

(No Model.)

W. L. SHEPARD.

VALVE MECHANISM FOR STEAM PUMPING ENGINES.

No. 344,998.

Patented July 6, 1886.

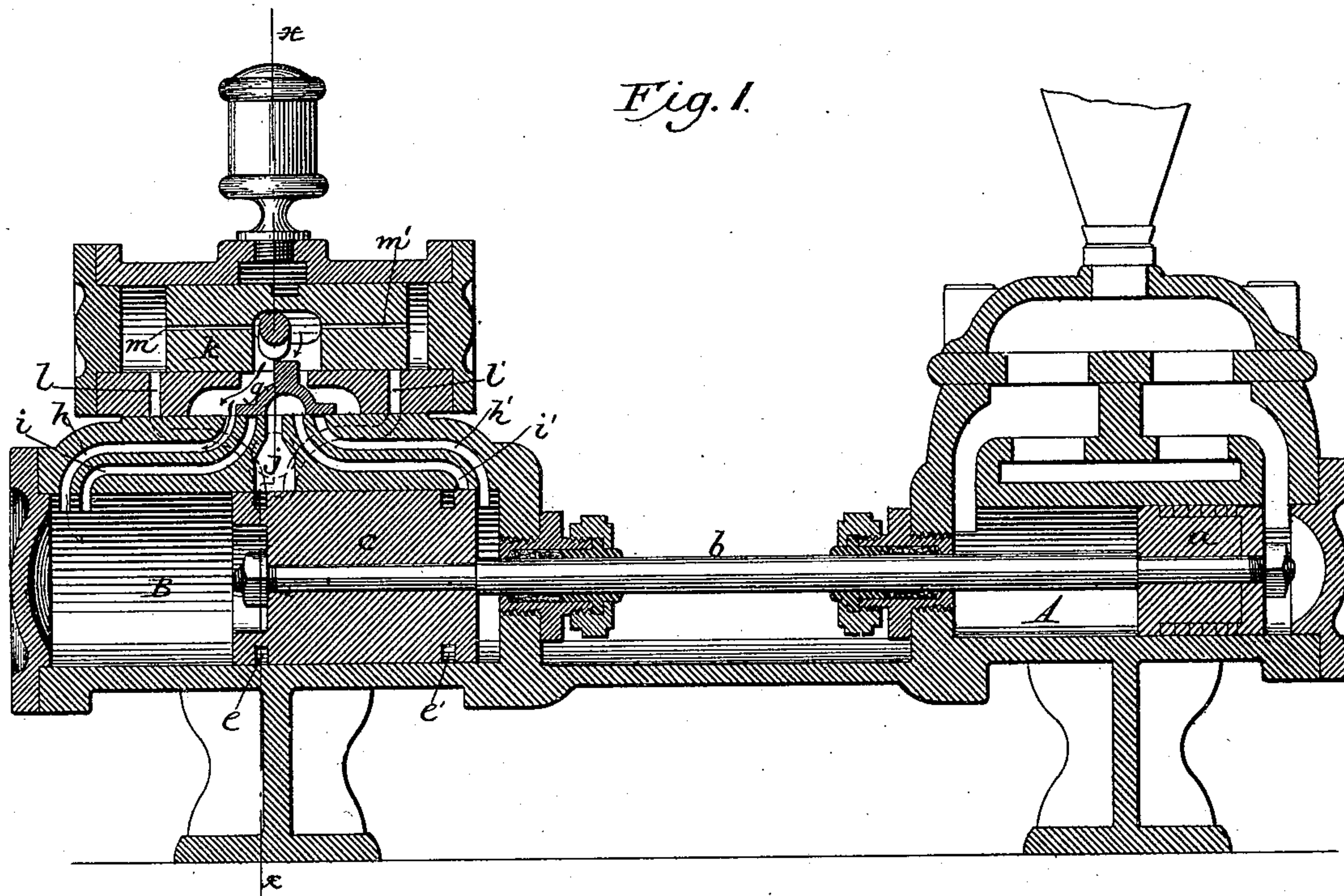


Fig. 1.

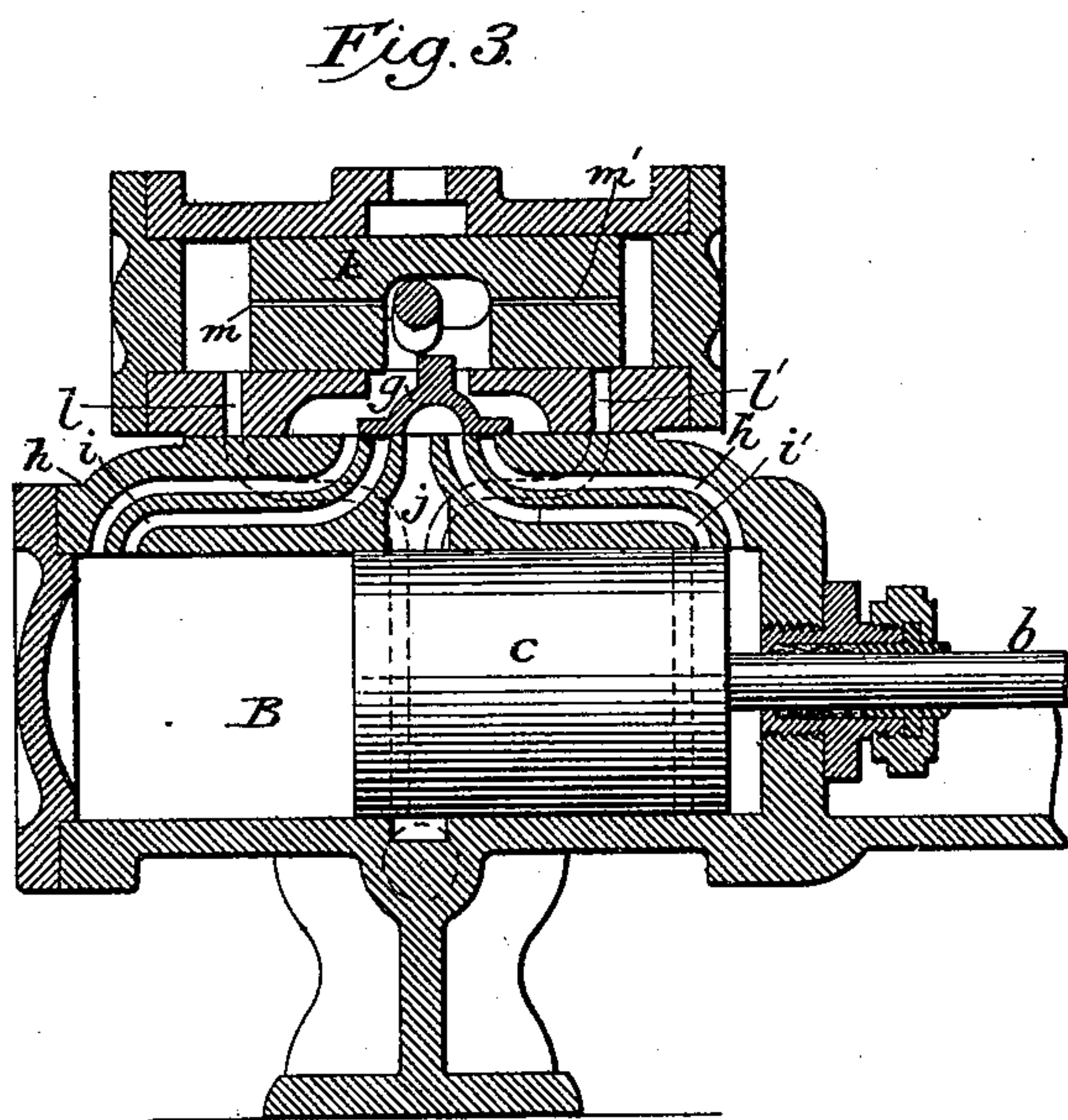


Fig. 3.

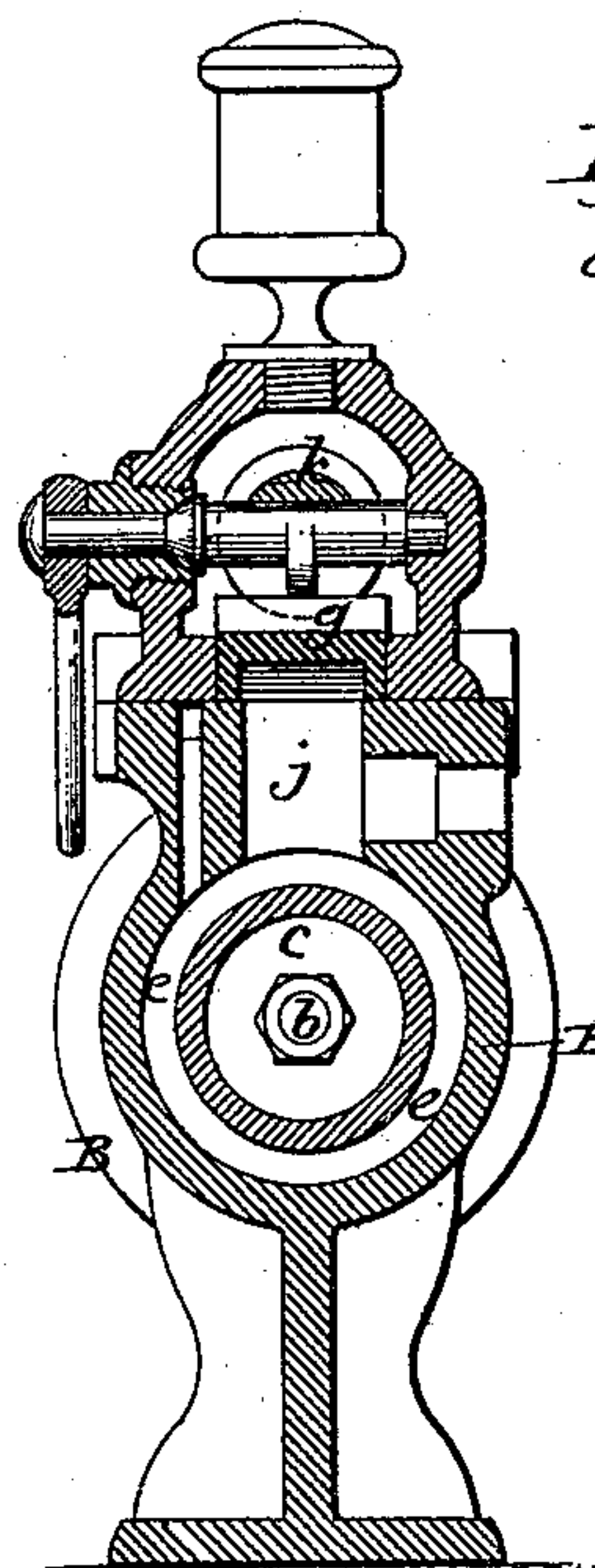


Fig. 2.
on line x-x

WITNESSES

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WILBUR L. SHEPARD, OF HARTFORD, CONNECTICUT, ASSIGNOR TO I. B. DAVIS & SON, OF SAME PLACE.

VALVE MECHANISM FOR STEAM PUMPING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 344,998, dated July 6, 1886.

Application filed January 24, 1885. Serial No. 153,847. (No model.)

To all whom it may concern:

Be it known that I, WILBUR L. SHEPARD, of Hartford, in the county of Hartford and State of Connecticut, have invented certain
5 Improvements in Valve Mechanism for Steam Pumping-Engines, of which the following is a specification.

My invention relates to an improved construction of the valve mechanism of the steam-
10 cylinders of steam pumping-engines. It has reference more particularly to that class of valves which are operated by the direct application of steam-pressure thereto, and is designed more especially as an improvement on
15 the valve mechanism represented in Letters Patent of the United States granted to John Tregoning, dated July 31, 1877, No. 193,736.

The improvement consists, generally speaking, of a piston provided with grooves or passages which co-operate with passages leading
20 from the ends of the valve-chest to the middle of the cylinder, by which the main piston is adapted to serve as a valve to control the admission and discharge of the steam.

Referring to the drawings, Figure 1 represents a longitudinal vertical section through the center of a pumping-engine constructed on my plan. Fig. 2 is a vertical cross section
30 of the steam-cylinder on the line *x x*. Fig. 3 is a sectional view of a modified form of the piston, having ports extended through the same in place of grooves formed in the circumference.

Referring to the drawings, A represents the
35 pumping-cylinder or pump proper, and B the steam-cylinder by which the pump is actuated. The pump is provided with the usual ports, valves, and reciprocating pumping-piston, *a*, which latter is connected in the ordinary manner by a piston-rod, *b*, to the steam-piston *c*, from which it receives motion. The
40 steam-piston is arranged to reciprocate in the steam-cylinder B, and is provided near its respective ends with circumferential grooves *e* *e'*, which serve as ports to permit the escape of exhaust-steam, as hereinafter explained.

At the top of the cylinder there is located a cylindrical valve-chest containing an ordinary slide-valve, *g*, and communicating through in-
50 duction-ports *h h'*, controlled by the valve,

with opposite ends of the cylinder *d*. Separate eduction-ports *i i'* are extended from the respective ends of the cylinder to the space or opening on the inner face of the main valve *g*, the movement of which connects said ports
55 alternately with the exhaust-passage *j*, located at the middle of the cylinder and leading outward, as represented in Fig. 2. The valve *g* is operated by means of the piston *k*, located in the valve-chest, and moved to and fro
60 therein by steam admitted behind its opposite ends. This piston is recessed on the under side so as to have a limited motion independent of the valve *g*, which is encountered and moved near the end of the stroke of
65 the piston. From opposite ends of the valve-chest ports *l l'* are extended inward to a point midway of the length of the cylinder, on one side of the same, at a distant point from the
70 discharge-passage *j*. It is to be noted that these ports *l l'* enter the valve-chest at such points that they are closed and covered alternately by the ends of the piston *k* as it moves to and fro. Small openings *m m'* are extended
75 from the central opening in the piston *k* to opposite ends of the same, for the purpose of admitting live steam constantly to the two ends of the piston.

The operation of the parts is as follows: Assuming the piston *k* and main valve *g* to be
80 moved to the right, as represented in Fig. 1, live steam will enter over the valve and through the port *h* into the main cylinder at the left of the main piston *c*, which will be forced to the right, as shown. During this
85 movement of the piston the dead steam will escape from the right hand of the main cylinder through the exhaust-port *i'*, and thence through the under side of the main valve *g* to the discharge-passage *j*. This escape con-
90 tinues until the end of the piston passes the mouth of the port *i'* and closes the same, whereupon the remaining steam confined in the end of the cylinder and in the discharge-port *h'* will serve as a cushion to arrest the motion of the
95 piston. Just before the piston completes its movement the groove *e* in its left end will be brought into position to connect the discharge-passage *j* with the mouth of the port *l*, leading
100 to the valve-chamber. The instant that this

communication is established the steam will be permitted to escape from the left of piston *k*, which is thus relieved from pressure.

At the same time that this relief occurs live steam passes through the port *m'* against the right end of piston *k*, which at this time closes the mouth of the port *l'*, in consequence of which the steam-pressure causes the piston *k* to be moved to the left, so as to effect a like movement of the main valve, which is followed by the admission of live steam through the port *h'* to the right hand of the main piston, and a discharge of the dead steam from the opposite end of the same through the port *i*. In due time the steam is discharged from the right of the piston *k*, and the movement of the parts again reversed. The parts of the two ends of the cylinder are duplicates of each other, and the movements to the right and left occur in like manner.

Although it is preferred to employ separate induction and eduction ports *h h'*, it is to be distinctly understood that a single port may be used in connection with an ordinary D-valve, this construction being common in steam-engines and pumping-machinery and familiar to every person skilled in the art.

While I prefer to employ a solid piston provided with circumferential grooves, it is to be understood that the hollow piston provided with ports to communicate with the passages *j'*, *l*, and *l'* may be employed. This construction is represented in Fig. 3.

It will of course be understood by the skilled mechanic that my improvements are applicable to pumping-engines of any and all forms in which a reciprocating piston is employed.

It is to be understood that the essence of my invention lies in the employment of the piston with channels or ports therein, in combination with ports adapted to register therewith, and extending to the valve mechanism, so that the main piston will operate directly to control the flow of steam through the exhaust-ports from behind the valve-operating piston, and it will be manifest to the skilled engineer that this feature may be used in connection with valve mechanism of various constructions.

In order that the pump may be started or the motion of the piston may be instantly reversed at any time, I mount in the valve-chest a rock-shaft having an eccentric portion to act upon the valve-piston *k* and move the same to the right or left, according to the direction in which the shaft is turned. This shaft is inserted through a hole in one side of the chest and confined by a collar or plug screwed into the chest. The plug bears at the inner end against a conical collar in the shaft, and the two surfaces are ground together in such manner as to produce a steam-tight joint, and thus avoid the use of packing. The inner end of the shaft is seated in a hole in the side of the chest.

Having thus described my invention, what I claim is—

1. The main cylinder provided with steam-ports opening into its ends, and the main piston provided with exhaust-steam passages near its ends, in combination with the main valve controlling the delivery of steam to and from the ends of the cylinders, the valve-actuating piston, the chest or cylinder containing said piston and communicating at both ends with the steam-supply, and also communicating at each end by an exhaust or discharge port with the main cylinder, the last-named ports being arranged to register with the two passages of the main piston alternately, whereby the main piston is caused to control the discharge of the steam from behind the valve-actuating piston.

2. In a steam-engine, a valve-actuating piston, and an inclosing chest or cylinder having its two ends in constant communication with the steam-supply, in combination with the main cylinder provided with the outlet-ports leading to opposite ends of the valve-chest and arranged to be closed alternately by the valve-piston, and the main piston provided near its ends with the exhaust-passages arranged to communicate alternately with said ports from the valve-piston and permit the discharge of the steam from the two sides of the valve mechanism alternately.

3. In a steam-engine, and in combination with a valve-actuating piston, the main cylinder communicating at its middle by two ports with opposite ends of the valve-piston, and the main piston provided near its ends with exhaust-steam passages adapted to register alternately with said ports and connect the same with the discharge-opening.

4. The main cylinder provided with separate inlet and outlet ports at each end, the slide-valve controlling said ports, the valve-piston supplied constantly with live steam at both ends, the valve-actuating piston having a limited motion independent of the valve, the two discharge-ports leading from opposite ends of the valve-chest to the middle of the main cylinder and adapted to be closed by the valve-actuating piston, and the main piston provided with the exhaust-passages near its two ends.

5. In combination with the main piston and cylinder and the main valve *g*, the actuating-piston *k*, having a limited motion independent of the valve, and the rock-shaft movable at will to change the position of the piston, whereby the starting of the engine may be effected.

In testimony whereof I hereunto set my hand this 26th day of December, 1884, in the presence of two attesting witnesses.

WILBUR L. SHEPARD.

Witnesses:

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