(No Model.) 2 Sheets—Sheet 1.

R. M. & J. G. DOWNIE.

PUMPING ENGINE.

No. 444,627. Patented Jan. 13, 1891.

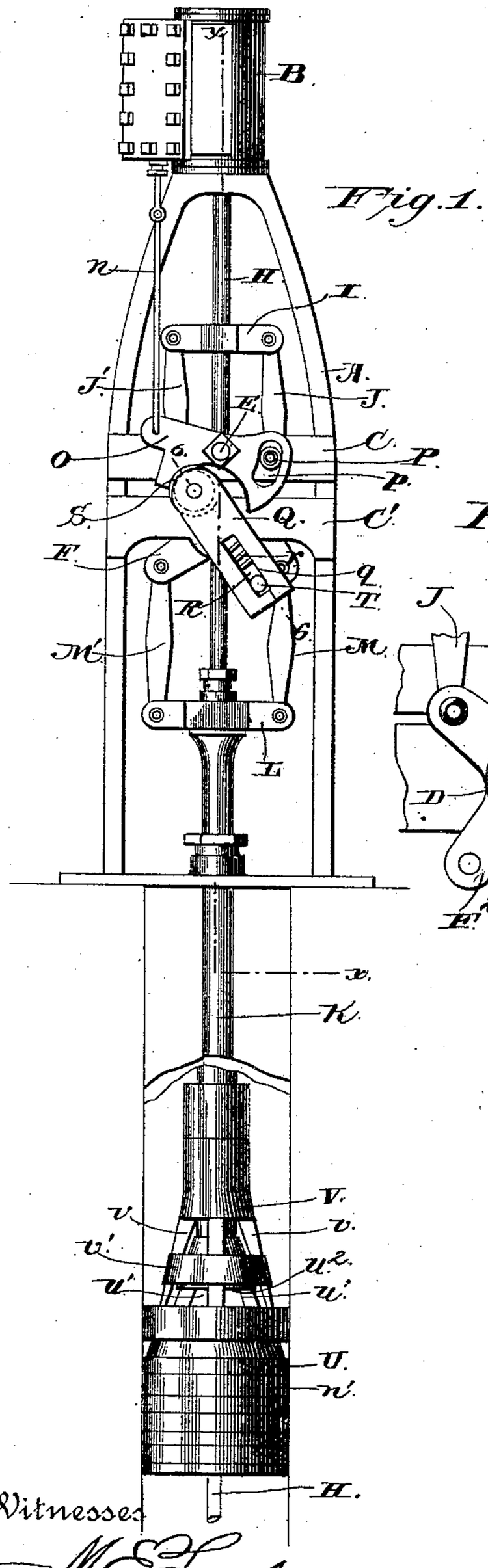

Fig. 1.

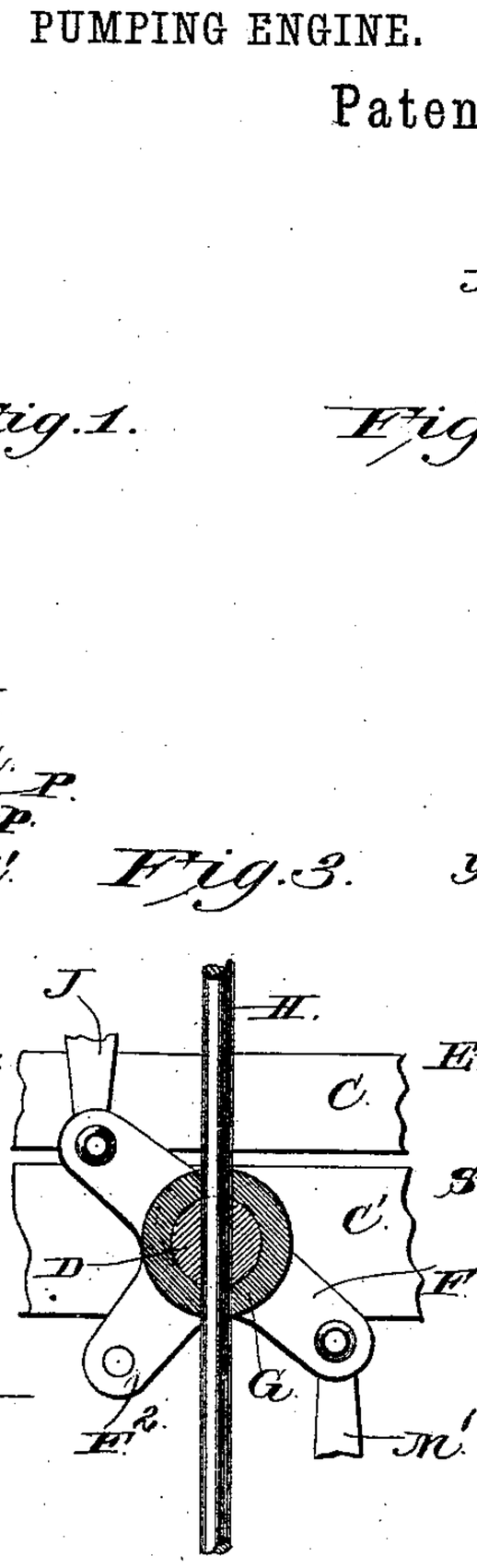

Fig. 3.

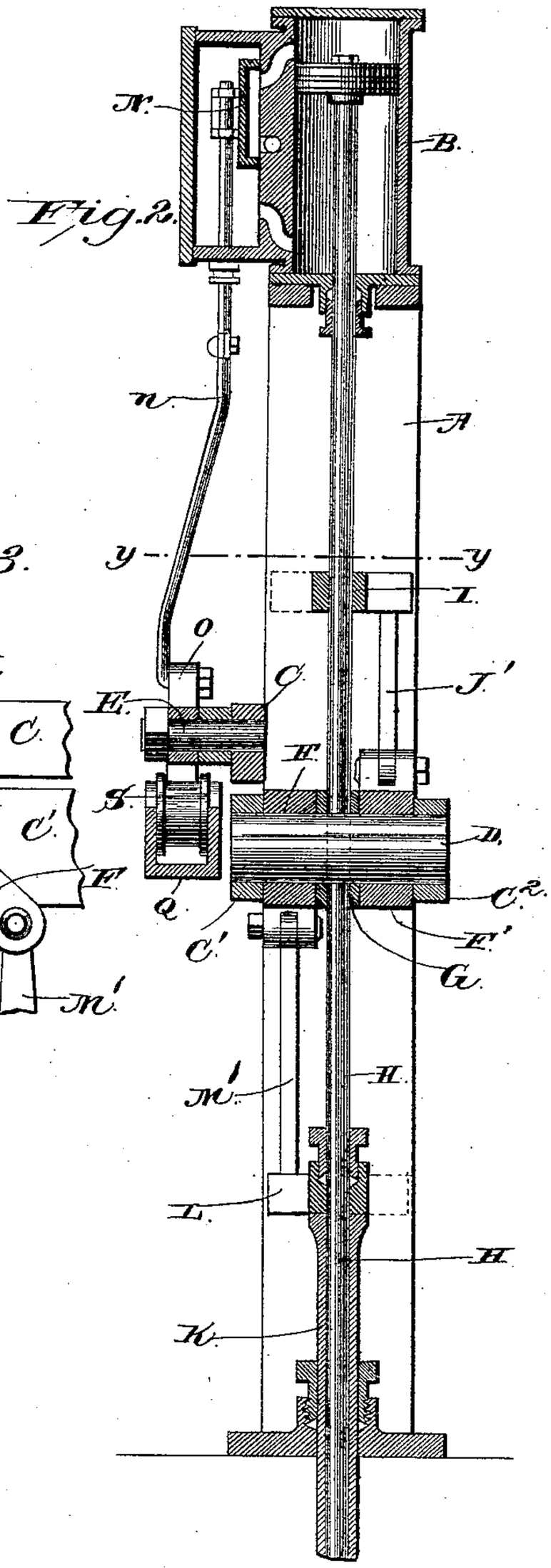

Fig. 2.

Witnesses:
M. Fowler
Wm. Bagger

Inventors
R. M. Downie and
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By their Attorneys
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

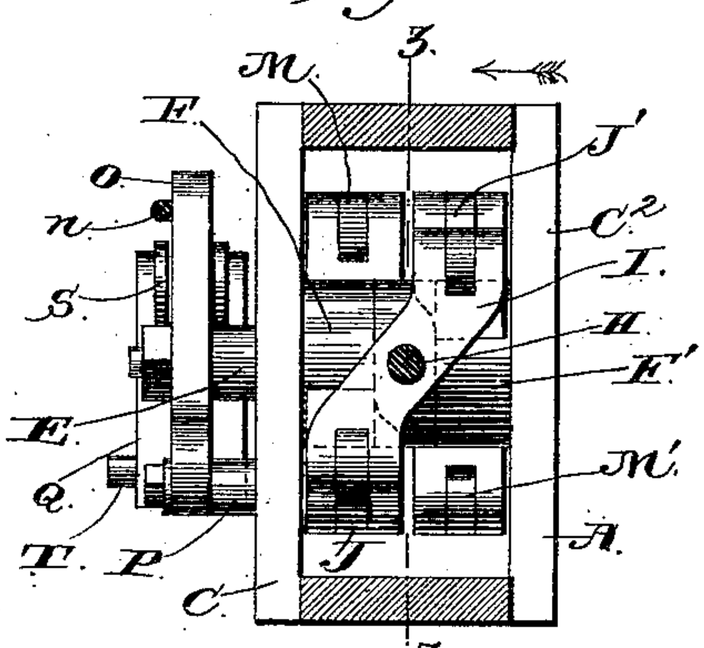
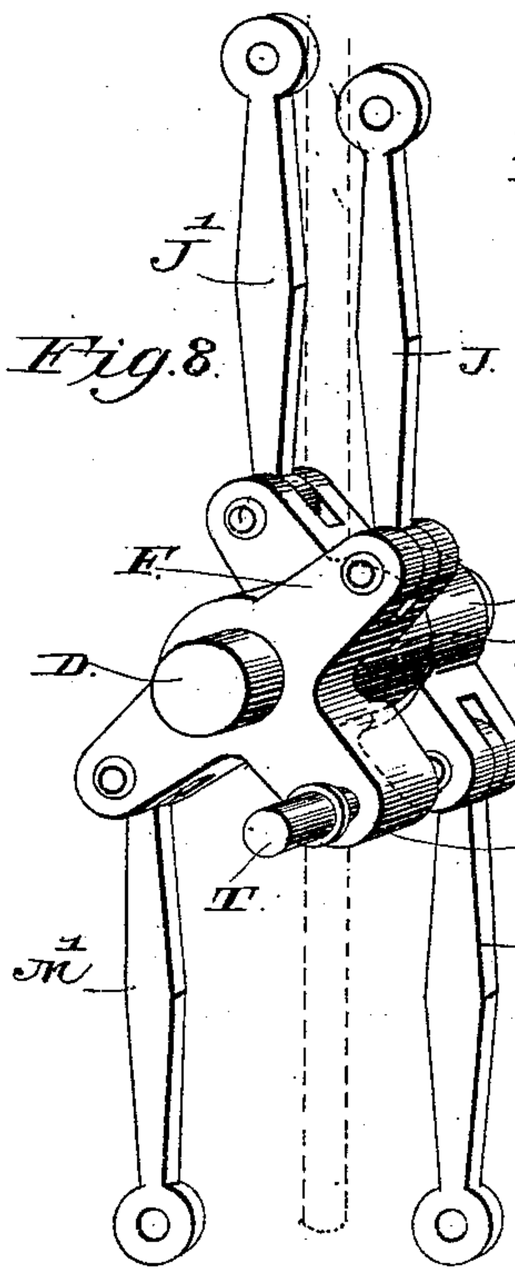


Fig. 5.

Fig. 8.



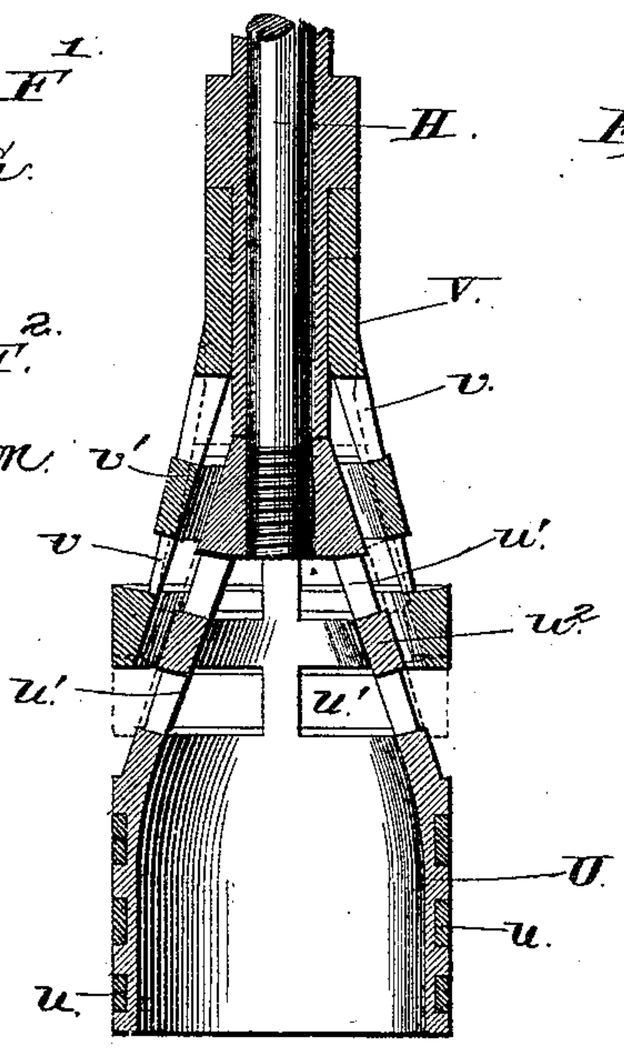


Fig. 7.

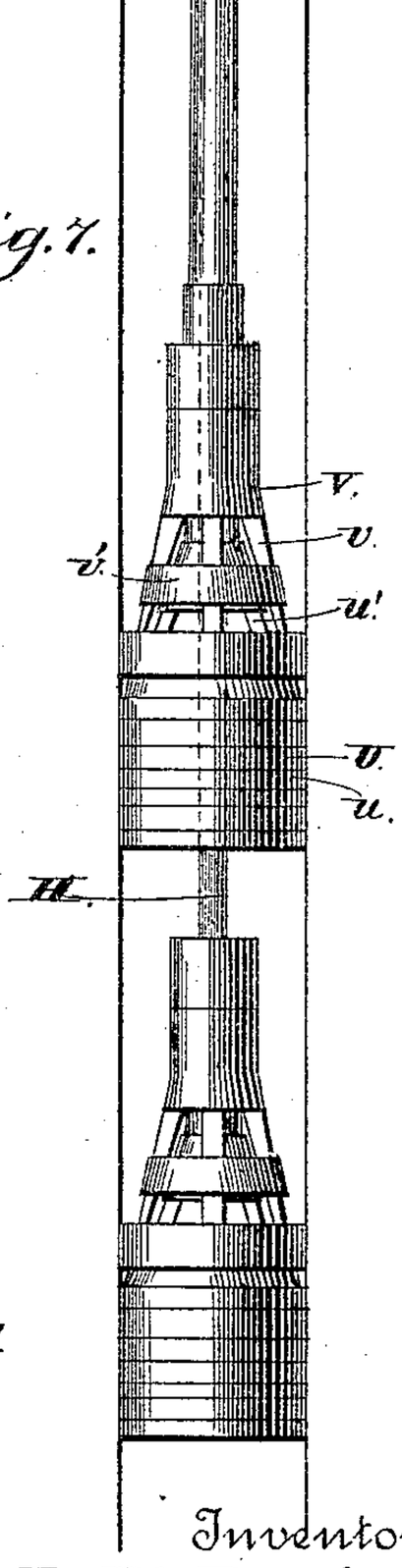
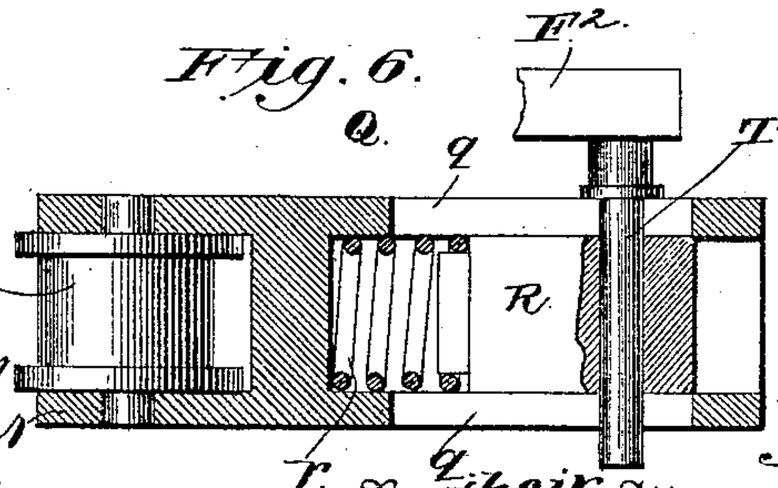


Fig. 6.



Witnesses
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E. G. Siggers
Wm. Bagger.

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By their Attorneys
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UNITED STATES PATENT OFFICE.

ROBERT M. DOWNIE AND JOHN G. DOWNIE, OF BEAVER FALLS, PENNSYLVANIA.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 444,627, dated January 13, 1891.

Application filed July 7, 1888. Serial No. 279,251. (No model.)

To all whom it may concern:

Be it known that we, ROBERT M. DOWNIE and JOHN G. DOWNIE, citizens of the United States, residing at Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Pumping-Engines, of which the following is a specification.

This invention relates to steam-pumps, and particularly to that class which are used for pumping Artesian wells.

The invention aims to provide means for operating the two plungers or valves in the Artesian well or water-cylinder in opposite directions at the same time by an ordinary engine, the said means through suitable devices controlling the motion of the slide-valve, and to provide a mechanism for the purpose hereinbefore specified, which will be simple, compact, efficient, and not liable to get out of repair.

The improvement consists of the peculiar construction and combination of the parts, which hereinafter will be more fully described and claimed, and shown in the annexed drawings, in which—

Figure 1 is a side view, parts being broken away, of a pump, showing an engine connected thereto by means of my invention. Fig. 2 is a vertical section on the line *x x* of Fig. 1. Fig. 3 is a detail vertical section on the line *z z* of Fig. 4, looking in the direction of the arrow. Fig. 4 is a horizontal section on the line *y y* of Fig. 2. Fig. 5 is a vertical central section of the plunger, on an enlarged scale, showing the motion of the valve by dotted lines. Fig. 6 is an enlarged section of the yielding connection carried by one of the walking-levers for operating the vibrating lever connected with the slide-valve of the engine on the line 6 6 of Fig. 1. Fig. 7 is a sectional view through a well, showing the pump in side elevation, with both plungers connected together. Fig. 8 is a detail view of the walking-levers and their connections.

The frame or stand A supports the engine B, of ordinary construction, and the mechanism for transmitting motion to the plungers and the slide-valve. The cross-bars C C′ C² preferably form an integral part of the frame A and support the rod D and the stud E, the rod D being held between the bars C′ and C² and the stud E being secured to the bar C. The walking-levers F and F′ are mounted on the rod D, and are separated by the collar G, keyed to the said rod D. The piston-rod H passes through a vertical opening in the bar D and the collar G, and is provided with the cross-head I, which is fastened thereto above the walking-levers. The ends of the cross-head I are connected with the opposite ends of the walking-levers by the pitmen J and J′.

The tubular rod K, mounted on the piston-rod H, is provided at its upper end with a cross-head L, similar to the cross-head I. The ends of the cross-head L are connected with the opposite ends of the walking-levers by the pitmen M and M′. The slide-valve N is connected by the rod *n* with one end of the vibrating lever O, which is mounted on the stud E, the other end of the lever having the slot *p*, through which the cushioned stop P, secured to the bar C, extends, to limit the movement of the said lever. The connection Q is hollow at its lower end to receive the block R, and has a grooved roller S at its upper end, which bears on the lower edge of the lever O and runs in the curved depression formed in the lower edge of the said lever directly below the stud E. The spring *r*, interposed between the bottom of the opening in the connection Q and the top of the block R, is sufficiently strong to effect a movement of the slide-valve and yield when the lever O is crowded against the stop P. The sides of the connection Q have slots *q* to permit the passage of the pin T, which extends from the walking-lever F or the extension F² of the said lever F. The extension or arm F² projects from the lever opposite its pivotal center and travels in the arc of a circle having the center of the bar D for its center. In practice as the rod H moves down it carries the cross-head I down with it, and the pitmen J and J′, connected with the said cross-head I, receive a corresponding downward movement and carry the opposite ends of the walking-levers F and F′ down with them. Obviously the corresponding ends of the walking-levers opposite to the ends carried down

will be elevated and through the pitmen M and M′ and the cross-head L will effect a corresponding upward movement of the rod K. Conversely, when the rod H moves upward, the reverse of the operation just described takes place and the rod K will be forced down The motion of the lever F effects a swinging movement of the arm F^2 and carries the lower end of the connection Q from side to side and causes the upper end of the said connection to travel in the curved depression in the lower edge of the lever and vibrate the said lever O and operate the slide-valve N.

In the operation of this pump it will be noticed that one of the plungers is moving up while the other one is moving down. The lower plunger on the upstroke will raise an amount of water equal to the cross-sectional area of the cylinder multiplied by the length of the piston-stroke, while the upper plunger on its downstroke will pass an amount of water equal to the cross-sectional area of the cylinder multiplied by twice the length of the piston-stroke. Thus the operation of this pump requires a valve with very large openings. Otherwise the friction of the water passing through the valves on the return will interfere with the operation of the pump. To meet this requirement, we provide the rods H and K each with a plunger, as shown in Fig. 5, which is composed of the frame U, having its lower end cylindrical and provided with packing-rings *n* and having its upper end conical and provided with a series of slots or openings *u′*, which are arranged around the frame in a circle, the circles of slots or openings being at different levels and separated by the solid ring u^2. The valve V is conical-shaped, and is adapted to fit snugly on the conical end of the frame U, and is provided with openings *v* opposite the solid portion u^2 of the frame, and has the portion *v′* opposite the openings *u′* in the frame solid. When the frame moves down, the water lifts the valve, and the frame registering therewith the water passes through the said openings and passes above the valve or plunger. When the frame or plunger moves up, the valve falls and closes the said openings.

The essential feature of this pump resides in the fact that it operates two plungers at the same time in opposite directions in the same cylinder and by an ordinary engine. The superior service and best operation of the pump depend largely upon the peculiar shape of the valve. The area of the openings in the valve is as great as or greater than the cross-sectional area of the cylinder in which it works. In the ordinary plungers it is quite different, for they usually employ a ball or some such valve, which takes up more than one-half of the cross-sectional area of the cylinder. By having the area of the openings in the valve as great as or greater than the area of the cylinder the plunger will raise an amount of water equal to the cross-sectional area of the water-cylinder.

We do not wish to be understood as claiming the conical valve, broadly, as such forms the subject-matter of an application filed by us March 27, 1889, Serial No. 305,011. Our claim to this valve in this application resides solely in the construction of the valve with openings the combined area of which is as great as or greater than the area of the cross-section of the cylinder in which the plunger works.

Having described our invention, we claim—

In a pumping-engine, the combination of the rod K and piston-rod H, each carrying a plunger, the plunger of the rod K moving in an opposite direction to the plunger of rod H, said plunger having a valve playing loosely over the outside thereof and provided with openings, the areas of which openings combined are as great as or greater than the area of the cross-section of the cylinder in which the plunger works, whereby one plunger on the upstroke will raise an amount of water equal to the volume of the cylinder within the limits of the stroke and the other plunger in the downstroke will pass an amount of water equal to the volume of the cylinder without undue friction, as set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in presence of two witnesses.

ROBERT M. DOWNIE.
JOHN G. DOWNIE.

Witnesses:
JOHN REEVES,
J. F. MERRIMAN.