No. 785,336. PATENTED MAR. 21, 1905.

O. O. STORLE.

PUMPING ENGINE.

APPLICATION FILED DEC. 24, 1901.

2 SHEETS—SHEET 1.

Fig. 1.

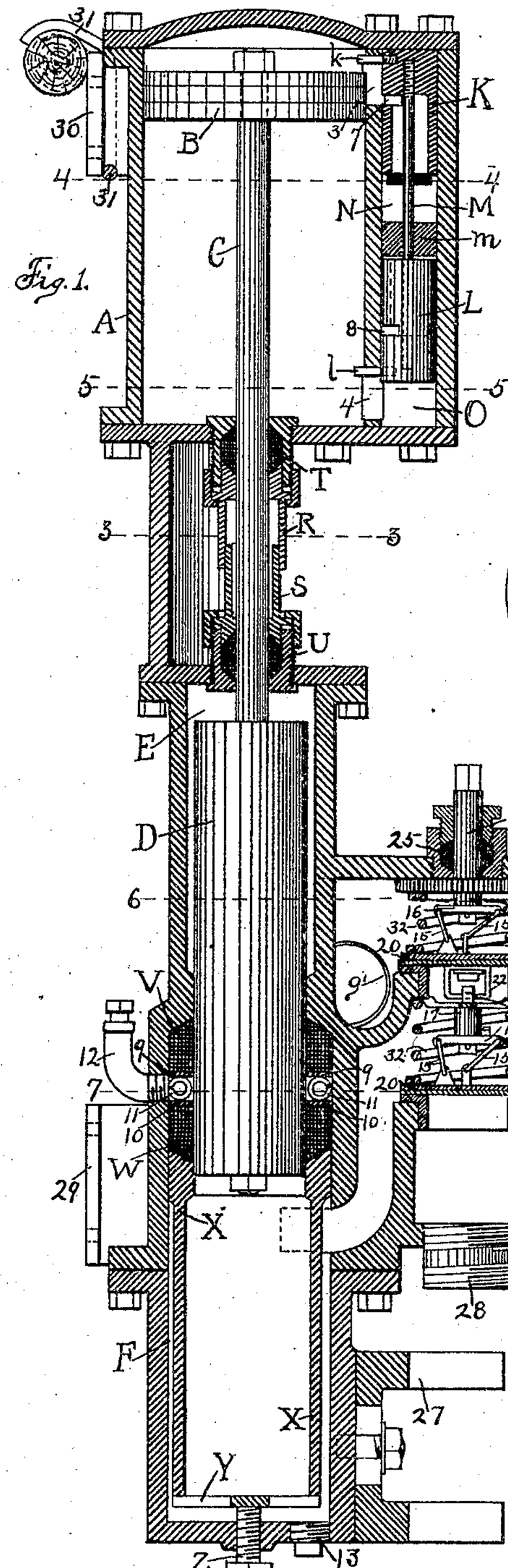


Fig. 2.

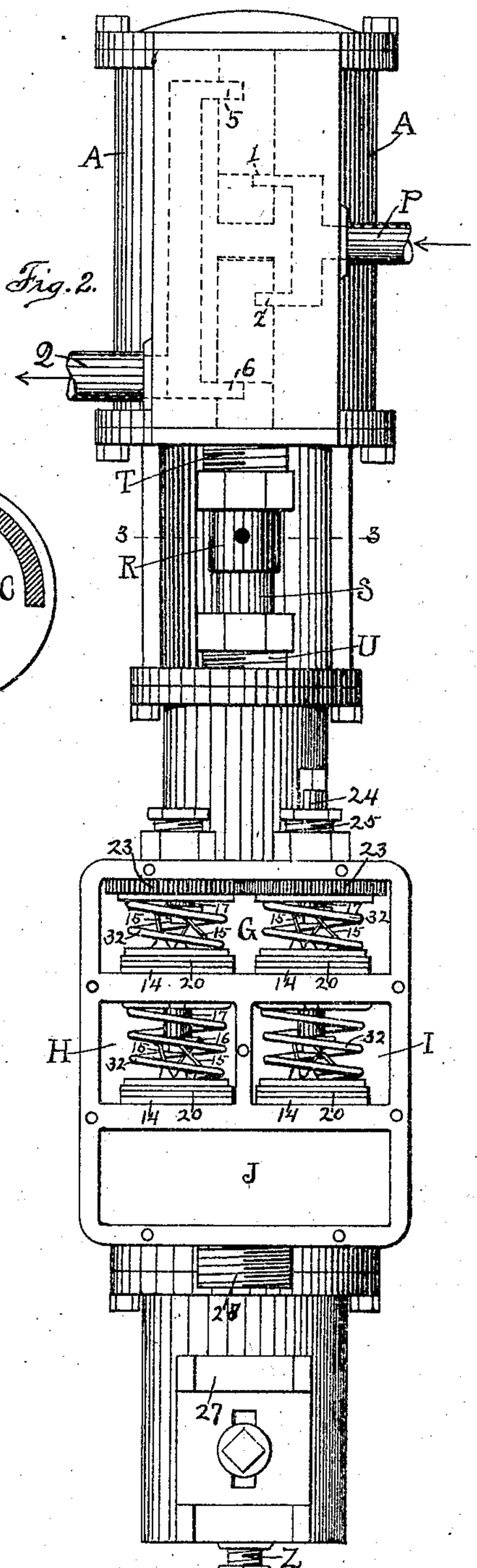
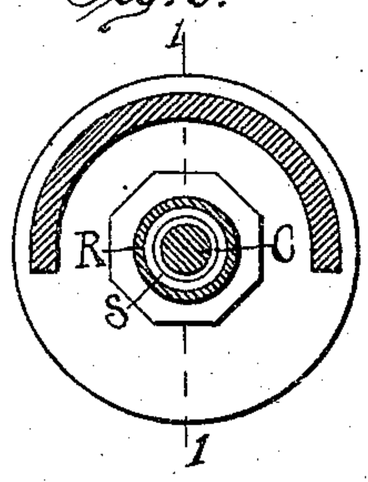


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

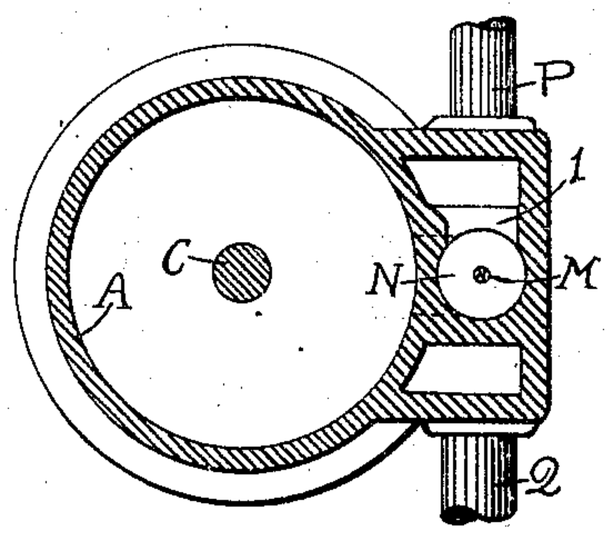
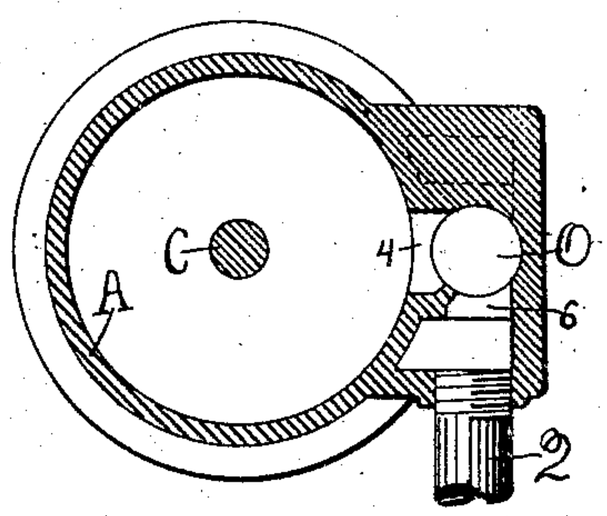


Fig. 5.



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No. 785,336. Patented March 21, 1905.

UNITED STATES PATENT OFFICE.

OLE O. STORLE, OF TACOMA, WASHINGTON.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 785,336, dated March 21, 1905.

Application filed December 24, 1901. Serial No. 87,058.

To all whom it may concern:

Be it known that I, OLE O. STORLE, a citizen of the United States, residing at Tacoma, in the county of Pierce and State of Washington, (whose post-office address is Tacoma, Washington,) have invented certain new and useful Improvements in Pumping-Engines, of which the following is a specification.

My invention pertains more particularly to force-pumps, but may be otherwise applied, and has for its object more particularly to provide an improved automatic cut-off to govern the supply and exhaust of steam or compressed air to the actuating piston-cylinder; and it consists in the features hereinafter described and claimed. I attain these objects by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of my invention on the lines 1 1 of Fig. 3. Fig. 2 is a front elevation of my invention, the face-plate being removed to permit an interior view of the valve-chambers. Fig. 3 is a cross-section at 3 3 of Fig. 2. Fig. 4 is a cross-section at 4 4 of Fig. 1. Fig. 5 is a cross-section at 5 5 of Fig. 1.

Similar letters and figures refer to similar parts in the several drawings.

My invention comprises a cylinder A, in which is operated the piston B, a piston-rod C, connecting B with the plunger D, operated forth and back in the pump-chambers E and F, the valve-chambers G, H, and I, with their respective valves, and the suction-chamber J, all similar in their general use and arrangement to pumps of this character now in use.

My improvement in the cut-off at the cylinder A consists of two cup-shaped cylinders K and L, connected with one another by the small piston-rod M, passing through the partition *m*. These two cup-shaped cylinders are located within smoothly-bored chambers N and O of the steam-chest. These chambers have ports 1 and 2 to admit the live steam from the pipe P, also ports 3 and 4, connecting with the cylinder A, and ports 5 and 6 to allow the steam to escape out and through the exhaust-pipe Q, each pair of ports being designed to be used alternately. At the bottom of the cup-shaped cylinders K and L are side ports 7 and 8, respectively. These are designed to supply steam to the cylinder A alternately.

The cup-shaped cylinders K and L are operated by means of the small studs *k* and *l*, respectively, set in the side and at or near the extreme end of each. These studs extend through the ports 3 and 4, respectively, into the cylinder A, so the piston B will come in contact with them.

We will suppose the pump is in operation and the piston B has been driven to the upper end of the cylinder, as seen in Fig. 1. The piston B has come in contact with the stud *k* and has lifted K sufficiently to admit a small inlet of live steam through the port 1. The chamber N is at once filled, and the pressure on the bottom of the cup-shaped cylinder K at once drives it to the top of the chamber and bringing the port 7 over the port 3, and thus supplying live steam above the piston B. The upward movement of K lifts the cup-shaped cylinder L, thus connecting the port 4 with the exhaust-port 6 and allowing the steam below piston B to escape. It will be observed that port 2 was closed before ports 1 and 6 were opened and B was driven a short distance by the expansive force of the steam. The piston B is now forced down until the stud *l* is reached, when the same movement is enacted through the cup-shaped cylinder L as described in K. By this means the steam is alternately supplied and exhausted from each end of the cylinder and the pump operated indefinitely. The mechanism is so simple that the cut-off can be made and operated at a minimum cost. It is to be observed that compressed air may be used as effectively as steam for a motive power.

The improvement for packing and covering the piston-slides is another feature of my pump. This is shown at R and S in Figs. 1, 2, and 3. The threaded caps designed to screw the packing tightly within the stuffing-boxes T and U are made with extending sleeves R and S, one telescoping into the other, as shown, and thus completely covering the piston-rod and protecting it from exposure to dirt, dust,

and grit, to which pumps of this kind are usually exposed. The space between the sleeves and the piston-rod is designed for a receptacle for lubricating-oil for the piston-rod.

Heretofore in force-pumps the plunger D has been operated within separated chambers, requiring a part of the sliding plunger to be exposed between the stuffing-boxes located in the adjoining ends of said chambers and around said plunger. In case the stuffing-boxes are not tightly packed the pump will suck air therethrough, which seriously interferes with the working of the pump. The water also squirts about the exposed slides and causes dirt, grit, and slime to accumulate, which adds to the wear of the pump and causes more or less annoyance to the operator or the workmen. In my improved pump I obviate these difficulties by operating the plunger D in one continuous inclosure, as seen in Fig. 1, with stuffing-boxes V and W at the center thereof, dividing the inclosure into the two chambers E and F, herein previously referred to. The stuffing-boxes V and W are separated by two annular flat rings 9 and 10, between which is placed a stout coil-spring 11, laid in a circle around the plunger. (See Fig. 1.) This coil-spring maintains a continuous space around the plunger D, whereby the same may be thoroughly lubricated, the lubricating-oil being supplied through the oil-cup 12. Should the stuffing-boxes not be packed sufficiently tight to prevent leakage, the water will simply be forced from one chamber to the other without any external waste or annoyance, nor will it take in air to prevent the working of the pump.

The stuffing-boxes V and W are packed by means of a cylindrical collar X, extending to the extreme end of chamber F. The upper end of X is made to fit the stuffing-box W around the plunger D, the remainder of the cylinder being made thin, leaving space for the movement of the water inside of and around the same as the plunger works therein. The lower end of X is open and supported on a head-piece Y, made with a multiple of arms. A set-screw Z provides a means for pushing X against the packing and making the same tight around the plunger D.

It is to be observed that the lower part of chamber F can be removed for renewing the packing in V and W. The plug-screw 13 may be removed at any time to remove sediment accumulated within chamber F when necessary, and, further, the force-pump made and operated as here shown and described can be used with less friction and expense and with better results.

The form of valves and valve-chambers in force-pumps now in use is such that they frequently become clogged when pumping dirty water, often requiring the pump to be stopped for opening and cleaning the same. In my invention this difficulty is overcome by improvements in the mechanism of the valves and in the form of the valve-chambers.

Another feature of my pump is in the form of the valve-seat. Instead of using the usual annular flat surface I make a valve-seat having a zigzag or crooked form, as shown at 14. The foot-plate of each valve is loosely suspended by means of eyelet-ended wire links 15 on a triple-armed evener 16, which is mounted on a central stem 17. Each stem has a little stud 18 projecting therefrom to engage a similar stud 19, set in one arm of each triple-armed evener 16. By turning the stem 17 the foot-plate and washer 20 of each valve will be made to turn on its respective zigzag seat 14, and thus slide off inward or outward any grit or substance that may be lodged thereon. I thus obtain a self-cleaning valve that will prevent waste of water within the pump and accomplish more work than with valves now in use.

Each lower valve is connected with the valve directly above by means of a fork-shaped extension 21, which engages a knuckle 22, attached to the under side of the upper-valve foot-plate. (See Fig. 1.) By this means the foot-plate of the lower valve will be made to turn round with that of the upper valve. The triple-armed evener 16 of each upper valve is mounted on the stem of and on the under side of a gear-wheel 23. These gears engage each other, so that when one is turned all the valves are made to revolve. One gear is made with a central square or angular stud which fits into a socket of a round stem 24. This stem is passed through the top of the valve-chamber by means of a suitably-constructed stuffing-box 25 and is made square at the top end, so that a wrench or crank may be applied thereto. By this means the valves may be rotated at will and the seats cleared of grit or clogging substances while the pump is in operation.

It is to be observed that the foot-plates 20 are permitted to lift and fall freely by means of the eyelet-ended links 15 being suitably inclined and loosely attached to the triple-armed evener 16, so as to allow a hinge-like movement and at the same time hold the foot-plate 20 centrally on the valve-seat 14. This dispenses with the stationary pins heretofore used to guide the valve-plates and obviates the catching of dirt and trash to interfere with the working of the valves. It is to be further observed that the valve-springs 32 are similar to those now in use, with the exception that in my invention they are suitably connected at both ends. These springs not only throw the valve foot-plates in place, but are wound up by the turning of the stem 24 and cause the foot-plates to turn when lifted by the pressure of the water, thus removing any grit or substance from the zigzag valve-seat 14, so that the same is readily washed away. The

small studs 18 and 19 will come in contact one with the other in winding up the spring and prevent the spring being wound up more than one round in either direction, which prevents their being broken. The top ends of the springs in chamber G are fastened to their respective gear 23. The top ends of the springs in the chambers H and I are fastened to the cross-arms extended from the stem 17 and which are a part of the fork 21. The lower end of each spring is connected with its respective foot-plate 20.

The discharging valve-chamber G is constructed with a sediment-pocket g on a lower plane than the valve-seats. The discharge-pipe g' connects on a level with the bottom of this pocket, thus causing much of the grit and dirt to be carried off with the water. In addition to this a clean-out hole and screw-plug g^2 provide a means for direct cleaning when necessary.

The valve-chamber I supplies and receives water to and from the lower chamber F of the force-pump, and the sediment passing therethrough will collect in the bottom of F and be removed through the clean-out hole by removing its plug-screw 13, as herein previously stated. The suction-chamber J requires no sediment-pocket and has none.

By means of the self-cleaning valves and the sediment-pockets in the valve-chambers, as described and shown, I provide a pump that will force more dirty water than with pumps now in use. I will also obviate the frequent stopping of the pump for removal of the face-plate 26 to clean the valves and valve-chamber, as now frequently required in operating force-pumps, and thus save much valuable time of men and machinery.

My invention is designed to be used chiefly in the sinking of shafts for mines. However, the improvements herein described are applicable to force-pumps of other form and design, and I do not limit myself to the exact form or design of pump herein shown and described; neither do I limit myself to dimensions or proportions, but retain the right to vary the same as conditions may require.

The pump may be provided with a forked bracket 27, adjustably attached to the lower end of the pump and designed to engage and support the suction-hose while being coupled to the pump at the threaded neck 28.

The anchor-plates 29 and 30 are of the form now used in setting a pump in position for service. These require the pump to be bolted or screwed to the timbers of the shaft or mine, and to do this considerable time and care must be taken. I simplify this method of operation by fixing a U-shaped hook 31 about and back of the upper plate 30. This hook is so formed that it will engage a cross-timber of the shaft or mine, and thus temporarily support the pump for operation. By this means the pump can be raised or lowered, as the working of the mine may require, without consuming valuable time, as now required to bolt or screw the same in a fixed position.

I do not claim herein the valve construction for controlling the flow of water through the valve-chamber, nor the construction relating to the plunger, nor the means for protecting the piston and plunger-rod between the piston and the plunger-chambers, as such features and others not claimed herein will form the subject of a separate application. The divisional application for the first above-mentioned subject-matter now bears Serial No. 182,625 and for the other subject-matter Serial No. 182,558.

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

1. In a force-pump comprising a plunger-casing, a valve-chamber in communication therewith, a piston-cylinder, and a rod connecting the plunger and piston in the casing and cylinder, respectively; an automatic cut-off for the piston-cylinder, comprising a two-part compartment in communication with the cylinder, two cup-shaped slides connected by a rod and fitting one in each of said compartments, and each provided with a stud projecting into the line of travel of the piston, said slides being adapted to be shifted alternately in the control of the live-steam and exhaust parts by contact of the piston with said studs and to have their movement completed by the action of live steam on the slides, substantially as described.

2. The combination with the piston and its cylinder, of an automatic cut-off for the piston-cylinder, comprising a compartment divided centrally by a partition to form two chambers, each communicating with the piston-cylinder and each formed with an inlet and an exhaust port, a rod passing through the central partition and provided in each chamber with a slide having a port adapted to be brought into and out of register with the port leading into the piston-cylinder from the chamber containing the slide, and means for transmitting motion from the piston to said slides, to shift the slides in alternation to admit the pressure agent into one slide-chamber and from thence into the piston-cylinder and cut off the supply to the other chamber and permit exhaust from the piston-cylinder through said chamber, substantially as described.

3. The combination with the piston and its cylinder, of an automatic cut-off for the piston-cylinder, comprising a compartment divided centrally by a partition to form two chambers, each having a port communicating with the piston-cylinder, and each formed with an inlet-port near the partition and an exhaust-port nearer the end of the chamber, a

rod passing through the partition and provided in each chamber with a hollow slide open at its inner end and closed at its other end and formed with a port to be brought into and out of register with the port leading into the piston-cylinder in the alternate shifting of the slide, and means in the path of movement of the piston for alternately shifting said slides to control the inlet and exhaust of steam to and from the piston-cylinder through said slide-chambers, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

OLE O. STORLE.

Witnesses:
A. H. DENMAN,
G. W. BULLARD.