(No Model.)

2 Sheets—Sheet 1.

J. G. DOWNIE.

STEAM PUMP.

No. 454,857. Patented June 30, 1891.

Fig. 1.

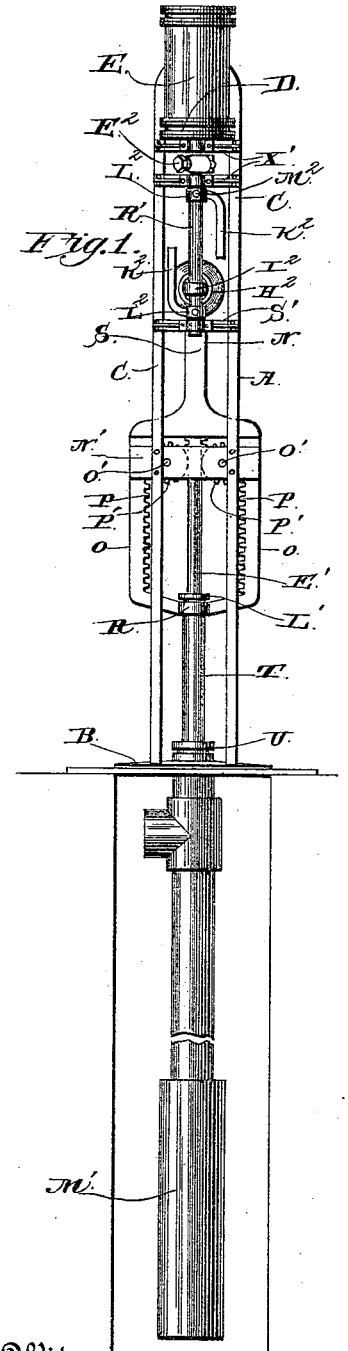
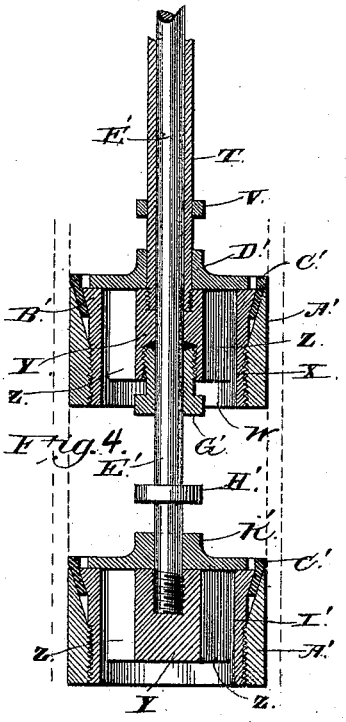


Fig. 4.



Witnesses.

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(No Model.) 2 Sheets—Sheet 2.

J. G. DOWNIE.

STEAM PUMP.

No. 454,857. Patented June 30, 1891.

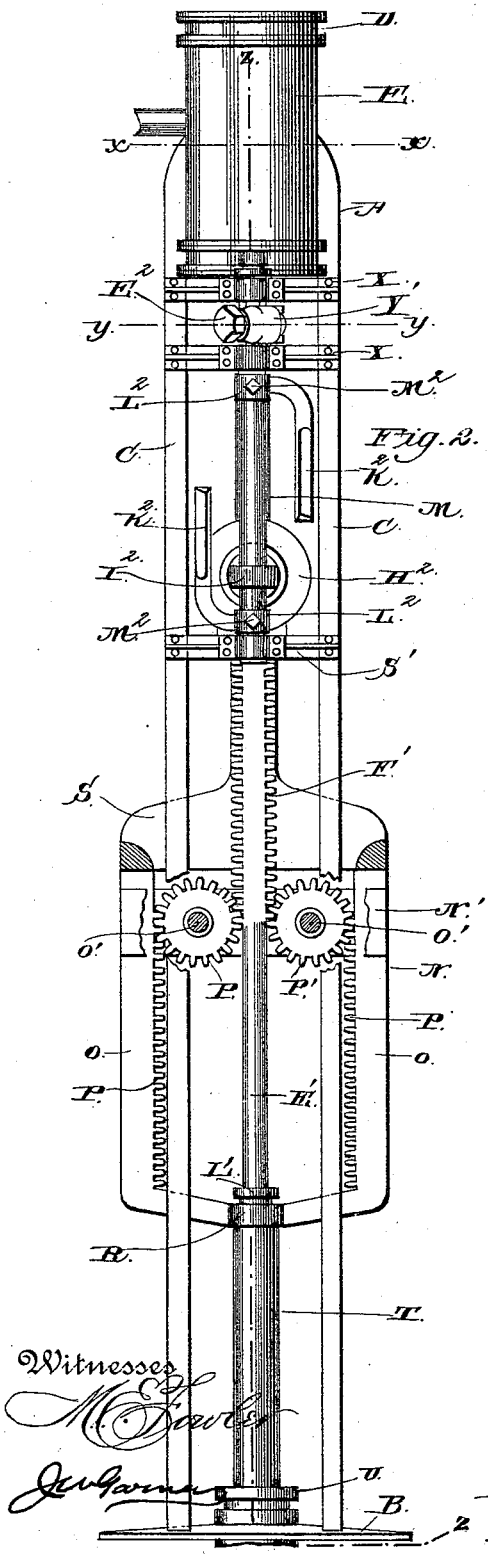

Fig. 2.

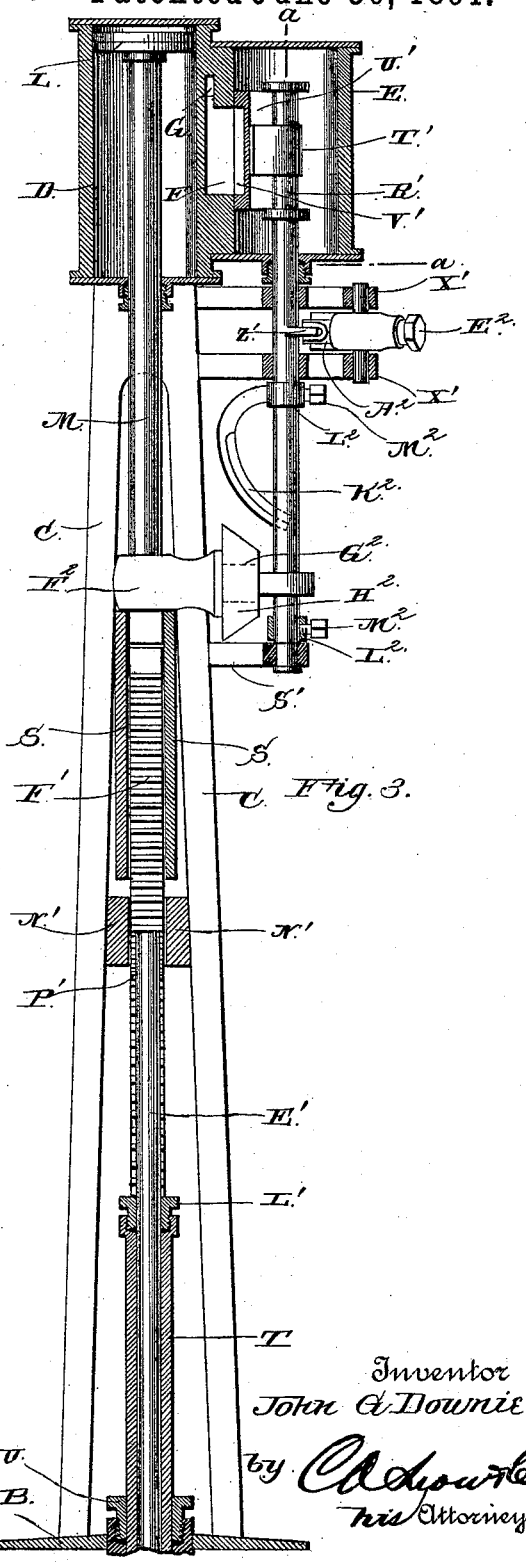

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN GALBRAITH DOWNIE, OF BEAVER FALLS, PENNSYLVANIA.

STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 454,857, dated June 30, 1891.

Application filed March 8, 1888. Serial No. 266,498. (No model.)

To all whom it may concern:

Be it known that I, JOHN GALBRAITH DOWNIE, a citizen 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 Steam-Pumps, of which the following is a specification.

My invention relates to an improvement in steam-pumps; and it consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of a steam pump and engine embodying my improvement. Fig. 2 is a similar view of the same on a larger scale, with parts broken away to disclose interior construction. Fig. 3 is a vertical central sectional view of the same. Fig. 4 is a vertical central sectional view of the plungers of the pump.

A represents a suitable frame which rises from the platform B. The frame A has a series of supporting legs or posts C, and to the upper end of the said frame is secured the steam-cylinder D of a steam-engine for operating the pump. This engine is not more fully described in this specification for the reason that I propose to make the same the subject-matter for another application for Letters Patent of the United States.

The piston-rod M of the engine has its lower end connected to a yoke N. The said yoke is substantially rectangular in form, and is provided on opposite sides with a pair of parallel arms O, on the inner sides of which are rack-teeth P. In the lower end of the yoke at the center of the same is a circular flange R, having a central circular opening and stuffing-box, and the upper side of the yoke is hollow or open, as shown in Figs. 2 and 3, and is provided with a pair of side plates S, which are arranged at a suitable distance apart. Secured to the flange R and depending from the same is a tubular cylindrical rod T, that passes through a stuffing-box U in the center of platform B and extends a suitable distance to a pump-cylinder M′, which may be located down in the well. The said tubular rod is provided near its lower end with a circular flange, collar, or offset V, and to the extreme lower end of the said tubular rod is screwed a plunger W, which comprises a cylindrical outer portion X, a central plug Y, and radial wings Z, connecting the said hub to the portion X. In the center of the hub is an opening which communicates with and has the same diameter as the bore of hollow rod T.

A′ represents a cylindrical casing which is screwed to the outer side of part X and is beveled on its upper inner side, as shown, and the upper portion of part X has a beveled bead or enlargement B′, which is on the same angle as the beveled inner side of the casing A′, thereby leaving an annular space between the part X and casing A′. In the said annular space is clamped the lower edge of an annular packing-collar C′, which is made of leather or other suitable material and the upper edge of which extends above the plunger.

D′ represents a valve having a central opening, through which the lower portion of tubular rod T extends, said valve being adapted to play vertically on said tube between the upper side of the plunger and the lower side of the collar or offset V, as will be readily understood.

E′ represents a solid rod which extends through the plunger W and through the bore of hollow rod T. The upper end of the said rod E′ is provided on opposite sides with rack-teeth F′ and is guided between the plates S at the upper end of the yoke.

In the lower portion of the hub of plunger W, through which the rod E′ passes, is a packing-box G′, and near the lower end of said rod is a projection, offset, or collar H′. To the extreme lower end of said rod E′ is screwed a plunger I′, which is similar to the plunger W, and has at its upper side a vertically-movable valve K′, which operates on the lower end of rod E′ and is similar to the valve D′. A packing-box L′ is arranged in the upper end of the hollow rod T to effect a tight joint with the solid rod E′. Said plungers W and I′ are arranged in a tube M′, (shown in dotted lines in Fig. 4,) which forms the cylinder or barrel of the pump in the usual manner.

N′ represents a pair of transverse bars or plates, which connect the supporting legs or

posts C of the frame and which form the guides for the yoke N. The said plates or bars are connected by spindles O′, which are arranged equally distant between the rack-teeth P and F′, and on the said spindles are journaled spur-pinions P′, the opposite sides of which mesh with the rack-teeth of the yoke and of the inner pump-rod E′.

The operation of my invention is as follows: When the yoke is forced downward by the piston-rod, it carries the plunger W with it and imparts rotary motion to the pinions P′, which pinions by meshing with the rack-teeth of the rod E′ raise the said rod simultaneously, and consequently elevate the plunger I′. On the reverse stroke of the piston the yoke is elevated, together with the plunger W, and the rod E′ and the plunger I′ are lowered, the said plungers W and I′ being thus moved simultaneously in opposite directions. While the plunger W is being moved upward the the valve D′ closes the vertical openings in the same between the radial ribs or wings, and thereby raises the column of water above said plunger, and at the same time the plunger I′ is descending in the well-tubing the valve K′ is open and water is being sucked upwardly through the lower plunger by the partial vacuum created in the tubing or barrel by the ascent of the plunger W. As soon as the latter reaches the upper limit of its stroke and the plunger I′ reaches the lower limit of its motion the valve K′ closes automatically by its own gravity and by the pressure of the superincumbent water, and on the next ensuing upstroke of the plunger I′ and the simultaneous downstroke of the plunger W the plunger I′ forces upward a column of water in the tubing, which column of water passes through the openings in the plunger W and raises the valve D′ thereof.

From the foregoing description it will be understood that one of the plungers is constantly lifting the column of water in the tubing, so that the water is kept in constant motion. Moreover, each plunger counterbalances the other, so as to neutralize its gravity, and consequently the engine has only to exert sufficient power to raise the column of water in the well-tubing plus the friction necessarily incident to the contact of the plungers with the said tubing or cylinder.

While describing my invention in a vertical position, I do not limit myself to a vertical movement or motion. As will be readily seen, the cylinder or tubing described as below or pending from the base B can be placed above the base B and the pump operated in any position without interfering with the principle of my invention; also, while describing the plunger W as connected to and operated by the yoke N, and thereby directly connected to the piston-rod M, I do not limit myself to this connection; but instead, and without changing the principle of my invention, I can as readily attach the rod E′ to the piston-rod M at a point above the rack-teeth F, connecting the yoke N to the hollow rod T. In this manner the piston-rod M would have direct connection with the plunger I′ instead of W and would produce all the results heretofore described; also, the plungers W and I′, instead of having their openings toward their operating-rods T and E′, may open in the opposite direction, as might be desirable in a horizontally-constructed pump, without changing the principle of the invention.

Having thus described my invention, I claim—

1. In a steam-pump, the mechanism for reciprocating pump-plungers in opposite directions, comprising the reciprocating yoke connected to one of the plungers, provided with a stuffing-box, and having the rack-teeth, the rod connected to the other plunger, extending through the stuffing-box in the yoke, and having the rack-teeth, the piston-rod of the engine connected directly to the end of said rod, and the spur-gears, one or more, meshing with the rack-teeth of the yoke and rod and connecting the same together, substantially as set forth.

2. In a steam-pump, the combination of the yoke adapted to reciprocate, having the rack-teeth P, and provided with a stuffing-box at one end, the tubular rod connected to said yoke, the valve-plunger attached to the said tubular rod, the rod E′, extending through the bore of the latter and having a plunger at its lower end, and its upper end, which extends through the stuffing-box in the yoke, provided with rack-teeth F′, the piston-rod of the engine connected direct with the upper end of said rod E′, and the spur-pinions P′, having their bearings in fixed supports, said pinions meshing with the rack-teeth P and F′ and transmitting motion from the rod E′ and the piston-rod to the yoke, substantially as set forth.

3. The combination of the yoke hollow at its upper end, provided with upwardly-extending guide-plates, having rack-teeth on the inner sides of its vertical arms, and provided with a stuffing-box at its lower end, the tubular plunger-rod depending from said yoke, the plunger-rod extending through the tubular plunger-rods and through the stuffing-box in the yoke and having its upper end provided with rack-teeth and guided between the guide-plates of the yoke, and the pinions journaled to fixed supports and meshing with the rack-teeth of the yoke and of the interior plunger-rod, substantially as set forth.

4. The plunger comprising a cylindrical casing screw-threaded at one end and provided at its other end with a beveled bead or flange, the hub, the connecting-fins, the shell screwed upon the casing and having a beveled end, the packing-ring, a tubular plunger-rod extending into the hub of the plun-

ger-casing, a valve seated upon the latter and mounted to slide upon said tubular plunger-rod, an inner plunger-rod extending through the tubular plunger-rod and through the hub of the plunger, a stuffing-box at the lower end of said hub, and a valved plunger at the lower end of the inner plunger-rod, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JOHN GALBRAITH DOWNIE.

Witnesses:
J. F. MERRIMAN,
JOHN REEVES.