(No Model.) 2 Sheets—Sheet 1.

# W. C. WELLS.

## APPARATUS FOR RAISING WATER.

No. 372,097. Patented Oct. 25, 1887.

*Fig. 1.*

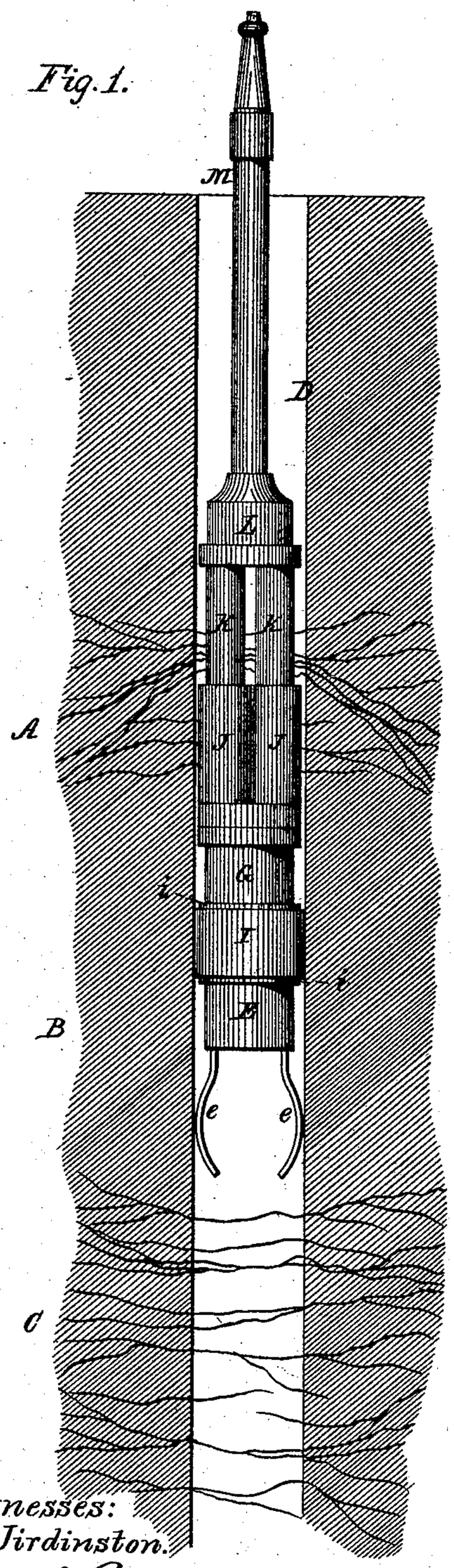
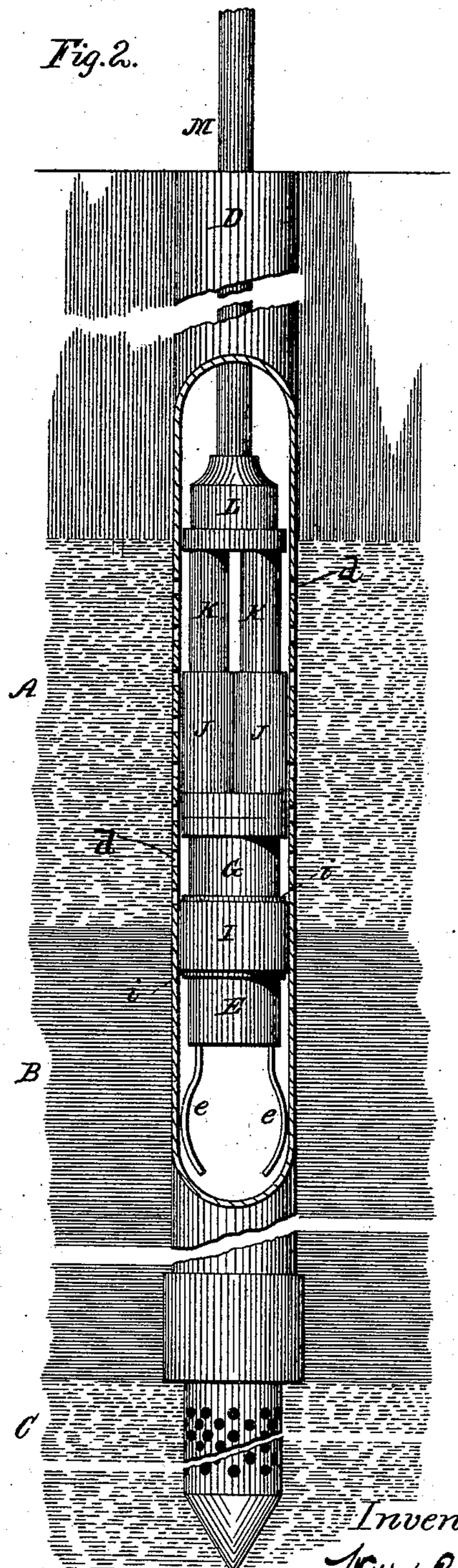



*Fig. 2.*

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(No Model.) 2 Sheets—Sheet 2.

# W. C. WELLS.

## APPARATUS FOR RAISING WATER.

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Fig. 3.

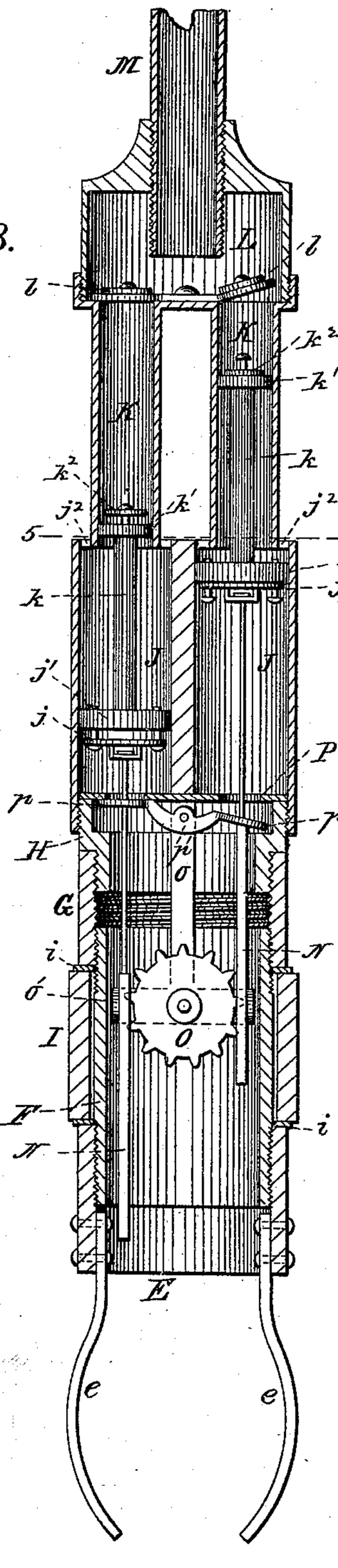



Fig. 4.

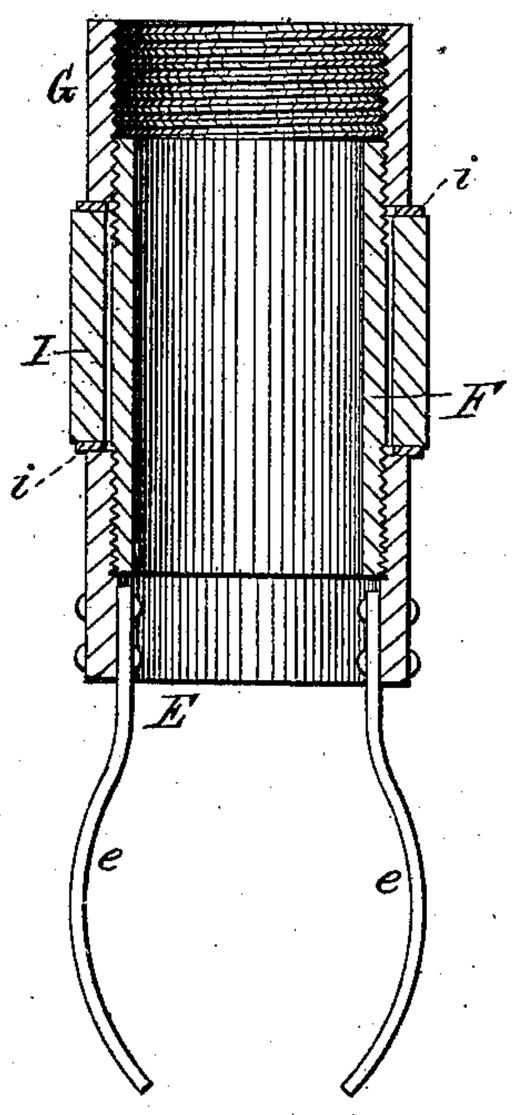



Fig. 5.

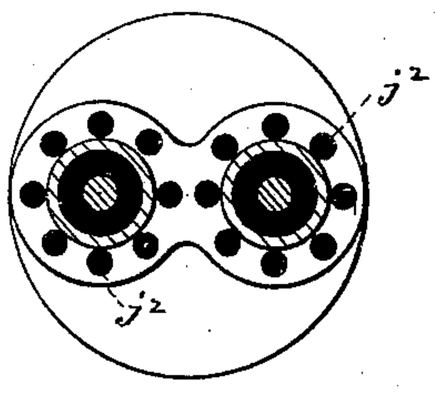
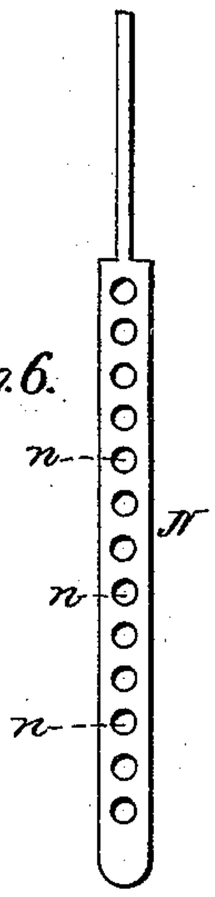



Fig. 6.

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# UNITED STATES PATENT OFFICE.

WILLET C. WELLS, OF TIFFIN, OHIO.

## APPARATUS FOR RAISING WATER.

SPECIFICATION forming part of Letters Patent No. 372,097, dated October 25, 1887.

Application filed July 26, 1886. Serial No. 209,083. (No model.)

*To all whom it may concern:*

Be it known that I, WILLET C. WELLS, a citizen of the United States, residing at Tiffin, in the county of Seneca and State of Ohio, have invented a certain new and useful Improvement in Apparatus for and Process of Raising Water, of which the following is a specification.

In boring for water it often happens that water-bearing strata are found in which the pressure of the water is sufficient to carry it but part way to the surface.

My invention consists in a method of utilizing the pressure or head of water for the purpose of forcing a percentage of its own volume to a greater height than the original pressure would carry it and in automatic apparatus therefor.

In the drawings, Figure 1 shows my pump seated in a drilled rock well. Fig. 2 shows the same seated in an ordinary tube-well. Fig. 3 is a longitudinal sectional view of the pump. Fig. 4 is a sectional view of the lower portion of the same. Fig. 5 is a cross-section on the line 5 5 of Fig. 3, and Fig. 6 is a detail of the lower portion of the piston-rods.

A represents a layer of earth or rock sufficiently porous or broken to be pervious to water.

B represents a stratum of clay or other material practically impervious to water; C, a water-bearing stratum in which the head or pressure is sufficient to force the water part way to the surface.

D represents the outer wall of a well, and may consist of the rock through which the well is drilled or the tubing of a bored or driven well, or any casing of like nature.

E is the induction-pipe of my improved pump, and *e e* springs attached thereto, and serving to hold it against rotation in the well.

F and G are screw-threaded coupling-pipes connecting the induction-pipe with a casing, H, inclosing a valve-chamber.

I is an elastic packing, preferably interposed between collars *i i*, upon the upper end of the induction-pipe and the lower end of the coupling G.

J J are piston-chambers, hereinafter called "piston-cylinders," connecting at their upper ends with smaller cylinders, K K, which connect with an air-chamber, L, from which leads the eduction-pipe M.

N N are piston-rods provided at their lower ends with a series of sprocket-openings, *n n*, adapted to take over the sprockets upon a sprocket-wheel, O, which may be mounted upon a bar, *o*, depending from a valve-plate, P, supported by the wall or casing H. A guide or yoke, *o'*, serving to hold the piston-rods in engagement with the sprocket-wheels, may also be attached to the bar *o*.

The valve-plate P is provided with twin apertures, under which are seated twin valves *p p*, so connected that one must close when the other opens. I have illustrated them as connected by a yoke, *p'*, pivotally mounted upon the bar *o*. The piston-rods take through the valves *p p*, and support valves *j j*, loosely connected with perforated pistons *j' j'*, adapted to reciprocate in the cylinders J J. The pistons *j' j'* are connected by piston-rods *k k* with perforated pistons *k' k'*, adapted to reciprocate in the piston-cylinders K K. These pistons are provided on their upper sides with valves $k^2$ $k^2$. The passages from the piston-cylinders K K to the air-chamber L are closed by upwardly-opening valves *l l*.

The pump is seated in a drilled rock well by placing it in such a position that the elastic packing I will be in the impervious stratum above the water-bearing stratum. The pump is then screwed downward relatively to the induction-pipe, thus expanding the packing I until it makes a water-tight connection with the wall of the well, thus preventing the passage of water except through the pump. The upper ends of the lower piston-cylinders are provided with waste-vents $j^2$, which should open into a stratum of soil or rock sufficiently porous or broken to carry off the waste water. The pump would be seated in a tube-well in the same manner; but the tubing should be provided with suitable perforations, *d d*, to allow the escape of the waste water.

In operation, one of the valves *p* being open, the water pours into the cylinder above, raising the piston, and at the same time rotating the sprocket-wheel O by means of the sprocket-rack upon the piston-rod, thereby actuating the piston-rod in the opposite cylinder in a downward direction. As the piston *j'* in one

cylinder reaches the limit of its upward movement, the shoulder *n* upon the piston-rod engages with the valve *p*, forcing it upon its seat, opening the opposite valve, and permitting the water to flow into the corresponding cylinder, thereby raising the piston in the last-mentioned cylinder and lowering that in the first cylinder, the valve *k* opening to permit the passage of the water through the piston. As the piston in the second chamber reaches its limit of upward motion, the position of the valves *p p* is again reversed, permitting the flow of the water into the first cylinder and forcing a portion of the water already filling that cylinder upward into the smaller piston-cylinder K, the remainder passing off through the waste-vents. By the succeeding stroke of the pistons the other upper cylinder K is filled with water, and the next stroke forces the water from the first filled of the two upper cylinders into the air-chamber, and the operation is automatically repeated, each stroke of the pistons forcing the water from one of the cylinders K into the air-chamber and thence into the eduction-pipe.

It will be observed that the power is used to force the water in the same direction from which it comes instead of in the opposite direction, as in the hydraulic ram, and that the flow is unbroken instead of pulsational, as in the ram.

The power which would tend to throw a large volume of water a given distance is transmitted from the larger to the smaller volume, and thereby enabled to propel it to a proportionately greater altitude. It will be observed, also, that my apparatus is of such form and construction that it can be placed in drilled or tube wells.

I do not limit myself to the details of construction shown and described, as it is obvious that these may be greatly varied by any skilled mechanic.

I claim as my invention—

1. In an automatic pump, the combination of twin series of valved pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, and valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, substantially as and for the purpose specified.

2. In an automatic pump, the combination of twin series of pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, and a waste vent or vents at or near the point of junction between the upper cylinder and that below with which it is connected, substantially as and for the purpose specified.

3. In an automatic pump, the combination of twin series of pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, an air chamber extending above the lower end of the eduction-pipe, and egress-valves, whereby the water in the air-chamber may be shut off from each of the upper piston-cylinders during the downward stroke of the corresponding piston, substantially as and for the purpose specified.

4. In an automatic pump, the combination of twin series of pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, an air-chamber extending above the lower end of the eduction-pipe, valves whereby the water in the air-chamber may be shut off from each of the upper piston-cylinders during the downward stroke of the corresponding piston, and waste-vents at or near the point of junction between the upper cylinder and the cylinder below with which it is connected, substantially as and for the purpose specified.

5. In an automatic pump, the combination of twin series of pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, and a packing adapted to connect the tubing of the well with the impervious stratum above a water-bearing stratum, substantially as and for the purpose specified.

6. In an automatic pump, the combination of twin series of valved pistons reciprocating in twin series of piston-cylinders, the upper piston and cylinder of each series being of smaller diameter than that below with which

it is connected, an induction-orifice beneath the lower piston-cylinders, valves whereby the head of water can be alternately directed to and shut off from each of the lower pistons, thereby causing an upward stroke of one series of pistons and permitting a downward stroke of another series, an air-chamber extending above the lower end of the eduction-pipe, valves whereby the water in the air-chamber may be shut off from each of the upper piston-cylinders during the downward stroke of the corresponding pistons, a waste vent or vents at or near the point of junction of the upper cylinders with those below with which they are connected, and a packing adapted to connect the tubing of the well with the impervious stratum above the water-bearing stratum, substantially as and for the purpose specified.

7. In an automatic pump, the combination of twin series of valved pistons adapted to reciprocate in twin series of piston-cylinders and to be driven by the force of an underground head of water, the upper piston and cylinder of each series being of smaller diameter than that below with which it is connected, an induction-orifice beneath the lower piston-cylinders, and a connection between the piston-rods of each series, whereby the upward movement of one series causes the downward movement of the other, substantially as and for the purpose specified.

8. In an automatic pump, the combination of a pair of lower piston-cylinders, a pair of upper piston-cylinders of smaller diameter whose piston-rods are connected with and moved by the corresponding lower piston-rods, a connection between the piston-rods of each series, whereby the upward movement of one causes a downward movement of the other, and ingress-valves, whereby the head of water is alternately directed to and shut off from each of the lower piston cylinders, for the purpose specified.

9. In an automatic pump, the combination of a pair of lower piston-cylinders and a pair of upper piston-cylinders of smaller diameter, the piston of each upper cylinder being connected with and actuated by the rod of the corresponding lower piston, sprocket-racks upon the piston-rods, a sprocket-wheel engaging therewith and adapted to be actuated alternately by the piston-rods of each series, thereby imparting motion in an opposite direction to the piston-rods of the other series, and valves whereby the head of water is alternately directed to and shut off from each of the lower piston-cylinders, for the purpose specified.

10. In an automatic pump, the combination of a pair of lower piston-cylinders, a pair of upper piston-cylinders of smaller diameter whose piston-rods are connected with and moved by the corresponding lower piston-rods, shoulders upon the piston-rods, ingress-valves connected by a hinged yoke and adapted to be alternately actuated by the shoulders upon the respective piston-rods, sprocket-racks upon the piston-rods, and a sprocket-wheel adapted to be actuated alternately by the piston-rods of each series, thereby imparting motion in an opposite direction to the piston-rods of the other series, for the purpose specified.

11. In an automatic pump, the combination of a pair of lower piston-cylinders, a pair of upper piston-cylinders of smaller diameter whose piston-rods are connected with and moved by the corresponding lower piston-rods, a connection between the piston-rods of each series, whereby the upward movement of one series causes a downward movement of the other, ingress-valves, whereby the head of water is alternately directed to and shut off from each of the lower piston cylinders, and waste-vents at or near the point of junction between the upper and lower cylinders, substantially as and for the purpose specified.

12. In an automatic pump, the combination of a pair of lower piston-cylinders, a pair of upper piston-cylinders of smaller diameter whose piston-rods are connected with and moved by the corresponding lower piston-rods, a connection between the piston-rods of each series, whereby the upward movement of one series causes a downward movement of the other, ingress-valves, whereby the head of water is alternately directed to and shut off from each of the lower piston-cylinders, waste-vents at or near the point of junction between the upper and lower cylinders, and an elastic packing adapted to press against the interior wall or casing of the well between the induction-pipe and the waste-vents, substantially as and for the purpose specified.

13. In an automatic pump, the combination of a pair of lower piston-cylinders, a pair of upper piston-cylinders of smaller diameter whose piston-rods are connected with and moved by the corresponding lower piston-rods, shoulders upon the piston-rods, ingress-valves connected by a hinged yoke and adapted to be alternately actuated by the shoulders upon the respective piston-rods, sprocket-racks upon the piston-rods and a sprocket-wheel adapted to be actuated alternately by each of said piston-rods, thereby imparting motion in an opposite direction to the other, waste-vents at or near the point of junction between the upper and lower cylinders, an elastic packing adapted to press against the interior wall of the well between the induction pipe and the waste-vents, screw-threaded couplings, whereby said packing may be expanded, and springs adapted to hold the eduction-pipe against rotation in the well, substantially as and for the purpose specified.

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