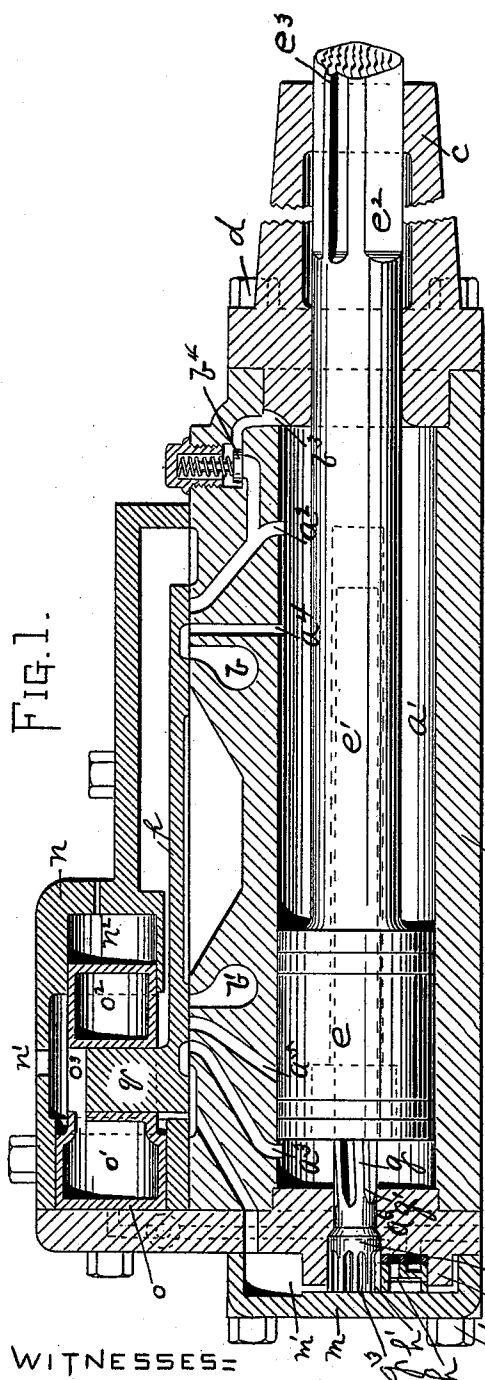


2 Sheets—Sheet 1.

No. 582,944.

Patented May 18, 1897.



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WITNESSES=

Walter Farnsworth
Robert C. Totten

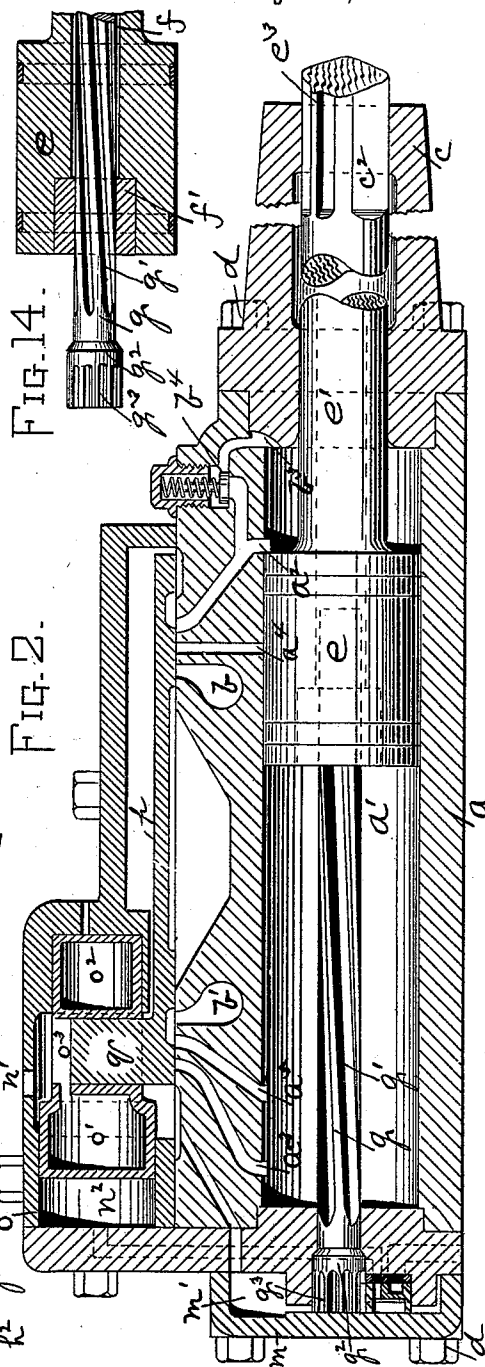


FIG-14.

FIG. 2.

INVENTOR.

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By Kay & Tabben
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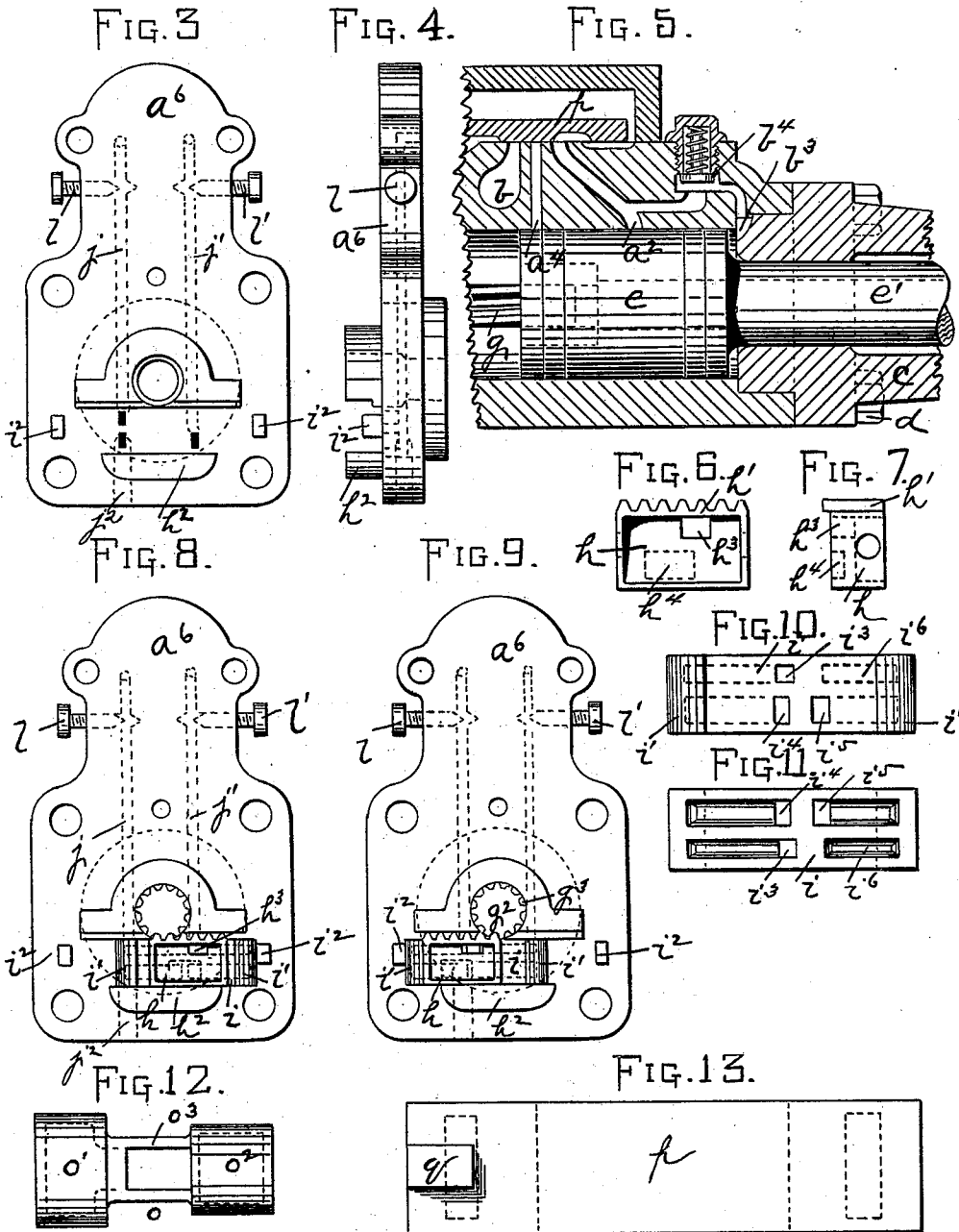
(No Model.)

T. OFFICER.
VALVE MECHANISM.

2 Sheets—Sheet 2.

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Patented May 18, 1897.



WITNESSES:

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UNITED STATES PATENT OFFICE.

THOMAS OFFICER, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO THE
SULLIVAN MACHINERY COMPANY, OF SAME PLACE.

VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 582,944, dated May 18, 1897.

Application filed May 14, 1896. Serial No. 591,478. (No model.)

To all whom it may concern:

Be it known that I, THOMAS OFFICER, a resident of Claremont, in the county of Sullivan and State of New Hampshire, have invented a new and useful Improvement in Valve Mechanism; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to valve mechanism, and involves certain novel features, all of which will be fully hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 represents a longitudinal section of my invention, showing the position of the ports when the piston is at the rear end of the cylinder. Fig. 2 is a like view showing the position of the ports when the piston is at the front end of the cylinder. Fig. 3 is a face view of the rear end of the shell or casing inclosing the ports. Fig. 4 is an edge view of same. Fig. 5 is a detail view of the front end of the cylinder when the piston is at the front end thereof. Figs. 6 and 7 are detail views of small slide-valve. Figs. 8 and 9 are end views of the shell or casing with the plate removed, disclosing the position of small slide-valve when the ports are in the positions shown in Figs. 1 and 2, respectively. Figs. 10 and 11 are detail views of the guide for the small slide-valve. Fig. 12 is a side view of the piston in steam-chest. Fig. 13 is a view of large slide-valve controlling ports to the cylinder. Fig. 14 is a section longitudinal of the piston, showing rifle-bar therein.

Like letters indicate like parts in each of the figures.

I have illustrated my invention as applied to the operation of a coal-cutter, but it may be applied to all other devices to which it may be found applicable.

The letter *a* designates a suitable shell or cylinder having the piston-chamber *a'* therein and the ports *a² a³ a⁴ a⁵*, the ports *a² a³* admitting steam to the front and rear ends of said piston-chamber, respectively, and the ports *a⁴ a⁵* communicating with the exhausts *b b'*, respectively. At the extreme front end of the cylinder is the port *b³*, which communi-

cates with the port *a²*, said port *b³* being controlled by the check-valve *b⁴*.

A guide-head *c* is secured to the front end of the cylinder, said guide-head being held in place by the bolts *d*. Within the cylinder *a* is the piston *e* with the piston-rod *e'*, which passes out through the guide-head *c*. The outer end of the piston-rod *e'* has the angular faces *e²* formed thereon to prevent the turning of the piston. A rib *e³* may be formed on the piston-rod *e'* to fit within a corresponding groove in the guide-head *c*. In this way the piston-rod is always inserted in the same position for the purpose more fully hereinafter set forth.

The piston *e* and piston-rod *e'* have formed therein the recess *f*, into which the rifle-bar *g* enters. This rifle-bar *g* has the spiral grooves *g'* formed therein, and said bar is adapted to engage with a nut *f'*, having corresponding grooves therein, said nut being held in place in any suitable manner at the outer end of the recess *f*. The outer end of the rifle-bar *g* passes through an opening in the back head *a⁶* of the cylinder and extends into the steam-chest hereinafter referred to. The rifle-bar *g* has the head *g²* on its outer end, said head having the teeth *g³* formed therein. These teeth *g³* mesh with teeth *h¹* on the upper edge of the small slide-valve *h*, so that upon the turning of the head *g²* the said valve *h* is moved back and forth. This small slide-valve *h* is supported on the ledge or guide *h²* and moves in contact with the reversing-valve *i*, also supported on the guide *h²*. The reversing-valve *i* has the projecting ends *i'*, so that when the slide-valve *h* in its movement strikes one of said ends *i'* the reversing-valve is moved. The movement of the reversing-valve is limited by the stops *i²*.

The small slide-valve *h* has the port *h³* formed therein adapted to communicate with the port *i³*, formed in the reversing-valve *i*. The valve *h* has also the blind port *h⁴*. The reversing-valve *i* has the ports *i⁴ i⁵* and the blind port *i⁶*. In the back head *a⁶* of the cylinder are formed the ports *j j' j²*. The port *j* is the inlet-port to the valve-piston chamber *k*, the port *j'* is the exhaust from said chamber

k , and the port j^2 is the exhaust-port from reversing-valve i . Valves $l'l'$ control the size of the ports j, j' .

A plate m is secured to the back head a^6 by means of the bolts d , said plate forming the auxiliary steam-chest m' . The head g^2 of the rifle-bar g abuts against the inner face of the plate m and prevents longitudinal movement on the part of said rifle-bar.

Bolted to the top of the cylinder a is the steam-chest n , said steam-chest having steam-inlet n' and a cylindrical chamber n^2 . Within said chamber n^2 is the valve-piston o , one end o' of said valve-piston being of greater area or diameter than the other o^3 . The ends o' o^3 of this valve-piston o are connected by the plate o^3 .

Within the steam-chest n is the long slide-valve p , controlling the ports a^2, a^3, a^4, a^5, b^3 . This slide-valve is operated by the movement of the valve-piston o , and for this purpose the said valve is provided with a projection q , adapted to engage said valve-piston.

The steam-chest n is always in communication with the auxiliary steam-chest m' by means of the passage r .

The operation of the invention is as follows: With the ports in the positions shown in Fig. 1, the piston e is just ready to begin its forward stroke, the port a^3 admitting steam to the rear end of the piston-chamber a' , the port a^4 being in communication with the exhaust b , and the port a^2 being closed. The reversing-valve i will be in the position shown in Fig. 8—that is, in contact with the stop i^2 on the right. In this position of the reversing-valve i the exhaust-port j' will be in communication with the exhaust-port j^2 from reversing-valve through the ports i^4, i^5 , said ports i^4, i^5 being connected by means of the blind-port h^1 of the small slide-valve h . With the ports in the positions just described as the piston e advances the rifle-bar g will be turned. The turning of the rifle-bar will move the slide-valve h to the left, the port h^3 coming into communication with the port i^3 , whereby steam is permitted to pass from the auxiliary steam-chest through said ports to the port j . Upon the further turning of the rifle-bar, the slide-valve h being in contact with the projecting end i' of the reversing-valve i , the said reversing-valve i will be moved into contact with the stop i^2 , as shown in Fig. 9. The steam admitted by the port j to the piston-chamber k will advance the valve-piston o and move the long slide-valve p . Enough steam is admitted by the port a^3 to drive the piston e to the end of its stroke before the valve p closes said port. As the piston e passes the port a^2 the steam to drive back said piston is admitted through the port b^3 , the check-valve b^4 being unseated. In this manner the steam admitted through the port a^2 acts to cushion the stroke of the piston.

Upon the return of the piston e the rifle-bar

g is turned in the opposite direction, and its first movement slides the valve h to the right, closing the port j and opening the exhaust-port j' . The steam being thus shut off from the port j , the valve-piston o resumes the position shown in Fig. 1. This is due to the fact that the head o' of said valve-piston o is larger than the head o^3 , and consequently, being of greater area, as soon as the pressure of steam from the port j is removed the pressure of the steam in the steam-chest n , acting on the larger area of the head o' , will drive said valve-piston back to the position shown in Fig. 1. The slide-valve p will also be moved, closing the port a^3 and opening the port a^4 . Upon the further retreat of the piston e the rifle-bar g will be turned still further, bringing the reversing-valve i into the position shown in Fig. 8.

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

1. The combination with a suitable shell, or casing, having a piston-chamber, of a reciprocating piston therein, a bar engaged by said piston and turned thereby, a valve engaged by the outer end of said bar controlling ports leading to a suitable chamber in the steam-chest, a valve-piston in said chamber, said valve-piston having heads of different areas, and a slide-valve engaged by said valve-piston and controlling ports leading to the first-mentioned piston-chamber, substantially as set forth.

2. The combination with a suitable shell, or casing, having a piston-chamber, of a reciprocating piston therein, a bar engaged by said piston and turned thereby, a valve engaged by the outer end of said bar controlling ports leading to the rear end of a suitable chamber in the steam-chest, a valve-piston in said chamber, said valve-piston having heads of different areas, the larger of said heads being opposite said ports, and a slide-valve engaged by said valve-piston and controlling ports leading to the first-mentioned piston-chamber, substantially as set forth.

3. The combination with a suitable shell, or casing, having a piston-chamber, of a piston reciprocating therein, a bar engaged by said piston and turned thereby, a valve engaged by the outer end of said bar controlling ports leading to a suitable chamber in the steam-chest, a valve-piston in said chamber, said valve-piston having heads of different areas connected by a plate, a slide-valve having a projection thereon engaging an opening in said plate, said valve controlling ports to said first-mentioned piston-chamber, substantially as set forth.

4. The combination with a suitable shell, or casing, having a piston-chamber, of a piston reciprocating therein, a spiral bar engaged by said piston and turned thereby, the outer end of said spiral bar having teeth formed therein, a slide-valve having teeth engaged

by said head, a second slide-valve having projections thereon engaged by said first-mentioned valve, said valves controlling ports leading to a valve-piston, and connections between said valve-piston and a valve controlling ports to said piston-chamber, substantially as set forth.

In testimony whereof I, the said THOMAS OFFICER, have hereunto set my hand.

THOMAS OFFICER.

Witnesses:

H. W. PARKER,
GEO. E. WOLCOTT.