No. 615,235. Patented Dec. 6, 1898.

A. BALL & T. OFFICER.

VALVE MECHANISM FOR MINING MACHINES.

(Application filed Jan. 20, 1898.)

(No Model.) 2 Sheets—Sheet 1.

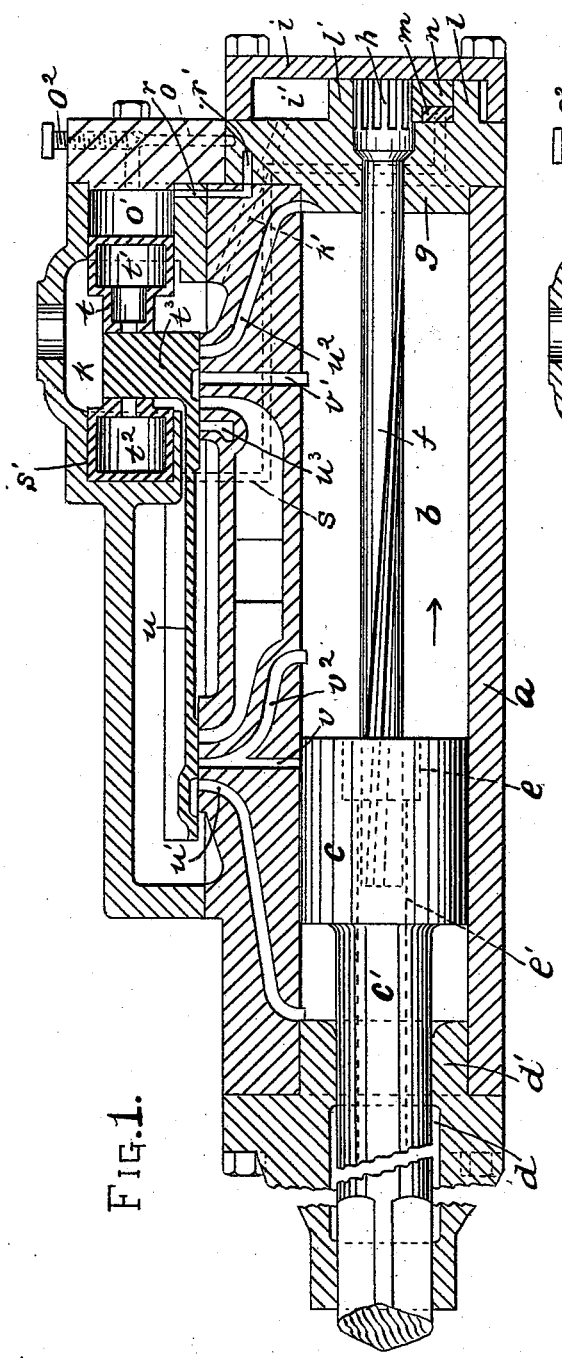

FIG. 1.

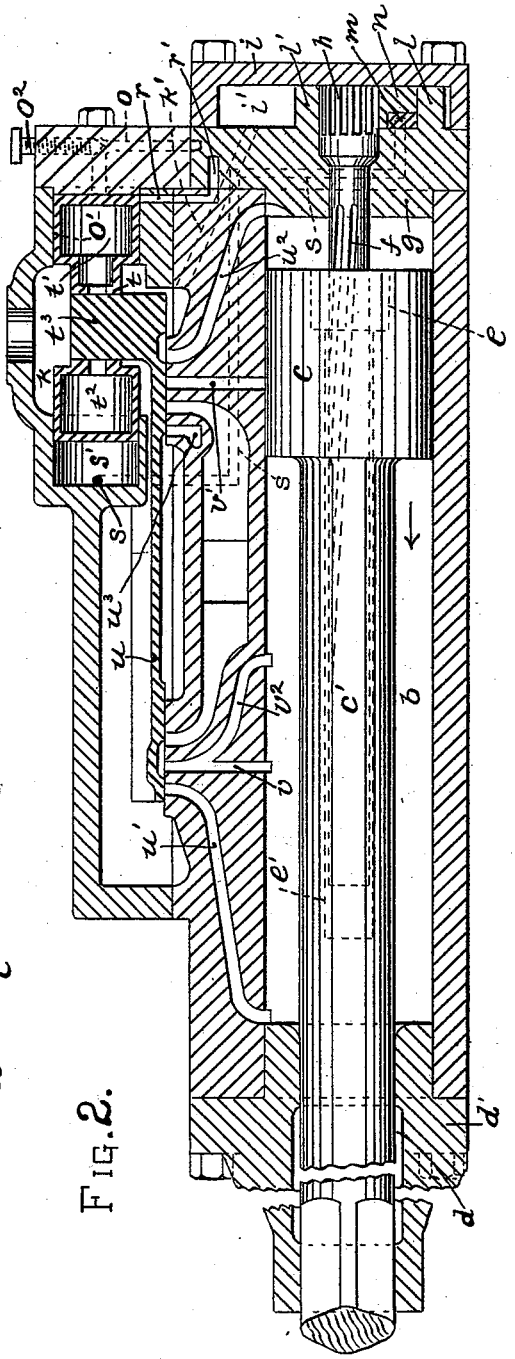

FIG. 2.

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FIG. 3.

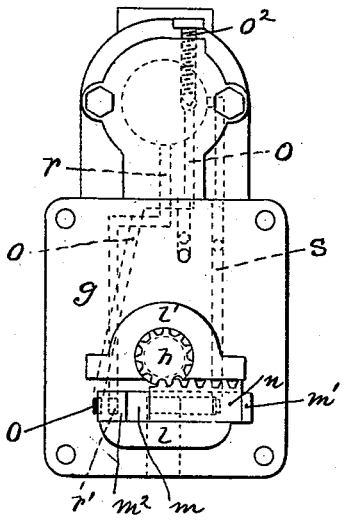


FIG. 4.

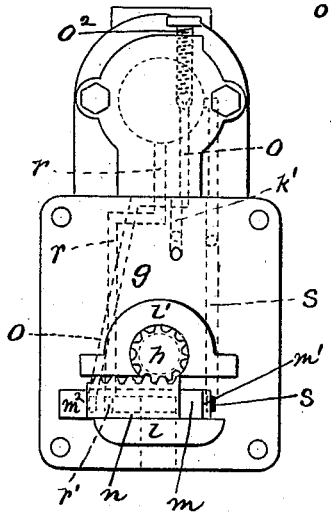


FIG. 5

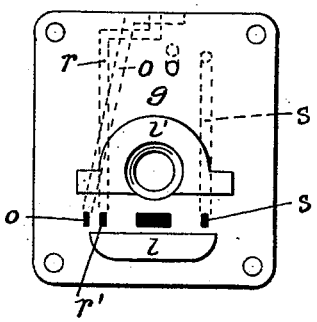


FIG. 6

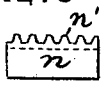


FIG. 7.

FIG. 8.

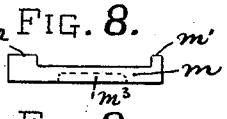
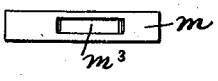


FIG. 9.



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UNITED STATES PATENT OFFICE.

ALBERT BALL AND THOMAS OFFICER, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNORS TO THE SULLIVAN MACHINERY COMPANY, OF SAME PLACE AND CHICAGO, ILLINOIS.

VALVE MECHANISM FOR MINING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 615,235, dated December 6, 1898.

Application filed January 20, 1898. Serial No. 667,332. (No model.)

To all whom it may concern:

Be it known that we, ALBERT BALL and THOMAS OFFICER, residents of Claremont, in the county of Sullivan and State of New Hampshire, have invented a new and useful Improvement in Valve Mechanism for Mining-Machines; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to valve mechanism for use in connection with coal-cutting and like machines.

In certain applications for Letters Patent filed by us we have set forth and claimed several different forms of valve mechanism, one of our chief objects being to regulate the movement of the piston in such a manner that the forward movement of said piston will be quick and strong, while its backward movement will be at a reduced speed, the result being that a strong quick blow is given to the coal on the advance movement of the piston, while its return movement, in which it does no work, will be at a reduced speed, so that less shock is given to the machine and the labor of the operator is not so severe.

The object of the present invention is to control the valve movement in such way as to produce substantially the same result; and the invention comprises the construction and arrangement of parts which we believe to be novel, all of which will be fully hereinafter set forth.

To enable others skilled in the art to make and use our invention, we will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal section of a portion of a coal-cutting machine with our invention applied thereto, showing the piston at the front end of cylinder. Fig. 2 is a like view showing piston at rear end of cylinder. Fig. 3 is a rear end view with cover removed and showing the position of reversing-valve when the parts are in position shown in Fig. 1. Fig. 4 is a like view showing reversing-valve in the position it assumes when parts are in position shown in Fig. 2. Fig. 5 is a view of back head with reversing-valve and driving-block removed. Fig. 6 is a side view of driving-block. Fig. 7 is an end view of same. Figs. 8 and 9 are detail views of reversing-valve.

Like letters of reference indicate like parts in each view.

The letter a designates a suitable shell or casing having the piston-chamber b therein, within which operates the piston c, attached to the piston-rod c', which carries at the forward end thereof a suitable cutting device. The piston-rod c' passes through a stuffing-box d in the front head d'.

Within the piston c is a spiral nut e, (shown in dotted lines,) while a passage e' (also dotted) extends through said piston and for a distance into the piston-rod. The rifle-bar f engages with the nut e, said bar being turned by the movement of the piston. The rear end of the rifle-bar f passes through an opening in the rear head g, the end of said bar having the toothed head h.

A cover-plate i is secured to the rear head g and forms the chamber i', which is constantly in communication with the air-chest k through the port k'. A guideway is formed by the projections $l\,l'$ on the rear head g. On the lower projection l rests the reversing-valve m, said valve having the knockers m' m^2 at each end thereof and the recess m^3 in its face. This valve m is held to its seat by the pressure of the live air in the chamber i'.

The driving-block n moves back and forth in the guideway formed by the projections $l\,l'$, said block having the teeth n', with which the teeth of the head h of the rifle-bar engage. The driving-block n is located between the knockers m' m^2 of the reversing-valve. The block n is shorter than the distance between said knockers m' m^2, whereby a dwell is given to the valve, as will more fully hereinafter appear. The area of the reversing-valve m being larger than the driving-block n, the friction of the driving-block will not move said valve when traveling over it.

A port o leads from the chamber i' to the chamber o' in the rear of air-chest k. This port o is regulated by the valve-screw o^2, so that the admission of air to said chamber may

be regulated as desired. An exhaust-port r leads from the chamber o' to the exhaust r'. A third port s leads from the chamber i' to the chamber s' in the air-chest k opposite to and in line with the chamber o'.

A valve-piston t has the heads t' t^2, which enter the chambers o' s', respectively, said heads being of the same area. A projection t^3 on the valve u engages with an opening in the valve-piston, whereby motion imparted to said valve-piston will impart like movement to said slide-valve u. This slide-valve u controls the ports u' u^2 at the front and rear ends, respectively, of the cylinder. The rear port u^2 has the auxiliary run-around port u^3. There are also the front and rear exhaust-ports v v', respectively. The front exhaust v has the branch port v^2, which extends toward the rear end of cylinder. This arrangement of the inlet and exhaust ports forms the subject-matter of an application for Letters Patent filed by us of even date herewith, Serial No. 667,333.

In operation, with the parts in the positions shown in Figs. 1 and 3, the air is passing from the air-chest through the port u' to the front end of cylinder, while the port o is open to admit air to the chamber o' to hold the valve-piston in the position shown in Fig. 1. While the port o is open the port s is in communication with the exhaust owing to the recess m^3. As the piston recedes the rifle-bar f is turned, and consequently the head h. This acts to move the driving-block n until said block comes in contact with one of the knockers m^2, whereupon the reversing-valve m is also moved, closing the port o and opening the port s. As soon as the port s is open the live air from chamber i' enters the chamber s' and moves the valve-piston to the position shown in Fig. 2. This movement of said valve-piston operates the valve u quickly, so as to open the ports u^2 u^3 quickly and admit air to rear end of cylinder. As the cylinder o' has the independent exhaust-port r and the independent inlet-port o the backward movement of the valve-piston is more rapid, and consequently the air is admitted more rapidly to the rear end of cylinder. As has been stated in this as well as in other of our applications, the object is to advance the piston with great speed and force, so as to strike a heavy blow on the coal and reduce the speed on said piston on its return. It will be readily seen that we accomplish this in the present instance by the travel of the valve u, which is made to travel forward slowly and backward with rapidity. This produces a contrary result on the piston, which accordingly moves forward with great rapidity and force and returns at a reduced speed. As the piston returns to the piston shown in Fig. 1 the port o is again opened and the port s turned into the exhaust. This advances the valve-piston, but at a slower rate of speed than on its backward movement, as the exhaust is not so rapid from the chamber s'. The result is that the slide-valve u opens the port u' more gradually and the piston is not driven back at such a high rate of speed. By having the driving-block n shorter than the space between the knockers of the reversing-valve a dwell is given to the said reversing-valve.

We do not wish to limit ourselves to the exact construction shown, as that may be varied without departing from the spirit of our invention.

What we claim as our 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 reversing-valve operated by said bar controlling ports leading to opposite ends of a valve-piston having heads of equal area, the chamber containing rear head of valve-piston alone having an independent exhaust-port, and a valve engaged by said valve-piston and controlling ports leading to the 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 reversing-valve operated by said bar controlling ports leading to opposite ends of a valve-piston having heads of equal area, means for exhausting the chamber containing the rear head of valve-piston more rapidly than the chamber containing front head thereof, and a valve engaged by said valve-piston and controlling ports leading to the 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, the outer end of said bar having teeth formed therein, a driving-block having teeth engaged by said head, a reversing-valve having knockers thereon against which said driving-block moves, said reversing-valve controlling ports leading to a valve-piston and connections between said valve-piston and a valve controlling ports leading to said 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 bar engaged by said piston and turned thereby, the outer end of said bar having teeth formed therein, a driving-block having teeth engaged by said head, a reversing-valve having knockers thereon against which said driving-block moves, said reversing-valve controlling ports leading to opposite ends of a valve-piston having heads of equal area, and connections between said valve-piston and a valve controlling ports leading to said piston-chamber, substantially as set forth.

5. 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, the outer end of said bar having teeth formed therein, a driving-block having teeth engaged by said head, a reversing-valve having knockers thereon against which said driving-block moves, the length of said driving-block being less than the distance between said knockers, said reversing-valve controlling ports leading to a valve-piston, and connections between said valve-piston and a valve controlling port leading to said piston-chamber, substantially as set forth.

In testimony whereof we, the said ALBERT BALL and THOMAS OFFICER, have hereunto set our hands.

ALBERT BALL.
THOMAS OFFICER.

Witnesses:
ARTHUR E. BLACKWOOD,
FRANK A. BALL.