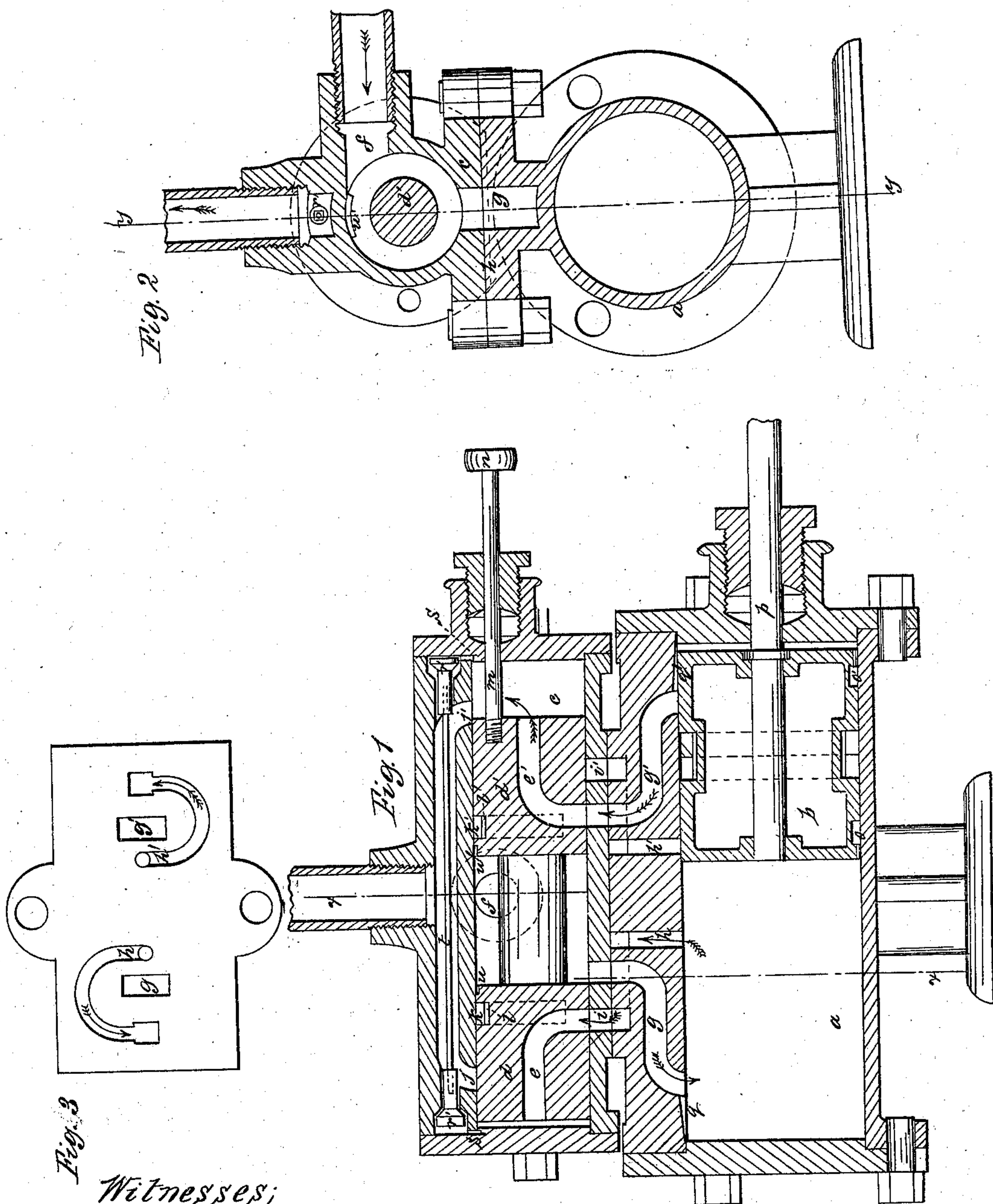


W. D. HOOKER.
VALVE FOR STEAM ENGINES.

No. 80,738.

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WILLIAM D. HOOKER, OF SAN FRANCISCO, CALIFORNIA.

Letters Patent No. 80,738, dated August 4, 1868.

IMPROVEMENT IN VALVES FOR STEAM-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 San Francisco, in the county of San Francisco, and State of California, have invented a new and useful Improvement in Valves and Steam-Passages for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a vertical section of a steam-engine cylinder and valve-chamber, showing my improvement in valves and steam-passages. *y y*, fig. 2, shows the plane of section.

Figure 2 is also a vertical section of the same. *x x*, fig. 1, shows the plane of section.

Figure 3 is a perspective view of the engine-cylinder where the valve chamber connects with the same, said figure showing the arrangement of the steam-passages connecting the engine-cylinder with the valve-chamber.

Similar letters of reference indicate corresponding parts in the three figures.

The nature of my invention consists—

First, in the means for operating the valves of steam-engines by both the supply and exhaust-steam direct from the engine-cylinder, without the aid of any external devices usually used for such purposes.

Second, in the arrangement of a cylindrical slide-valve, in such a manner that it shall be operated by both the supply and exhaust-steam.

Third, in the arrangement of the steam-passages connecting the engine-cylinder with the valve-chamber.

Fourth, in the arrangement of the valve-chamber, and ports through the same, in such a manner, with relation to the valve, that the steam shall be allowed to escape freely before the valve has arrived at the end of its stroke, and also allowing the valve to cushion on the air or steam pent up at the end of the valve-chamber, thereby preventing the valve from striking the ends of the valve-chamber, and requiring but slight resistance to stop its flight, as it is shot over by the supply and exhaust-steam.

Fifth, in the arrangement of recesses in the engine-piston, which are kept at the bottom of the engine-cylinder, and opposite of the small ports, by any suitable connection made to the piston-rod outside of the engine-cylinder. The steam is admitted to these recesses, and raises the piston, thereby making a steam-tight joint between the piston and small ports, and also preventing the bottom of the cylinder from wearing.

Sixth, the combination of the valve-stem with the valve, in such a manner as to prevent the valve from turning around in the valve-chamber, thereby keeping the ports in the valve over the ports in the valve-chamber. The valve-stem projects through the end of the valve-chamber. The object of this is to determine the true action of the valve, and also to move the valve by hand when required.

Seventh, in the packing-rings, said rings being held in contact with the periphery of the valve-chamber by springs inserted between the rings and valve, the object of this arrangement being, not only to force the rings outward, and prevent the supply-steam from escaping between the valve and valve-chamber, but also by the downward pressure exerted on the valve by the springs, together with the pressure brought to bear on the valve by the steam being admitted to the recesses formed in the valve, to insure a steam-tight joint where the valve covers the ports in the valve-chamber.

To enable others skilled in the art to understand and construct my improvements, I will now proceed to describe them.

a represents the engine-cylinder; *b*, the piston; *c*, the valve-chamber; *d d'*, the cylindrical slide-valve; *e e'*, the ports leading through said valve; *f*, the supply-port; *g g'*, the ports leading from valve-chamber *c* to the cylinder *a*; *h h'* are small ports leading from the cylinder *a* to the ports *i i'* in valve-chamber *c*, said ports *h h'* leading around the ports *g g'* to the ports *i i'*, as shown, (see fig. 3.) *j j'* are the exhaust-ports; *k k'*, the packing-rings inserted in the valve *d d'*; *l l'* are springs placed between the said rings and valve *d d'*; *m*, the valve-stem; *n*, the handle to move the same by hand; *o o'* are recesses formed in piston *b*; *p*, the piston-rod; *q q'* are small vent-holes leading from cylinder *a* to ports *g g'*; *r r'* are small stop-cocks; *s s'* are small ports leading to stop-cocks *r r'*; *t*, the rod that connects the stop-cocks *r r'*; *u u'*, the recesses in the valve *d d'*.

I will now proceed to describe the operation of my improved valve and steam-passages for steam-engines.

Steam being admitted at the supply-port *f*, it fills the valve-chamber and balances the valve *d d'*; but in proportion as the said valve is exposed to the downward pressure of the steam admitted to the recesses *u u'*, and the pressure of the springs *l l'*, so will the pressure be to keep the said valve steam-tight over and around the ports in the valve-chamber *c*. The springs *l l'* are curved, to conform to the recesses formed in the valve *d d'*, and are inserted between the said valve and the packing-rings *k k'*, said springs being made the proper curve to bring the required pressure on the rings. The steam now passes through port *g*, in the direction indicated by the arrows, and into the cylinder *a*, and forces the piston *b* to the position shown; (see fig. 1.) The piston *b* opens the small port *h*, the supply-steam rushes up said port *h*, and around port *g*, and through port *i* and port *e*, and forces the valve *d d'* over until the exhaust-port *j* is reached, when the supply-steam is cut off from the engine-cylinder *a*, and the exhaust-steam rushes through port *g* and port *e*, finishing the stroke of the valve *d d'*. At or near the point that the supply-steam is cut off from the cylinder *a*, by the valve *d* covering the port *g*, the port *g'* opens, admitting steam to the opposite end of the engine-cylinder *a*, when the piston *b* is forced back by the supply-steam until it opens the small port *h'*, when the supply-steam rushes up said small port *h'*, and around port *g'*, as indicated by arrows, (see fig. 3,) and through port *e'*, and reverses the valve *d d'*, exhausting and admitting steam, as before described, thus keeping up a continuous motion of the piston *b*.

The position of the ports *g g'*, *i i'*, and *j j'*, can, of course, be varied, so as to give the required lead to the supply and exhaust-steam, so that the greatest effect may be obtained in proportion to the amount of steam used.

The small stop-cocks *r r'* are inserted in the ends of the valve-chamber *c*, and are connected together by the rod *t*, said rod passing through the exhaust-passage, the object being, that while one is shut by the steam, the other shall be held open by the rod *t*, so as to allow a sufficient quantity of air to escape by the open stop-cock, and allow the exhaust-port to open sufficiently to let the exhaust-steam go free.

The ports *g g'* connect with the engine-cylinder *a* at some little distance from the ends of said cylinder *a*. This arrangement is for the purpose of cushioning the piston *b* on the compressed air or steam pent up between the piston *b* and the cylinder-heads, after the said piston *b* has passed the ports *g g'*.

The valve-chamber *c* is secured to the engine-cylinder *a* by bolts or screws, as shown, (see fig. 2.)

The valve-stem *m* is connected to the valve *d d'*, and passes through the valve-chamber cover, and is provided with a suitable stuffing-box, to prevent the steam from escaping. At the end of said valve-stem is fastened the handle *n*. The valve-stem *m* is attached to the valve *d d'* at some little distance from the centre, and near the periphery of the said valve, the object being to prevent the valve from turning around in the valve-chamber *c*, and to operate the valve by hand, when required, and also to determine the true action of the valve from the exterior of the valve-chamber *c*.

There are no dead-points or centres that the piston *b* will stick on, but as either one or the other of the ports *g g'* is always open, the piston *b* will always start when steam is admitted to the valve-chamber *c*; consequently the piston *b* can be driven fast or slow, as may be required.

The engine can be driven by compressed air, as well as by steam, when so desired, and can be applied to driving steam-pumps, rock-drilling machines, steam-hammers, and any machinery where a direct action is required.

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

1. The recesses *o o'* in the piston *b*, arranged with reference to the ports *h h'*, substantially as herein set forth and shown.

2. The arrangement, with relation to the cylinder *a*, valve-chamber *c*, and the additional puppet-valve chamber of the valve *d d'*, with its recesses *u u'*, supply-port *f*, ports *g g'*, *h h'*, *i i'*, *e e'*, vents *q q'*, exhaust-ports *j j'*, ports *s s'*, and puppet-valves *r r'*, substantially as herein described and shown.

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Witnesses:

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