W. L. Hatcher,

Piston Valve.

No. 113,428. Patented Apr. 4. 1871.

Fig. 1.

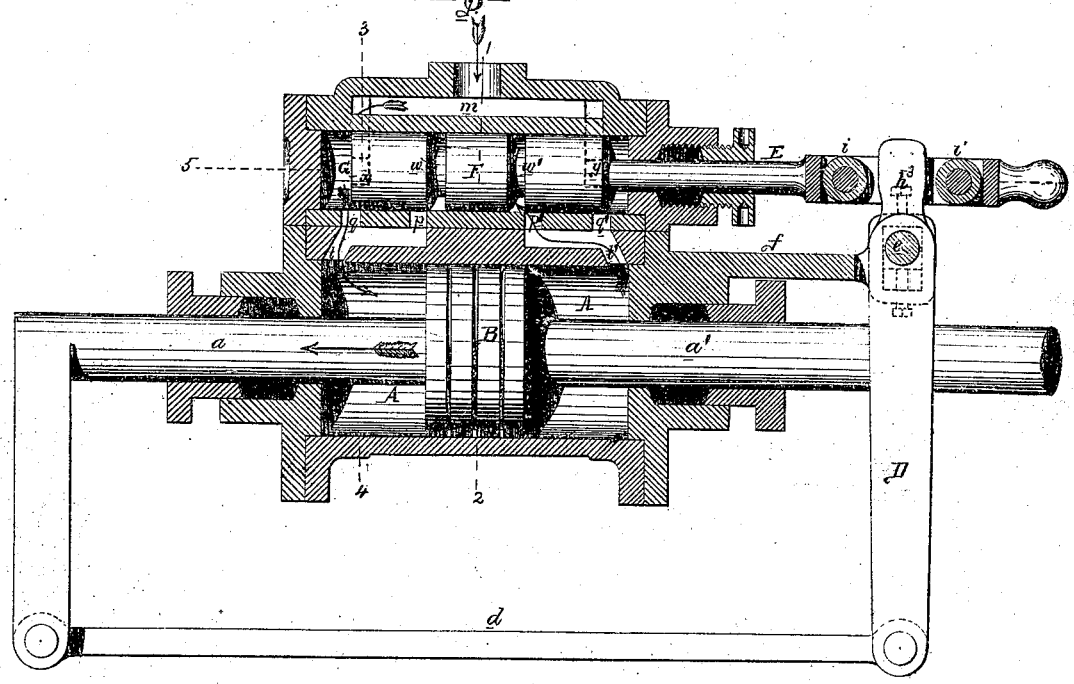


Fig. 2.

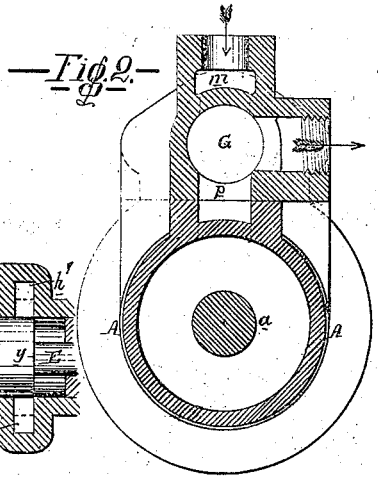


Fig. 3.

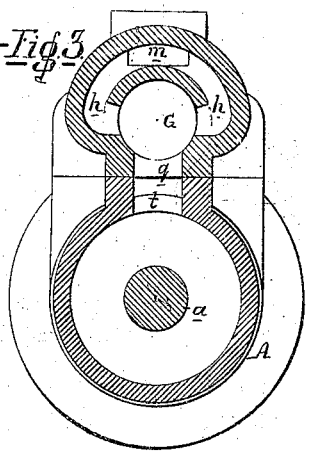
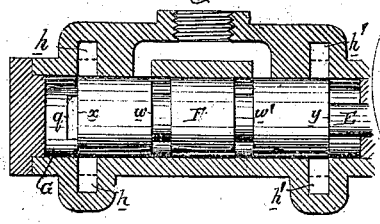


Fig. 4.



Witnesses { Wm. A. Clark
John Parker

William L. Hatcher
by his Attys
Howson and Son.

UNITED STATES PATENT OFFICE.

WILLIAM Z. HATCHER, OF PLYMOUTH, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND WILLIAM L. LANCE, OF SAME PLACE.

IMPROVEMENT IN VALVES AND VALVE-GEARS.

Specification forming part of Letters Patent No. **113,428**, dated April 4, 1871.

I, WILLIAM Z. HATCHER, of Plymouth, county of Luzerne, State of Pennsylvania, have invented an Improved Valve and Valve-Motion for Steam-Engines, of which the following is a specification:

Nature and Object of the Invention.

My invention consists of the combination, with a steam-cylinder and piston, of a valve operated, substantially in the manner described hereafter partly by the positive motion of the piston and partly by the direct action of the steam; also, of the combination, described hereafter, of a grooved cylindrical valve with certain steam and exhaust ports.

The object of my invention is to obtain such a rapid reciprocating motion of the piston without the aid of the usual eccentric or crank for operating the valve that the engine may be applied directly to the operating of pumps, blowing-cylinders, and especially to rock or coal drills.

Description of the Accompanying Drawing.

Figure 1 represents a longitudinal section of cylinder and valve-chest with my improved valve-motion; Fig. 2, a transverse section of the same on the line 1 2, Fig. 1; Fig. 3, a transverse section on the line 3 4, Fig. 1; and Fig. 4, a sectional plan view of the valve-chest on the line 5 6, Fig. 1.

General Description.

A represents a steam-cylinder, and B its piston, the rods *a a'* of the latter projecting through the usual stuffing-boxes on both heads of the cylinder.

A projection, *b*, at the rear end of the piston-rod is connected by a rod, *d*, to an arm, D, which is hung to a pin, *e*, the adjustable bearings of the latter being in a projection, *f*, of the front cylinder-head, or in any other suitable and permanent object.

On the pin *e* is a short arm, h^3, which is arranged to strike alternately the rollers *i i'*, contained in an elongated slot in the spindle E of the valve, and which can be either adjustable or not, the distance between the peripheries of the two rollers being greater than the width of the arm, for a purpose rendered apparent hereafter.

F is a cylindrical valve, arranged to slide in a cylindrical chamber formed in the valve-chest G, in which, above the valve, is a longitudinal passage, *m*, steam from the generator being admitted to this passage, which communicates through ports *h h* with the interior of the valve-chest at one end of the same, and through ports h^1 h^1 with the opposite end of the said valve-chest. It will be observed, on reference to Figs. 3 and 4, that these steam-ports *h h* and h^1 h^1 communicate at points directly opposite to each other with the interior of the valve-chest, so that, the pressure of steam from the ports being equal on both sides of the valve, the latter will be equally balanced, and will work much more freely than if the steam were admitted at one point only. Portions only of the steam-ports *q* and *q'* are opposite to the ports *h h* and h^1 h^1, as will be observed on reference to Figs. 1 and 4.

The exhaust-ports *p p'* communicate, during a portion of the stroke of the valve, with annular grooves *w w'* cut in the said valve, the steam escaping through a suitable opening or openings in the side of the steam-chest.

The operation of the valve is as follows: When the piston has very nearly reached the limit of its stroke in the direction of the arrow the arm h^3 strikes the roller *i'* of the valve-spindle, and so moves the valve as to cover the exhaust-port *p* and steam-ports h^1 h^1, half-open the steam-port *q*, and very slightly open the steam-ports *h h* and exhaust-port *p'*. This partial movement of the valve is all the duty which the arm *h* has to perform, the further movement of the valve being accomplished by the pressure of steam against the rear end, *x*, of the valve, which causes the latter to move suddenly, and thus further and fully opens the steam-ports *h h* and brings the annular groove *w'* opposite the exhaust-port *p'*, thereby insuring a free escape of the exhaust-steam at the front end of the cylinder through the passages *t' p' w'*, while a full volume of live steam is introduced at the rear end of the same through the passages *q t*.

The result of the above movement of the valve is the instant reversal of the piston, and as the latter reaches the limit of its forward movement the arm h^3 strikes the roller *i* of the

valve-spindle, and thereby slightly moves the valve, so as to close the steam-ports $h\,h$, partly close the port q, and slightly open the exhaust-port p and steam-ports $h^1\,h^1$, the completion of the valve-movement being effected by the pressure of steam against its end y, and the movement of the piston being again reversed.

To increase or diminish the stroke of the valve it is only necessary to lengthen or shorten the operating-arm h^3 by a proper vertical adjustment of the pin e, or to adjust the rollers $i\,i'$ from or toward each other. (See Fig. 1.)

It will be thus seen that the necessary movement of the valve to cause a reciprocating movement of the piston is accomplished partly by a positive motion derived from the piston-rod and partly by the pressure of steam against the valve itself.

Although the movements of the valve are sudden, it is relieved at every stroke from jars or shocks by a cushion of steam between the end of the chamber of the valve-chest and the end of the valve opposite to that on which the live steam is acting.

Although the above-described valve-motion is applicable to pumping-engines and blowing-engines, it has been more especially designed for rock or coal drills, in which the drilling-tool is secured directly to the piston-rod.

It will be seen that as the direct or live steam from the boiler passes to the ends of the valve F, the latter will not be balanced under any circumstances, so that the steam can act with its full force upon the valve, the rapid positive movement of which is thus insured.

Claims.

1. The combination, with a steam cylinder and piston, of a valve, F, and devices, substantially as described, whereby the valve is operated partly by a positive movement derived from the piston and partly by the action of steam passing directly from the boiler.

2. The ports $q\,q'$, $p\,p'$, and $h\,h^1$, arranged in respect to the grooves in the valve F, as described.

3. The ports $h\,h\,h^1\,h^1$, arranged in relation to the valve F, covering said ports, and communicating with the interior of the valve-chest, substantially as described.

4. The arrangement of the ports $h\,h^1$ in respect to the ports $q\,q'$ and to the valve F, as and for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM Z. HATCHER.

Witnesses:

HARRY SMITH,

WM. A. STEEL.