

No. 886,589.

PATENTED MAY 5, 1908.

F. L. EAGER.
ENGINE.

APPLICATION FILED JAN. 16, 1906.

Fig.3.

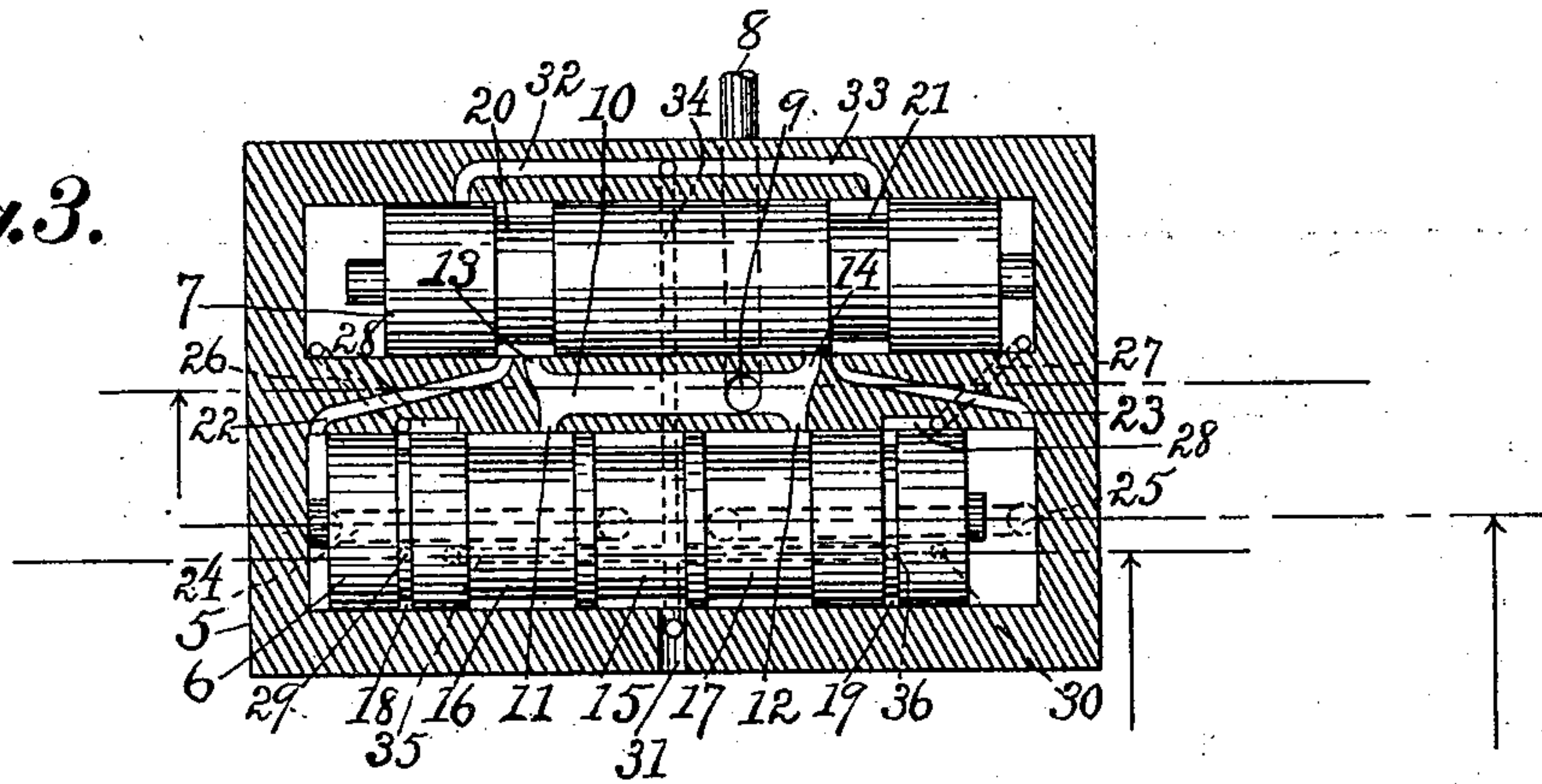


Fig.2.

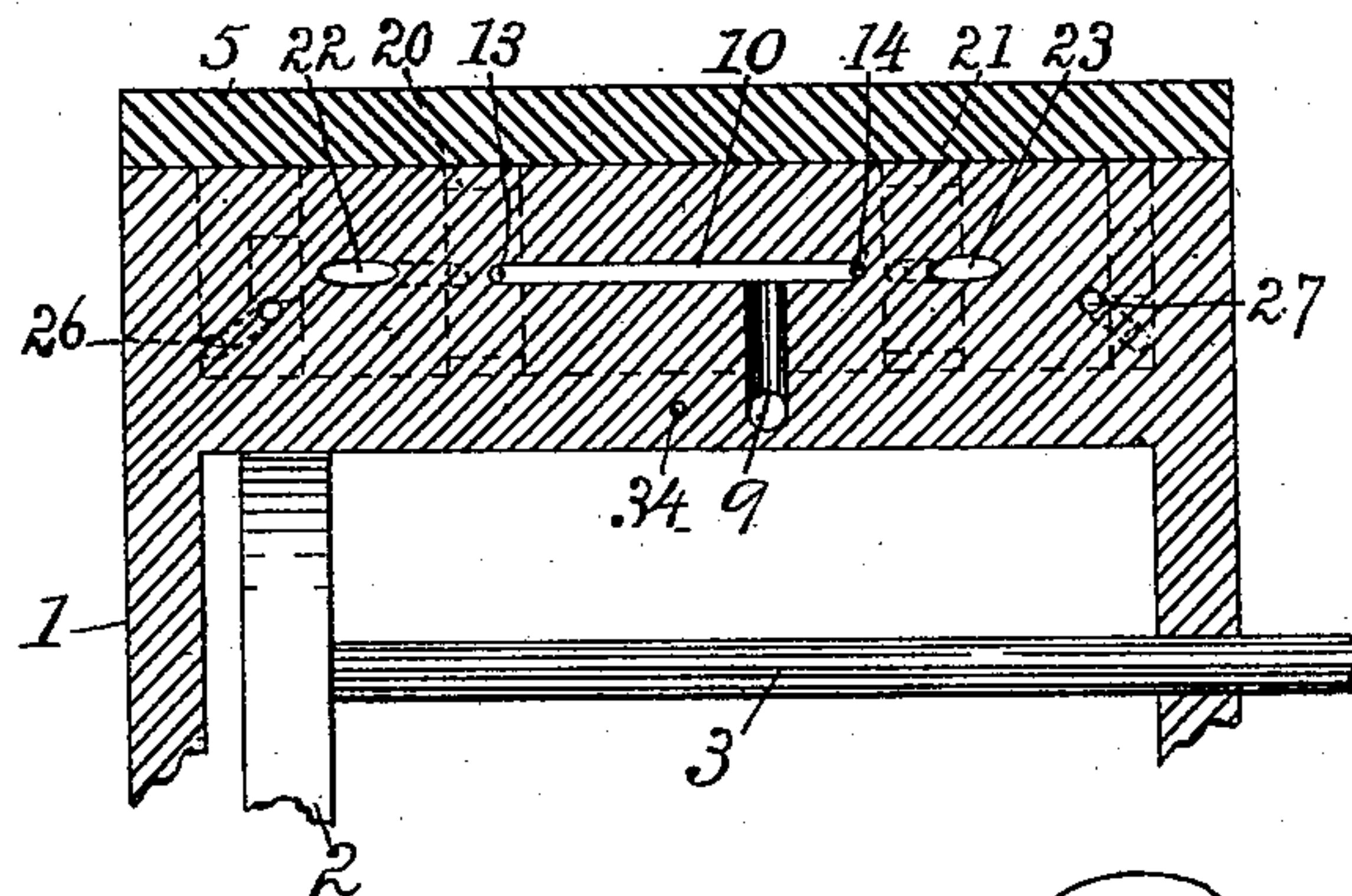


Fig.1.

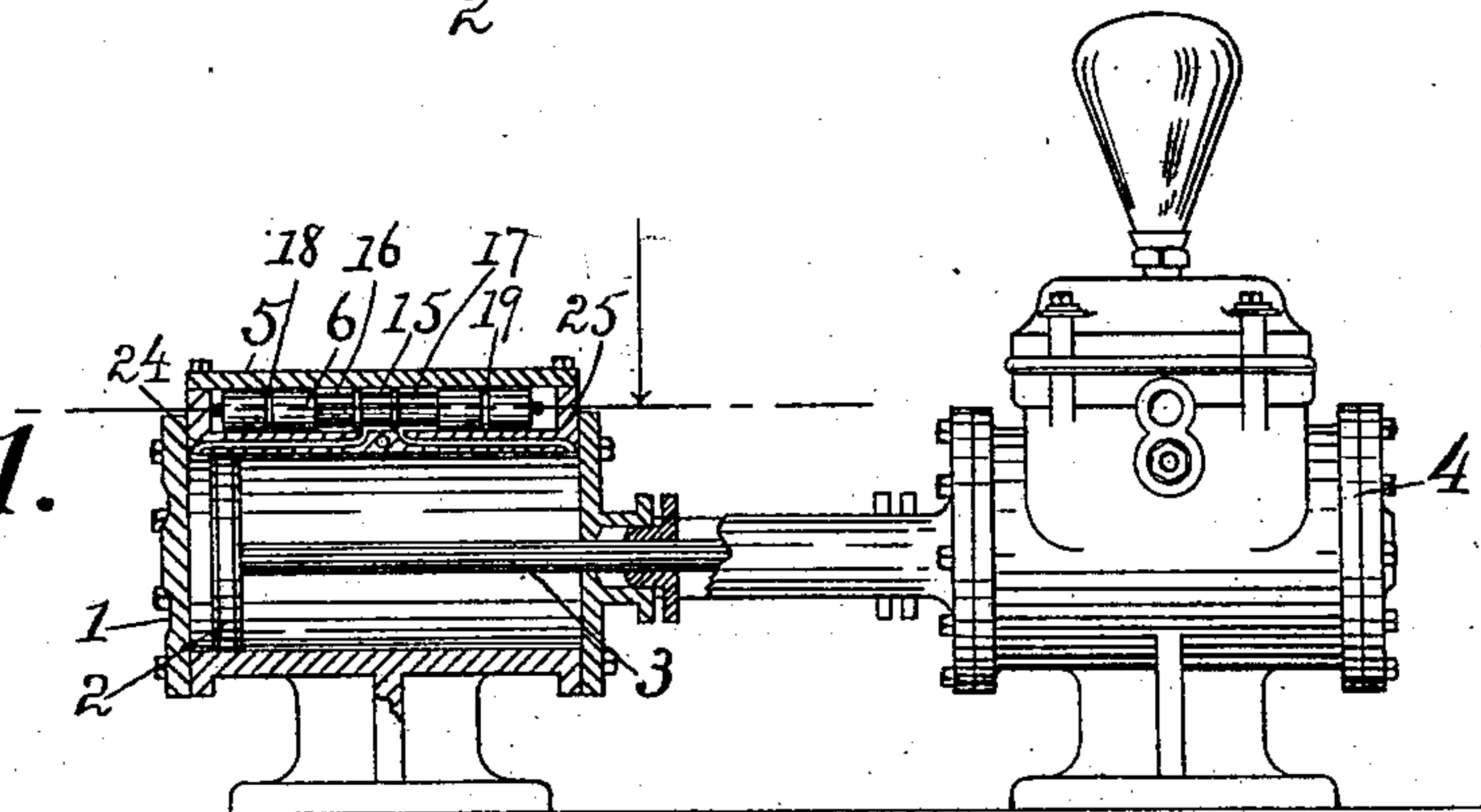
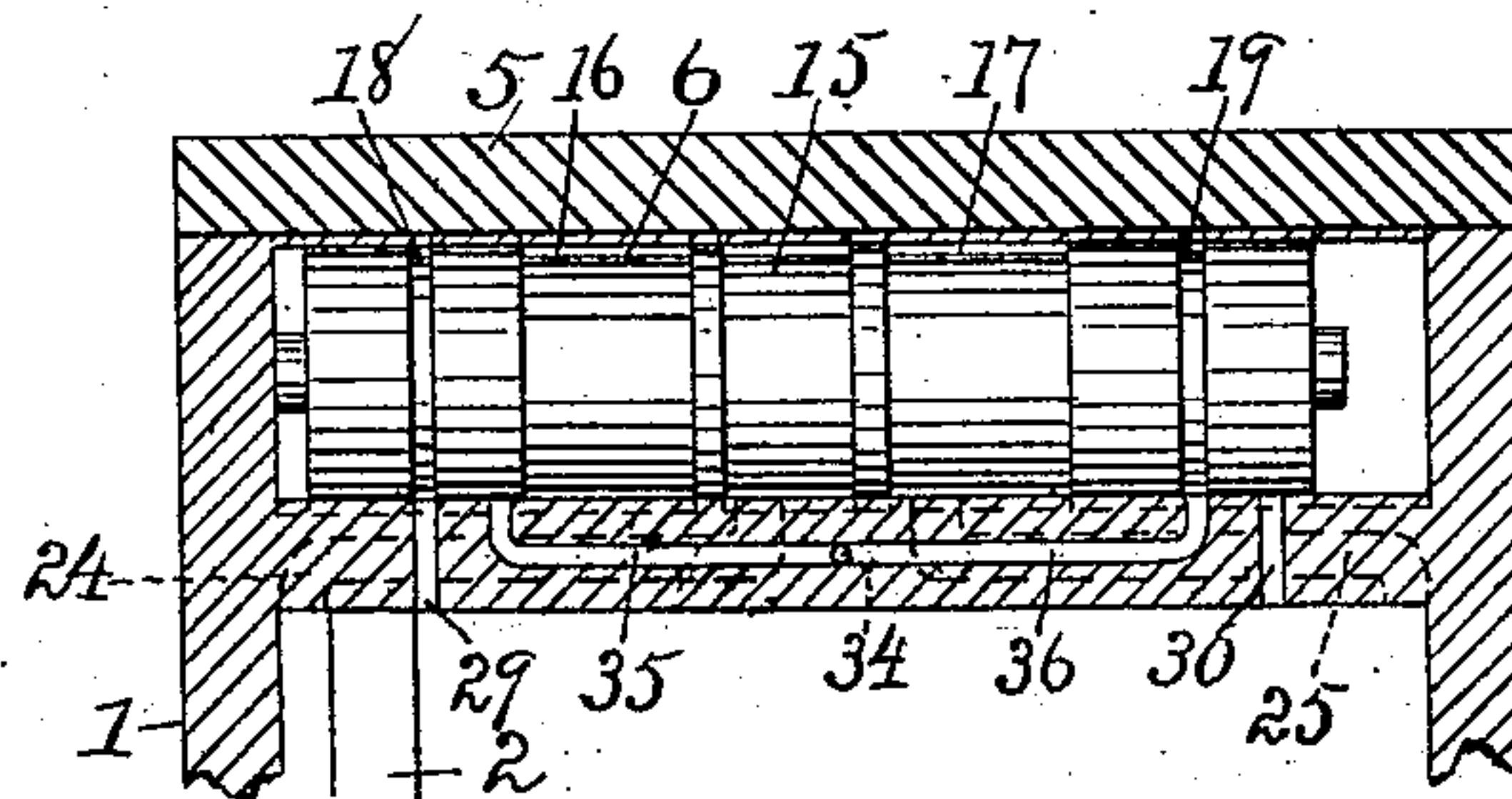


Fig.4



Witness
G. B. Berkovich.
Clara E. Johnson

Inventor.
Frank L. Eager.
Jenkins & Barker.
Attorneys.

UNITED STATES PATENT OFFICE.

FRANK L. EAGER, OF WATERBURY, CONNECTICUT.

ENGINE.

No. 886,589.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed January 16, 1905. Serial No. 241,231.

To all whom it may concern:

Be it known that I, FRANK L. EAGER, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new and Improved Engine, of which the following is a specification.

My invention relates to that class of engines employing fluid under pressure as the driving power, and the object of my invention is to provide an engine of this class in which the means for controlling and directing the supply and exhaust shall be actuated directly by the fluid used to move the piston; and a further object is to provide a device of this class that shall have extreme simplicity in its construction and one in which the simplest form of piston may be employed, the means for controlling and directing fluid supply and exhaust being located entirely outside of the piston; and a further object is to provide a device in which the action of the valves shall be positive and certain at all times.

A simple form of device in the use of which these objects may be attained is illustrated in the accompanying drawings in which;

Figure 1 is a view in elevation, in section through the valve chest and cylinder embodying my invention, the piston being connected to a pump. Fig. 2 is a detail view, on enlarged scale, in vertical section, through the center of the valve chest on the plane denoted by dotted line in Fig. 3, and through the center of a portion of the cylinder. Fig. 3 is a view, on enlarged scale, in cross section through the center of the valve chest. Fig. 4, is a detail view, on enlarged scale, in vertical section through the valve chest on a plane passing through the center of the pilot valve exhaust port.

In the accompanying drawings the numeral 1 denotes a cylinder in which is located a piston 2 from which projects a piston rod 3, that is connected as to a pump 4 of any ordinary construction. The piston and piston rod may be of the simplest form of construction and possessing parts necessary only for the proper packing.

A valve chest 5 is operatively connected with the cylinder in the preferred form, and as herein shown and described, this chest being located over and forming an integral part of the cylinder. This valve chest contains two chambers in which are located a main valve 6 and a pilot valve 7. The valve chambers are connected with the chamber in

the cylinder and with each other in a manner to allow the valves to perform their proper function in the operations of controlling the delivery and exhaust of steam to the piston and to the valves to control the operations of the piston. The main valve controls the delivery and exhaust of steam to the pilot valve and the latter controls the delivery and exhaust of steam from the main valve so that each of these valves is controlled in its operation by the movements of the other.

While it is obvious that these valves may be variously arranged with respect to each other and in relation to the cylinder and that their construction may be varied to a greater or less degree from that herein shown to control the parts and the delivery and exhaust of steam and without departing from my invention yet I have shown herein a satisfactory construction and arrangement of these several parts.

In the dividing wall in the valve chest between the two valve chambers there is located a live steam chamber 10 supplied with live steam from any suitable source through the pipe 8 and opening 9 into said chamber. Cylinder supply ports 11 and 12 open from this live steam chamber into the main valve chamber, and main valve supply ports 13 and 14 open into the pilot valve chamber.

The main valve 6 is provided along its length with annular recesses each of proper dimensions to properly perform its function. Preferably in the center of this valve is a cylinder exhaust recess 15, and at each side of this cylinder exhaust recess cylinder supply recesses 16 and 17 and nearer each end of the valve pilot valve supply and exhaust recesses 18 and 19.

The pilot valve has properly located therein and of proper dimensions to perform the functions required, annular recesses providing main valve supply and exhaust recesses 20 and 21.

Preferably located in the dividing wall between the valve chambers are main valve supply and exhaust ports 22 and 23, one end of each of these ports being located in proximity to the main valve supply ports 13 or 14 and in position to be controlled by the main valve supply and exhaust recesses 20 or 21. The other end of each of these ports delivers to one end of the main valve chamber.

Cylinder supply and exhaust ports 24 and 25 extend through the wall between the

cylinder and the valve chest, the ends of these ports being so located that they may be governed by the exhaust recess 15 or the supply and exhaust recesses 16 and 17 of the main valve, and the other end of each of these ports delivering to one end of the cylinder.

Pilot valve supply and exhaust ports 26 and 27 extend through the dividing wall between the two valve chambers one end of each of these ports delivering to the end of the pilot valve chamber and the opposite end of each port being located in position to be governed by the pilot valve supply and exhaust recesses 18 and 19, exhaust passages 28 extending along the dividing wall between the two valve chambers to conduct the exhaust to the recesses 18 and 19, when these recesses shall be located in proper position to exhaust the steam from the ends of the pilot valve chambers. Pilot valve supply ports 29 and 30 extend through the wall between the main valve chamber and the chamber in the cylinder, these supply ports being located in proper position to deliver steam from the cylinder to the supply and exhaust recesses 18 and 19.

The exhaust for the different parts of the structure consists of a main exhaust 31, leading directly from the cylinder exhaust recess 15. Main valve exhaust ports 32 and 33 extend from positions governed by the main valve supply and exhaust recesses 20 and 21 and thence by the main valve exhaust passage 34 to the main exhaust 31. Pilot valve exhaust ports 35 and 36 extend through the dividing wall between the cylinder and the main valve chamber, one end of each of these valves being located in position to be governed by the pilot valve supply and exhaust recesses 18 and 19, these recesses leading into and connecting with the main valve exhaust passage 34 from whence the exhaust is conducted out through the main exhaust 31.

In the operation of the device the parts being in the position shown in the drawings, with the piston at the left hand end of the cylinder and having just completed its movement toward the left, steam from the live steam chamber 10 passing through the cylinder supply port 12, into the cylinder supply and exhaust recess 17, and thence through the cylinder supply and exhaust port 25 can have no effect for the reason that the piston is, by the operation of the valves, prevented from moving further toward the left. In this movement of the piston toward the left the pilot valve supply and exhaust port 29 has been uncovered by the piston so that live steam is admitted through the port into the pilot valve supply and exhaust recess 18 in the main valve and thence through the pilot valve supply and exhaust port 26 moving the pilot valve to the position shown in Fig. 3 of the drawings. In this movement

of the pilot valve the exhaust from the right hand end of the pilot valve chamber has been through the pilot valve supply and exhaust port 27 into the pilot exhaust passage 28, into the pilot supply and exhaust recess 19 and thence through the pilot valve exhaust port 36 to the main exhaust 31.

Live steam can now pass through the main valve supply port 13 into the main valve supply and exhaust recess 20 and through the main valve supply and exhaust port 22 to the left hand end of the main valve chamber forcing the main valve to the right. In this movement of the main valve the exhaust is through the main valve supply and exhaust port 23 to the main valve supply and exhaust recess 21 in the pilot valve and thence through the main valve exhaust port 33 to the main valve exhaust passage 34 and thence to the main exhaust 31. When the main valve has reached its position at the right hand end of its chamber the cylinder supply and exhaust port 24 is open into the cylinder supply recess 16 in the main valve and the cylinder supply and exhaust port 25 is opened into the cylinder exhaust recess 15. Steam now passes from the live steam chamber 10, through the cylinder supply port 11 into the cylinder supply recess 16 and through the cylinder supply and exhaust port 24 to the left hand end of the cylinder thus forcing the piston to the right. In this movement of the piston the exhaust is through the cylinder supply and exhaust port 25 to the exhaust recess 15 in the main valve and out through the main exhaust 31.

In the location of the main valve to cause the operation of the piston just described, the pilot valve supply and exhaust recess 19, has been located in position to uncover the pilot valve supply port 30 and the pilot valve supply port 29 has been closed. As the piston moves to the right exhausting its steam on the right hand side of the piston through the piston supply and exhaust port 25 and recess 15 into the main exhaust 31 the pilot valve supply port 30 is finally opened on that side of the piston receiving live steam. The steam thus passes from the cylinder through the pilot valve supply port 30 recess 19 in the main valve and supply and exhaust port 27 to the right hand end of the pilot valve chamber forcing the pilot valve to the left. As the pilot valve moves to the left the exhaust from the left hand end of the chamber is through the pilot valve supply and exhaust port 26, recess 18 in the main valve and pilot valve exhaust port 35 to the main exhaust 31. When the pilot valve has reached the limit of its movement to the left, the main valve supply port 13 has been closed leaving the main valve supply and exhaust port 22 only opening into the main valve supply and exhaust recess 20. The main valve supply

port 14 has however been opened into the main valve supply and exhaust recess 21 so that live steam now passing from the live steam chamber 10 into the recess 21 and through the port 23 exerts pressure upon the main valve and moves it to the position shown in Fig. 3 of the drawings and at the left hand end of the main valve chamber. The exhaust from the left hand end of the main valve chamber has been through the main valve and supply exhaust port 22, recess 20 in the pilot valve and main valve exhaust port 32 into the passage 34 and thence to the main exhaust 31. In this position of the main valve, the piston having reached its limit of movement toward the right, live steam is admitted through the cylinder supply and exhaust port 25 to the chamber in the right hand end of the cylinder forcing the piston toward the left and the exhaust being through the cylinder supply and exhaust port 24 into the recess 15 and out through the main exhaust 31. When the piston has nearly completed its movement toward the left, the pilot valve supply port 9 is opened on the right hand side of the piston containing the live steam which is admitted through said port into the pilot valve supply and exhaust recess 18 in the main valve, supply and exhaust port 6 to the left hand end of the pilot valve chamber forcing the pilot valve to the right, the exhaust from the right hand end of the pilot valve chamber being through the pilot valve supply and exhaust port 27, exhaust passage 28, pilot valve supply and exhaust recess 19 in the main valve and pilot valve exhaust port 36 to the main exhaust 31, the parts now being in the position shown in the drawings and ready to repeat the cycle of movement.

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

1. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder, and to a pilot valve, supply and exhaust ports for a pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses extending completely therearound.

2. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main valve for controlling the supply and exhaust to the cylinder and to a pilot valve, said main valve having supply and exhaust recesses extending completely therearound, supply and exhaust ports to the pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses extending completely therearound.

3. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve and having recesses arranged on opposite sides of its center whereby the valve may be reversed end for end, supply and exhaust ports to the pilot valve, and the pilot valve for controlling the movements of the main valve.

4. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve, supply and exhaust ports to said pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses located on opposite sides of its lengthwise center whereby said valve may be reversed end for end.

5. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a steam actuated main valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve and having supply and exhaust recesses on opposite sides of its lengthwise center whereby it may be reversed end for end, supply and exhaust ports to a pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses located on opposite sides of its lengthwise center whereby said valve may be reversed end for end.

6. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center, supply and exhaust ports to the pilot valve, and the pilot valve for controlling the movements of the main valve.

7. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve, supply and exhaust ports to said pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center.

8. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in

the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center, supply and exhaust ports to the pilot valve, and the pilot valve for controlling the movements of the main valve and having supply and exhaust recesses duplicated on opposite sides of its lengthwise center.

9. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve located in a recess round in cross-section and controlling the supply and exhaust ports to the cylinder and to a pilot valve and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center, supply and exhaust ports to a pilot valve, and the pilot valve for controlling the movements of the main valve.

10. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports

to the cylinder and to a pilot valve, supply and exhaust ports to said pilot valve, and the pilot valve located in a recess round in cross-section and controlling the movements of the main valve and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center.

11. In combination with a cylinder and its piston and piston rod, supply and exhaust ports communicating with the chamber in the cylinder, a main steam actuated valve for controlling the supply and exhaust ports to the cylinder and to a pilot valve, said main valve being located in a recess round in cross-section having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center, supply and exhaust ports to a pilot valve, and the pilot valve controlling the movements of the main valve and located in a recess round in cross-section and having supply and exhaust recesses extending completely therearound and duplicated on opposite sides of its lengthwise center.

FRANK L. EAGER.

Witnesses:

ARTHUR B. JENKINS,
L. E. BERKOVITCH.