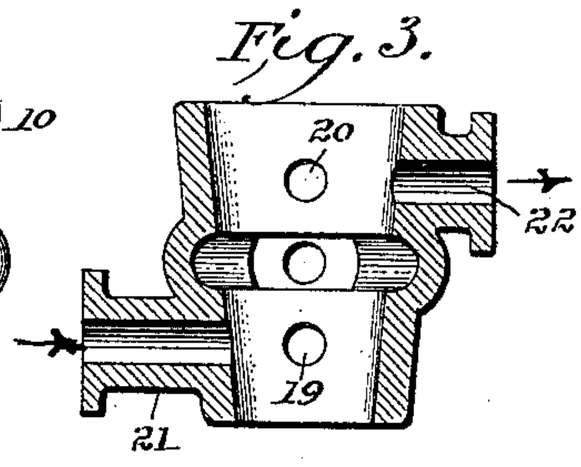


Fig. 4.

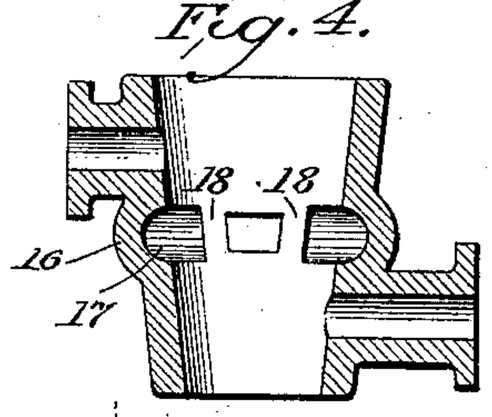


Fig. 5.

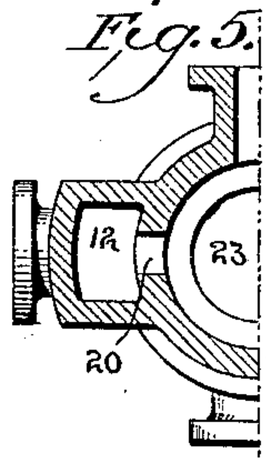


Fig. 6.

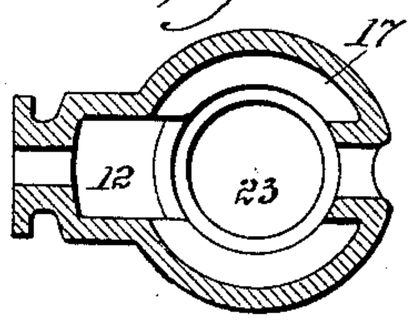


Fig. 7.

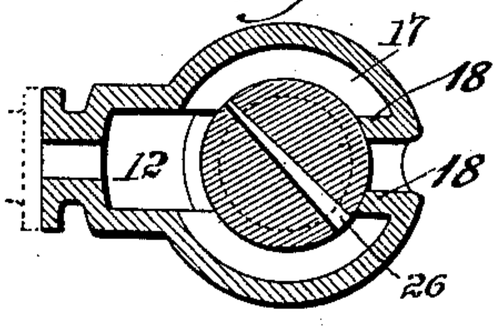


Fig. 8.

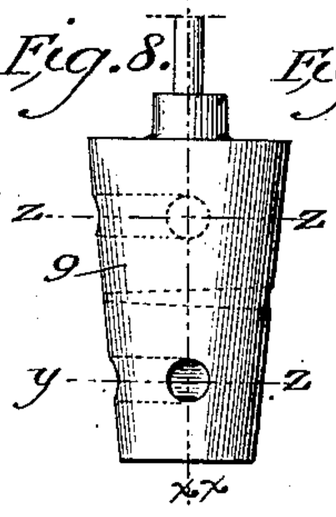


Fig. 10.

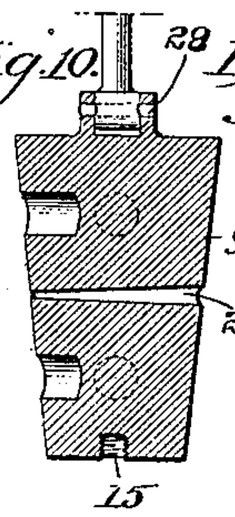


Fig. 9.

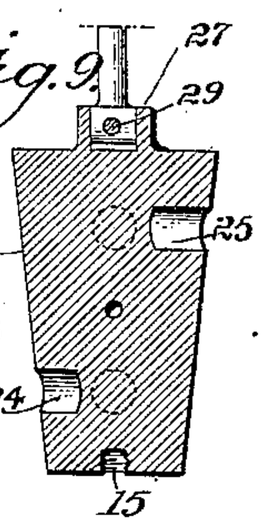


Fig. 11.

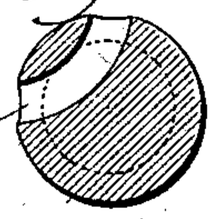
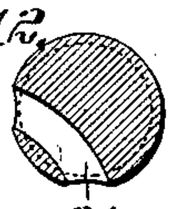


Fig. 12.



Witnesses:
John R. Nolan
Chas. Buck.

Inventor:
Edwin W. Evans
By John Dolley Jr.
His Attorney

UNITED STATES PATENT OFFICE.

EDWIN W. EVANS, OF PHILADELPHIA, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 452,568, dated May 19, 1891.

Application filed March 19, 1891. Serial No. 385,693. (No model.)

To all whom it may concern:

Be it known that I, EDWIN W. EVANS, of Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, due reference being had to the accompanying drawings, which illustrate my invention.

My invention has reference generally to engines, particularly to that class known as "gas-engines," for power purposes, and has special reference to a construction and operation of a rotary valve and a valve-jacket for the same that combine the principles of mixing, ignition, and exhausting, and has for its object cheapness and durability in construction and operation, avoiding the use of eccentrics and cams, efficiency in timing the engine; and to the end sought it consists of the novel features of construction, &c., hereinafter described, and pointed out in the claims.

In the drawings which illustrate my invention, Figure 1 is a view, partly in vertical section, of a rotary valve and its connected piston, piston-cylinder, &c., embracing my invention. Fig. 2 is a view in side elevation of the valve-jacket. Fig. 3 is a cross-sectional elevational view of the same, taken on the line *x x*, Fig. 2, and looking in the direction indicated by the arrows 1 1. Fig. 4 is a similar view looking in the direction indicated by the arrows 2 2. Fig. 5 is a top sectional view of the jacket, taken on the lines *y x*, Fig. 2. Fig. 6 is a sectional view through the horizontal center of the valve-jacket with the valve removed. Fig. 7 is a similar view with the valve in place. Fig. 8 is a perspective view of the rotary valve. Figs. 9 and 10 represent vertical sectional views of the same, taken on the line *x x x x*, Fig. 8, and looking in opposite directions. Fig. 11 is a horizontal sectional view of the valve, taken on the line *z z*, Fig. 8, through its exhaust-port; and Fig. 12 is a similar view taken on the line *y z*, Fig. 8, through its mixing or inlet port.

Referring to the drawings, in which the parts are indicated by numerals, similar numerals wherever used denoting like parts, 1 is the piston-chamber, and 2 the piston; 3, the power-transmitting wheel; 4, the horizontal shaft to which the piston is geared; 5, means shown for supporting the shaft, and 6 a gear-wheel on the extremity of said shaft. This gear-wheel 6 meshes with a larger gear 7, mounted on the upper extremity of a vertical shaft 8, which is suitably attached to the valve or plug 9, and the latter rotated by the working of the piston and the intermediate gearing, for purposes presently more fully explained.

The chamber 1 is in open communication with the jacket 10 of the valve by means of the port 11. This jacket is preferably constructed to the partial cone or tapered shape shown in the several figures, formed at one side, preferably integral therewith, with an inclined vertically-extending chamber or receiver 12, which is closed at top and bottom and has a port 11ª leading therefrom and adapted to communicate with the port 11 of the piston-cylinder chamber 1, for a purpose hereinafter made clear. The jacket 10 is provided with a bottom 13, preferably removable therefrom, and shown retained thereon by means of a screw 14, passing through the same and engaging a screw-tapped hole 15 in the bottom of the rotary valve 9 and rotates therewith.

The wall of the jacket 10 about midway its height is bellied or swelled, as at 16, to form the annular chamber or port 17. This chamber or port 17 is in open communication with the chamber or receiver 12, and the wall thereof opposite said receiver is formed with inwardly-extending flanges or seats 18 18, the extremities whereof are flush with the inner side wall of the main body portion of the jacket, and when the valve 9 is in place within the jacket they engage the same and form seats for the chamber or port 17, for a purpose more fully explained. The jacket is further provided with lower and upper ports 19 and 20, which communicate with the receiver 12 and also with main inlet and outlet ports 21 and 22 on opposite sides thereof.

Within the chamber 23 of the jacket 10 snugly fits and rotates the plug or valve 9. This valve is preferably a solid cone-shaped plug of metal cored with the ports or passageways 24 and 25, respectively, near the bottom and top thereof, which take the oppositely-curved directions shown—that is to say, one

extremity of each port is in a vertical line with respect to each other—and they reversely diverge therefrom in an arc of a circle, so that their respective other extremities are on opposite sides of the valve or plug. A tapered ignition-chamber 26 is cored through the longitudinal center of the valve, its restricted opening being in central alignment with the ports 24 25, Fig. 9.

I have shown the bottom of the valve or plug screw-tapped, as at 15, to receive the screw 14, for a purpose hereinbefore recited, and provided at its top with a neck or extension 27, having holes 28 and a pin 29, by means of which connection is effected with the shaft 8; but other means of connecting the parts may equally well be employed.

Having now fully described the several parts of my invention, the operation is as follows, the construction and operation being represented and described as in a gas-machine. The cylinder 1 and jacket 10 being connected, so that the port 11 of the former and port 11^a of the jacket form a single port or open communication between said cylinder and the receiver of the jacket, the gears 6 and 7 meshing—the piston 2 at low center and the valve 9 in its jacket—so that the port 24 is alone open and is open to the ports 21 and 19 at its respective extremities and connection made between the port 21 and a source of gas-supply, the wheel 3 is given a turn by hand, when the piston 2 will at once commence to rise and the valve 9 to rotate, (the gearing being such as to cause the valve 9 to make a quarter-turn to each stroke of the piston,) and the port 24 gradually closes to the ports 21 and 19, simultaneously taking in a charge of gas, which flows through the ports 21, 24, and 19 in turn to the receiver 12, and thence through the port 11^A 11 to the piston-cylinder chamber 1, and so continues until the piston has reached its top center—that is to say, made a full stroke—at which time the port 24 will be entirely closed to the ports 21 and 19 and the valve completed its first quarter-turn, such being the position of parts represented in Fig. 1. The piston now travels toward low center, compressing the confined gas and forcing a portion through the restricted opening of the ignition-chamber 26, which is aligned with the recess 17 of the jacket 10, and the other extremity of which is now passing the flame 30, preferably a Bunsen burner stationed between the seats 18 18, where the gas is ignited and burns until the piston has completed its downward or second stroke and reached low center, at which time the valve will have completed its second quarter-turn. (See Fig. 7.) At this instant the lighted gas at the larger end of the ignition-chamber 26 encounters the larger body of compressed gas now contained in the recess 17, receiver 12, port 11^A 11, and the lowermost portion of the piston-chamber 1 and explodes the same, causing the piston to rapidly ascend to top center, thus giving momentum and increased power to the driving-wheel 3 through its intermediate gearing, and from there transmitted in a manner well understood. At this time the piston will have made its third stroke and the valve completed its third quarter-turn. The port 25 of the valve is now in turn open at its respective extremities to the ports 20 and 22 and completely exhausts the exploded gas as the piston travels toward low center again to make its fourth stroke, at the completion of which the valve will have made its last quarter-turn and the port 25 will be closed and the parts in position to take in a new charge of gas and repeat the operation of mixing, compressing, exploding, and exhausting charges of gas or the like.

Having now described my invention, I wish it understood that I do not desire to limit myself to the exact construction of parts shown in my drawings and described, but may vary the same in any manner to better carry out the principle of my invention without departing from the true scope thereof.

I claim—

1. In a gas or other engine, the combination, with the piston-cylinder, piston, and its connected power-transmitting gearing, of the jacket inclosing the valve, having supply and exhaust ports, and a receiving-chamber provided with a port connection with the piston-chamber and port connections with the valve-chamber, and a valve of the character herein described within said jacket, geared to the piston and adapted to rotate, as described, and for the purposes set forth.

2. In a gas-engine having a source of gas-supply, a rotary valve of the character herein described, having mixing, igniting, and exhaust ports, in combination with a jacket having a supply-port adapted to communicate with the mixing-port in the valve at predetermined intervals and an exhaust-port adapted to communicate with the exhaust-port in the valve at predetermined intervals, a receiving-chamber in open communication with the piston-chamber and having port connections with the valve-chamber adapted to communicate with the mixing and exhaust ports of the valve at predetermined intervals, an annular recess-port in the body of the jacket about the valve in open communication with the receiving-chamber and provided with seats engaging the valve, the igniting-port in the valve working in alignment with said annular recess-port, and means at or between said seats whereby the gas in said ignition-port may be ignited to in turn ignite or explode the main body of gas in the manner described, whereby a charge of gas may be taken into the piston-chamber, &c., and in turn compressed, ignited, exploded, and exhausted, thereby imparting momentum to the piston and its power-transmitting gearing, as and for the purposes set forth.

3. In a gas or other engine, a rotary valve of the character herein described, consisting

of a plug of metal or the like having reversely-diverging ports, as and for the purposes set forth.

4. In a gas or other engine, a rotary valve of the character herein described, consisting of a plug of metal or the like having upper and lower reversely-diverging ports and a central horizontal port, as and for the purposes set forth.

5. In a gas or other engine, in combination with a suitable jacket having communication with the piston-chamber and provided with supply and exhaust ports, a rotary valve of the character herein described within said jacket and consisting of a plug of metal or the like having upper and lower reversely-diverging ports and a central horizontal port, as and for the purposes set forth.

In testimony whereof I have hereunto signed my name this 3d day of December, A. D. 1890.

EDWIN W. EVANS.

In presence of—
CHAS. M. RHODES,
JOHN JOLLEY, Jr.