

No. 81,168.

PATENTED AUG. 18, 1868.

W. D. HOOKER.
DIRECT ACTING ENGINE.

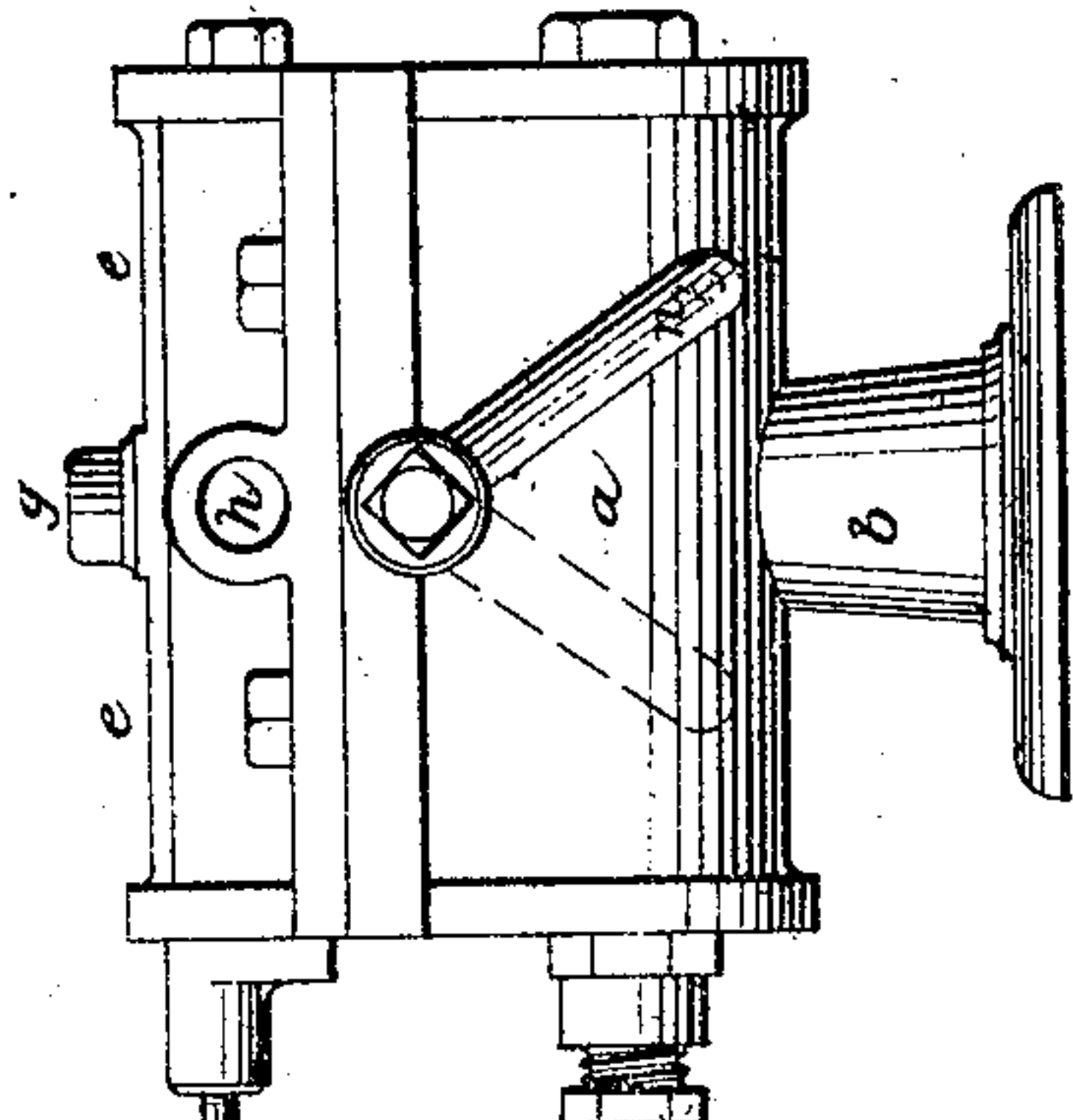


Fig. 1.

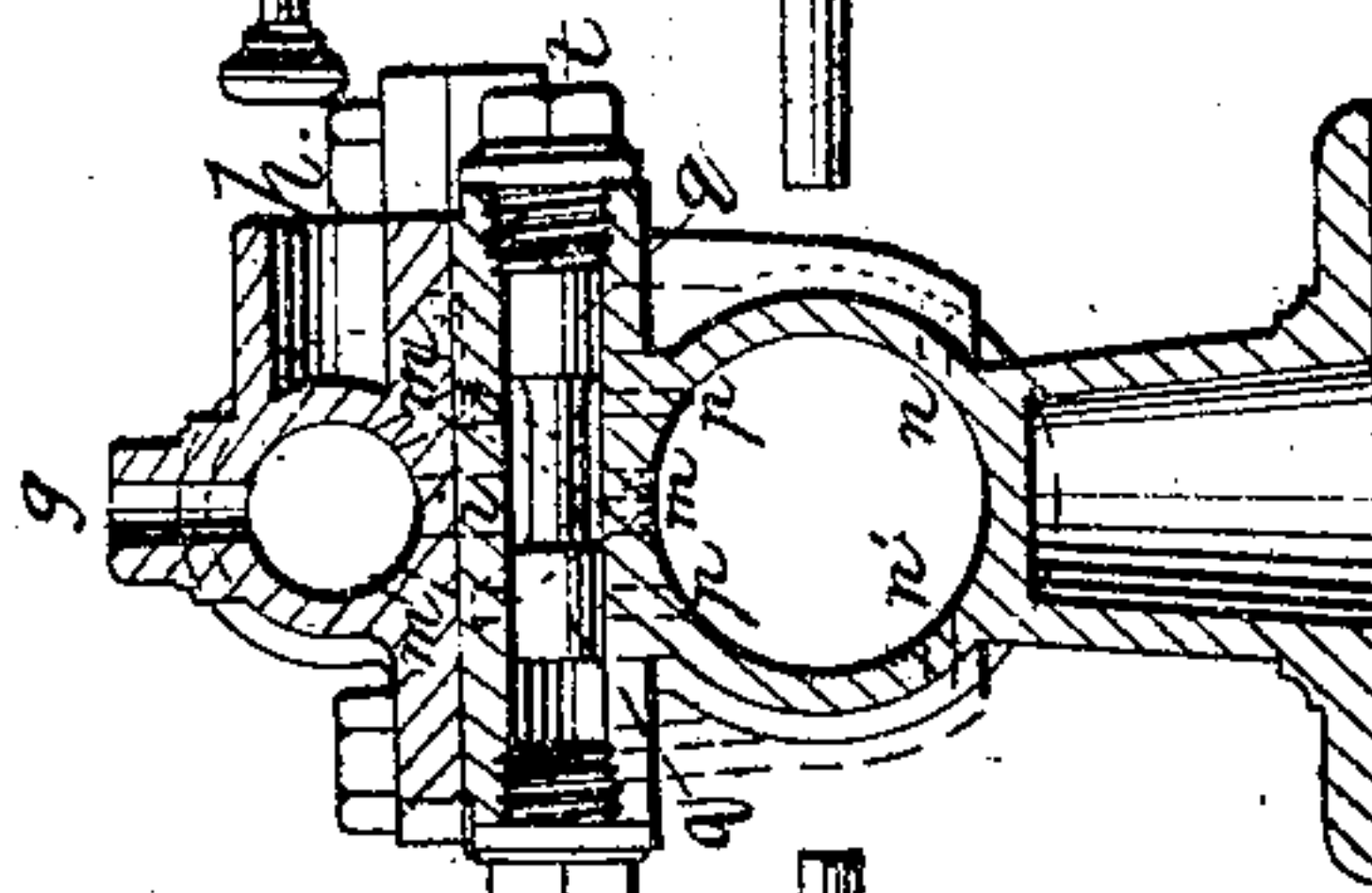


Fig. 2.

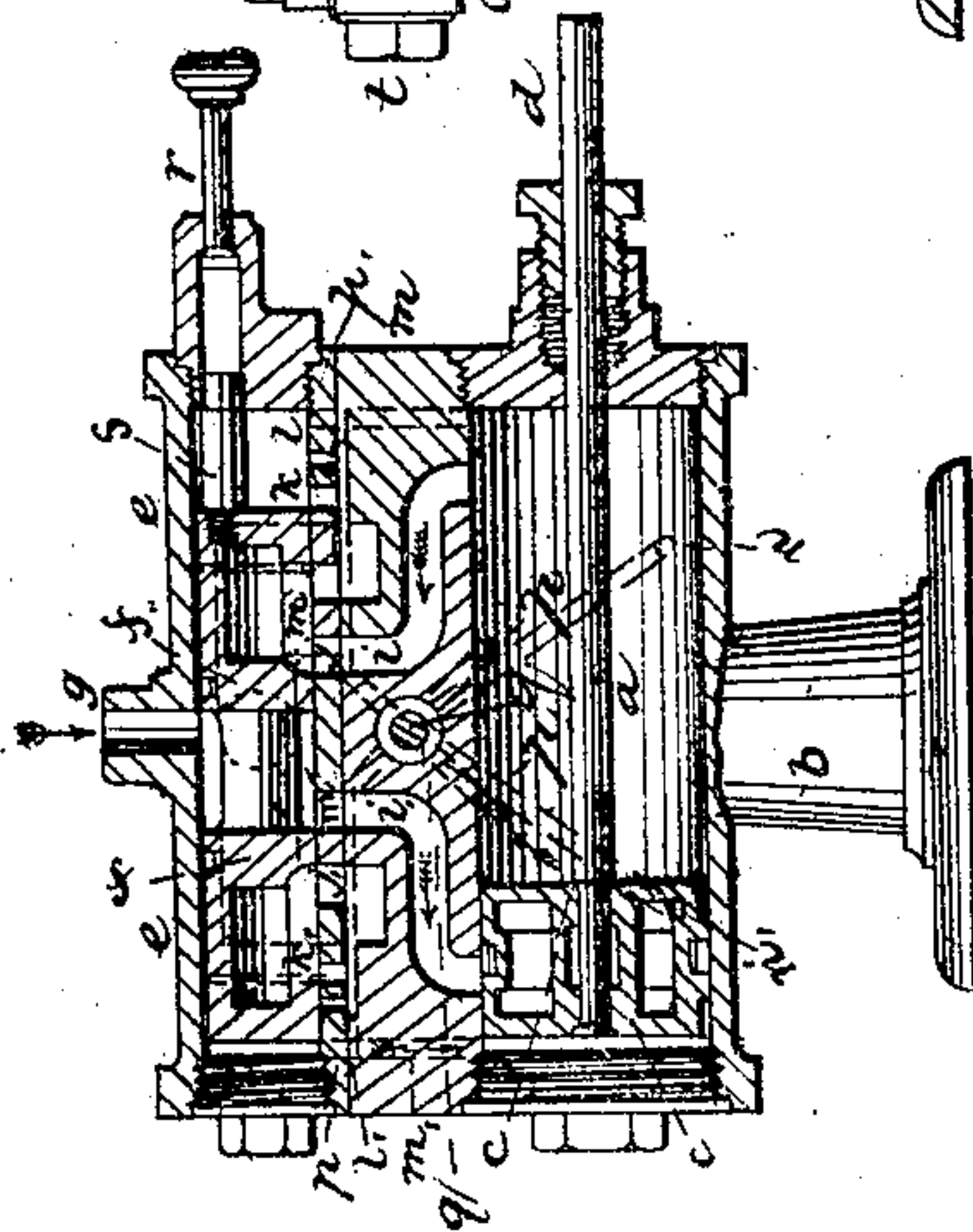


Fig. 3.

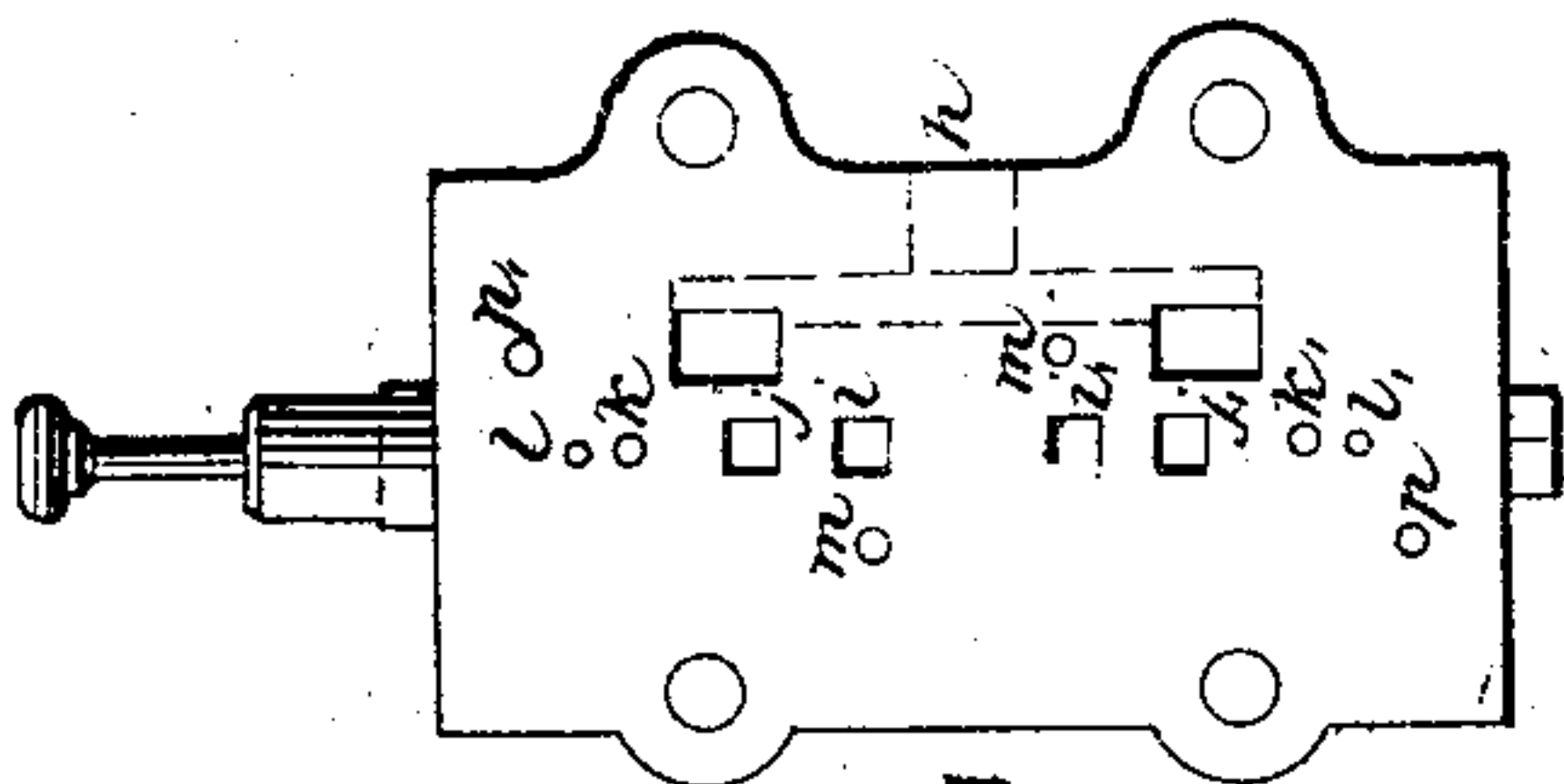


Fig. 4.

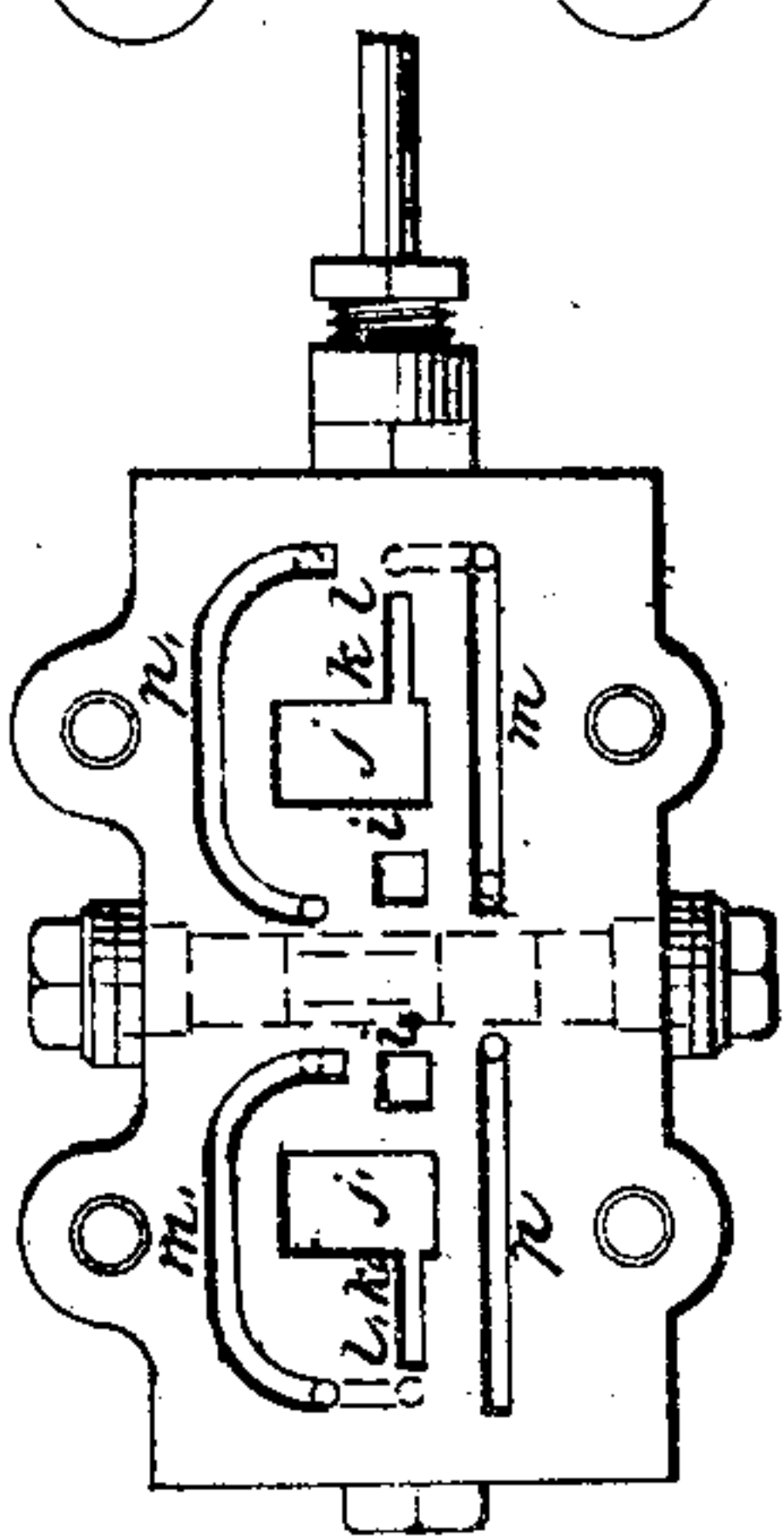


Fig. 5.

Witnesses.

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Letters Patent No. 81,168, dated August 18, 1868.

IMPROVEMENT IN DIRECT-ACTING ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, WILLIAM D. HOOKER, of the city and county of San Francisco, State of California, have invented an Improved Direct-Acting Steam-Engine; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention or improvements without further invention or experiment.

The object of my invention is to construct an improved direct-acting steam-engine, in which, by means of two valves, one main and one auxiliary, the steam is caused to act on each end of the piston in the cylinder, alternately, without the use of eccentrics, cams, or tappets, while, by the use of a system of ports, opening at different parts of the cylinder and valve-chambers, the valve and piston are cushioned at each end of their stroke, in such a manner as to allow a very high rate of speed, without the danger of concussion, and more particularly rendering the engine peculiarly adaptable to direct-acting steam-pumps.

This is accomplished by the arrangement of an auxiliary valve, suitable ports connecting the engine-cylinder and the valve chamber, and the piston and main valve of a direct-acting engine, in such a manner that the auxiliary valve shall open and close the ports leading to the ends of the main-valve chamber alternately at each stroke of the piston, by the action of the steam supplied and released through the ports, to and from said auxiliary valve, by the alternate movement of the piston and the main valve, thereby supplying steam to one end of the main-valve chamber, and closing communication to the opposite end, the auxiliary valve performing the function of opening one port and supplying steam to one end of the main valve, closing communication with the opposite end, thus cushioning or arresting the valve at the end of the stroke, small ports being made in the ends of the main-valve chamber and connecting with the main exhaust-ports, to release the steam at each stroke of the main valve, the exhaust also assisting to complete the stroke of the valve.

It also consists in the arrangement of suitable auxiliary ports, in connection with the main ports, piston, and main valve of a direct-acting engine, in such a manner that the said auxiliary ports shall be closed by the main valve when the piston passes the main ports, and thereby cause the piston to be cushioned on the vapor confined in the end of the cylinder, the main valve performing the functions of supplying steam through the main and auxiliary ports, but releasing steam through the main ports only, and arresting the piston at the end of its stroke by the valve covering the auxiliary ports.

To more fully explain my invention, reference is had to the accompanying drawings, forming part of this specification, of which—

Figure 1 is a side elevation of my invention.

Figure 2 is a side sectional elevation.

Figure 3 is an end sectional view.

Figure 4 is a plan, showing the main ports and the auxiliary ports and passages.

Figure 5 is a bottom view of the valve-chamber, showing the position of the ports on it.

Similar letters of reference in each of the drawings indicate like parts.

a is the cylinder and *e* the main-valve chamber of my engine, the two, for convenience, being cast separate, and fitted so as to allow of the construction of the different ports and passages, as shown in figs. 4 and 5, the two parts being then bolted together, as shown in fig. 1. Between the main-valve chamber and the cylinder is an auxiliary valve, *g*, moving in a chamber at right angles with the main valve, this auxiliary valve being operated alternately from one end to the other of its chamber by steam from the cylinder, to admit steam from the cylinder to the ends of the main valve.

n n' are the passages, which admit the steam from the cylinder to the ends of the auxiliary valve, and which are made to open into the cylinder at such points that it is impossible for the valve *g* to be moved until the piston has completed a certain portion of its stroke.

The valves may be constructed of any desired form, but I prefer a cylindrical one, the central portion being turned smaller than the ends, to admit steam. The main valve *f* has two exhaust-ports, one near each

end, as shown in fig. 2, and a shallow channel is made in the valve, at the end of each exhaust-port, so that any escaping steam may be released, and not allowed to find its way behind the valve.

To prevent the valve from turning around, I place a pin or short stem, *s*, near the upper part of the valve, which, working in a corresponding opening, keeps the valve always in position. The small ports in the upper portion of the cylinder are kept tight, and the cylinder prevented from wearing, by means of recesses in the bottom of the piston, to allow the steam to press it upwards.

Steam being admitted, the valve standing in the position shown in fig. 2, it will fill the main port *i'*, but not be admitted through it behind the piston which covers the port. But the small port *m'*, which opens behind the piston, also connects with the steam-passage in the valve, as shown in figs. 4 and 5, and through this the steam enters and drives the piston to the right, until the main port *i'* is opened to admit a full supply of steam. As the piston continues its motion, the port *n* is opened, admitting steam behind the auxiliary valve *q*, and forcing it into the position shown in fig. 3, thus closing the port *P'*, so that when the piston has uncovered it, the valve *q* prevents steam from passing to the right of the main valve. Continuing its motion, the piston opens the port *P*, and the valve *q* being in the proper position, steam passes through the port and enters behind the main valve *f*, driving it to the right. Whatever steam escapes through the small ports *k'* and *l'* enters the exhaust, *j*, as shown at fig. 4, while any air or vapor at the right of the valve *f* is allowed egress through the ports *k* and *l* until the valve passes them, when it will cushion on the remaining confined vapor. The piston has also passed the port *i*, and will be cushioned on the remaining steam or vapor at the right, the port *m* being still closed by the main valve *f*. At this instant, the valve *f* has passed to the right, the ports *i* and *m* have been opened, and the piston returns in the same manner. As the valve *f* moves to the right to change the motion of the piston, the exhaust *j* is opened, and the steam from the cylinder passes out through the port *i'* and *j'*, and, by its pressure, keeps up the motion of the valve *f* until it has completed its stroke.

The advantages of my engine are, first, durability, simplicity, and cheapness, there being but three moving parts in the whole engine, the two valves and the piston; second, certainty of action, starting at any point, variable speed from the lowest to the highest, and its adaptability to fire-engines requiring a high rate of speed; and, thirdly, the ease of inspection, the valve being easily removed by taking off the cover.

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

1. The auxiliary ports *m m'*, together with the main ports *i i'*, in combination with the main valve *f*, piston *c*, and auxiliary valve *q*, of a direct-acting engine, constructed substantially as described.
2. The arrangement of the auxiliary valve *q*, ports *p p'* and *n n'*, in combination with the main valve *f*, and piston *c*, of a direct-acting engine, constructed substantially as described.
3. In combination with the main valve *f*, supply-ports *i i'*, exhaust-ports *j j'*, auxiliary valve *q*, and ports *p p'*, I claim the small ports *l l'* and *k k'*, substantially as herein described.

In witness whereof, I have hereunto set my hand and seal.

WILLIAM D. HOOKER. [L. S.]

Witnesses:

J. L. BOONE,
C. W. M. SMITH.