

G. W. PRICE.
DEEP WELL PUMP.
APPLICATION FILED JULY 21, 1908.

930,614.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

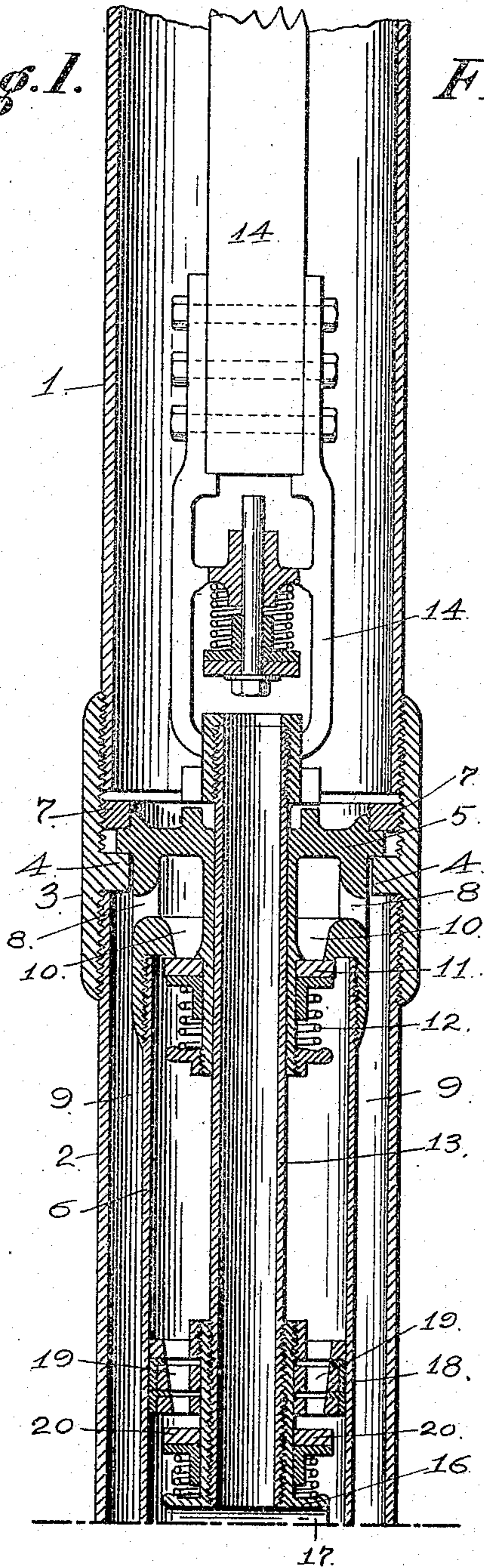
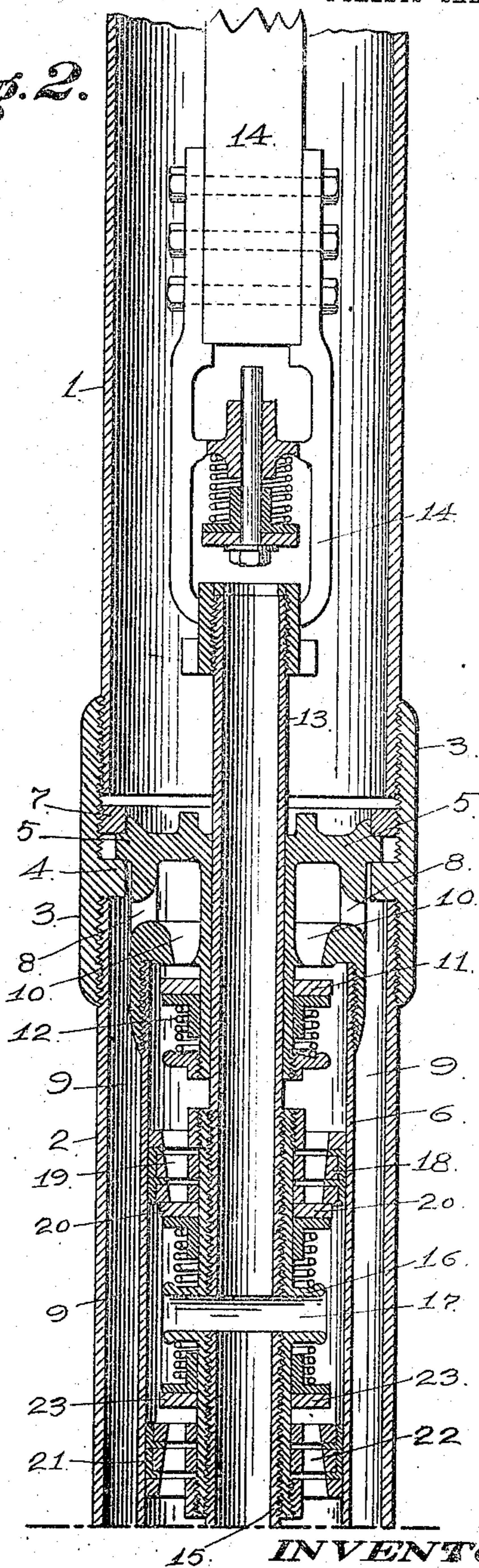


Fig. 2.



WITNESSES.

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2 SHEETS—SHEET 2.

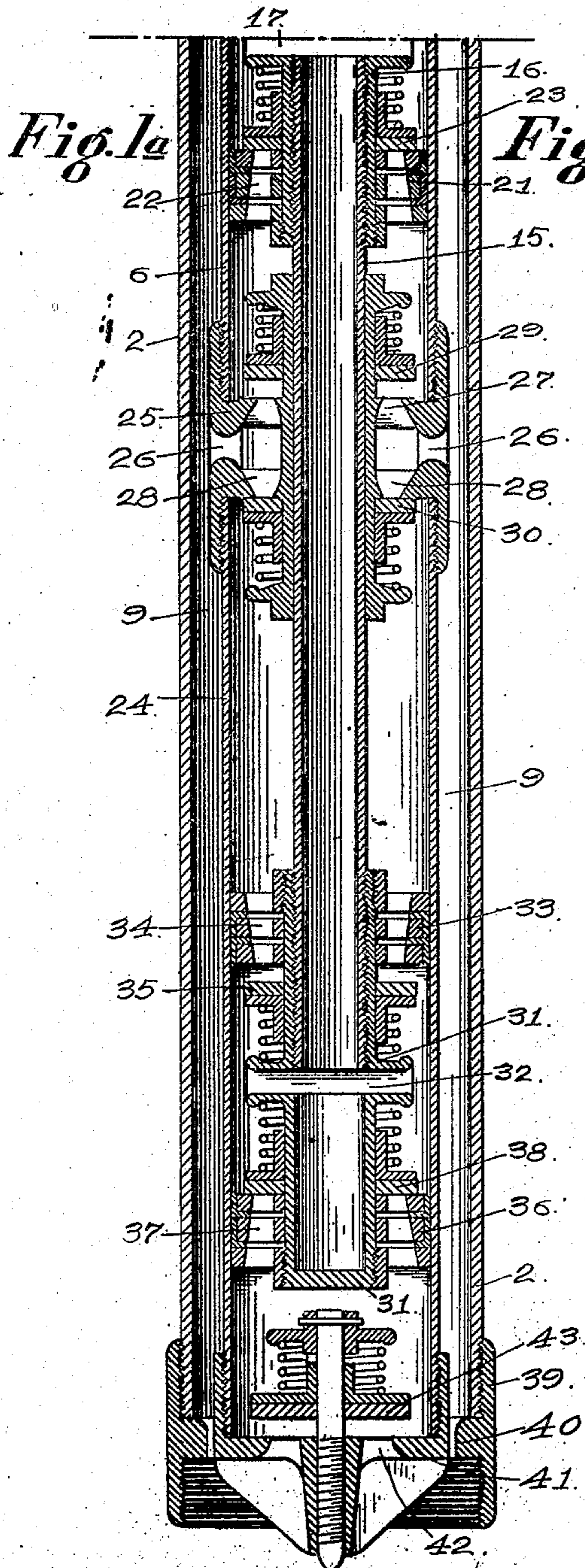
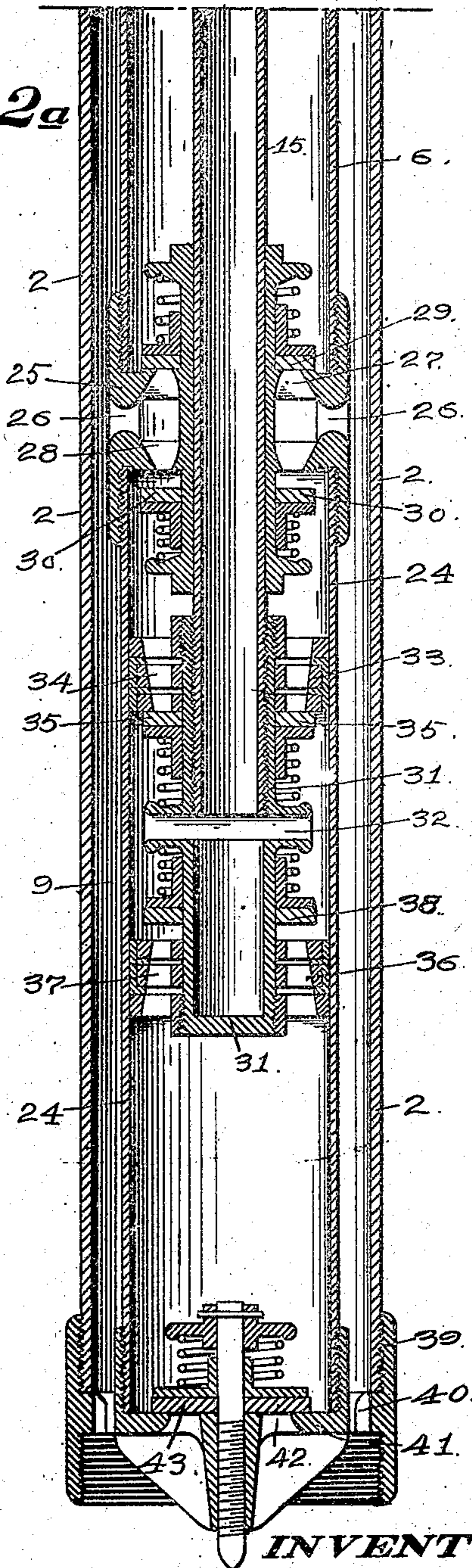


Fig. 2a



WITNESSES.

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UNITED STATES PATENT OFFICE.

GOMER W. PRICE, OF OAKLAND, CALIFORNIA.

DEEP-WELL PUMP.

No. 930,614.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed July 21, 1908. Serial No. 444,568.

To all whom it may concern:

Be it known that I, GOMER W. PRICE, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Deep-Well Pumps, of which the following is a specification.

My invention relates to the class of deep-well pumps of the plunger type, and it consists in the novel pump which I shall hereinafter fully describe.

The object of my invention is to provide a pump capable of raising large quantities of water for irrigation and for other purposes, from bored or Artesian wells of great depth, said pump being of simple construction, adapted for indefinite extension, and capable of economic operation. In irrigation reclamation fields where, on account of excessive pumping, the water level has been lowered, the favorite centrifugal pumps are no longer available without the trouble and expense of making pits to receive them in order to get them near the water. The pumps which followed these centrifugal pumps, namely the single acting cylinders located at different levels in a cased well are open to the objection of insufficient capacity to deliver the water the well was able to supply. The double plunger pump, which has taken the place of these, and in which one plunger operates above another in opposite direction, while of greater capacity, is objectionable from an economical standpoint, in that it requires a costly arrangement of pump head, a double set of cranks, connecting rods, cross heads, and plunger rods, which fit one within the other. The operation of this type of pump, especially in sandy water, has always been costly and annoying, because no means have been devised to prevent the water and sand from getting in between the two plunger rods and causing them to cut and wear, resulting in the frequent wearing out and breaking of the pump rods, and the consequent breaks in other portions of the pump. Moreover, these pumps are not able to deliver the amount of water many wells can furnish.

By my invention, I provide a pump which I may appropriately call a "multi-plunger cylinder" which avoids all these objections in that it is capable, by its simple and indefinite extension, of delivering all the water supplied, and by its construction and

mode of operation it is not open to the objection of costly manufacture, or expensive maintenance.

Referring to the accompanying drawings:—Figure 1 is a vertical section of the upper portion, broken, of my pump, showing the plungers on the up-stroke. Fig. 1^a is a vertical section of the lower portion of said pump, being a continuation of Fig. 1. Fig. 2 is a vertical section of the upper portion, broken, of the pump, showing the plungers on the down-stroke. Fig. 2^a is a vertical section of the lower portion of said pump, being a continuation of Fig. 2.

1 is the discharge pipe, which serves the additional purposes of sustaining the cylinder, and containing and guiding the operating-rods.

2 is a downward extension of the discharge pipe 1, connected with it by a coupling 3, which is formed with an internally projecting flange 4, upon which rests the head casting 5 of the upper section 6 of the cylinder, which is thus suspended within the extension 2. A screw ring 7 holds the head 5 down to its seat on the flange 4, so that the interior of the extension 2 is not in direct communication with the interior of the discharge pipe 1.

The suspending head 5 of the cylinder section 6 is formed below its top with an annular series of ports 8, which communicate exteriorly with the space 9 between the cylinder 6 and the extension 2, and interiorly with a port 10, opening through the base of the head, which port 10 is controlled by a valve 11, held to its seat by a spring 12.

13 is the upper section of a hollow plunger rod which passes down through the cylinder head, and has connected with its upper end the propelling rod 14. The hollow plunger-rod section 13, is connected within the cylinder section 6 to a succeeding similar plunger-rod section 15, by a coupling 16 which has ported extensions 17 communicating exteriorly with the interior of the cylinder 6 and interiorly with the hollow plunger-rod sections.

Upon the upper end of the coupling 16 is a plunger 18, fitting the cylinder section 6, and having ports 19 made through it. These ports are controlled from below by a spring-actuated valve 20. Upon the lower end of the coupling 16 is another plunger 21, also fitting the cylinder 6, and having ports 22

through it, which are controlled from above by a spring-actuated valve 23. These two plungers are respectively above and below the ports 17. Springs interposed between the ported extension 17 and the valves 20 and 23 normally hold the valves seated.

24 is a succeeding cylinder section. It is connected with the upper cylinder section 6, by a coupling 25, which has in its circumference an annular series of ports 26 communicating exteriorly with the space 9 between the extension 2 and the cylinder sections, and interiorly with a port 27 opening upwardly through the top of the coupling, and with a port 28 opening downwardly through the bottom of the coupling. The coupling 25 conveniently comprises a tubular portion sleeved on the plunger rod 15 and having outward extensions constituting seats for the adjacent terminals of the cylinders, which latter are threaded to said outward extensions.

The upper end of the coupling is provided with a spring-controlled valve 29 which controls the upper port 27, and the lower end of the coupling has a spring-controlled valve 30, which controls the lower port 28.

The second section 15 of the plunger rod plays down through the coupling 25 of the cylinder sections, and has secured upon its lower end a second coupling 31, which, if a third plunger-rod section were to follow, would be precisely like the first plunger-section 16; but, as here illustrated, no more plunger-rod sections following, said coupling has its lower end closed as shown. This coupling 31, has at its middle ported extension 32 which communicates exteriorly with the cylinder section 24 and interiorly with the hollow plunger rod section 15. Upon the upper end of the coupling 31 is a plunger 33 which fits the cylinder section 24, and has made through it the ports 34, which are controlled from below by a spring-controlled valve 35. Upon the lower end of coupling 31 is a second plunger 36, also fitting the cylinder section 24, and having ports 37 through it, which are controlled from above by a spring-controlled valve 38, springs being interposed between the ported extension and the respective valves and for normally holding the latter seated.

To the lower end of the discharge pipe extension 2 is fitted a foot guide 39, which if more extensions were to follow, could serve as a coupling for the next extension; but as here shown, this is the bottom of the pump. This foot guide is provided with spaced lugs 40 projecting inwardly and which serve as guides to steady the base of the cylinder section 24. This section has fitted to its lower end a foot plate 41 with ports 42, which are controlled from above by a spring-controlled valve 43.

The operation of the pump is as follows,

assuming first: that several strokes have been made, so that every portion and stage of the cylinders, valves, plunger-rods and encircling pipes are charged with water. When the propelling rod 14 is moving upwardly, as shown in Fig. 1, the bottom valve 43 in the lower cylinder section 24 opens, as does also the upper valve 29 of the cylinder-section coupling 25 which valve is really the bottom valve of the upper cylinder section 6. Water now flows past valve 43 into the lower end of cylinder section 24 and follows the lower plunger 36 upwardly within said section. The water which is in the space 9, between the cylinder and the outer casing 2 (the parts being submerged) flows from said space through the ports 26 in the cylinder-section coupling 25 and up through the port 27 and past the open valve 29 into the upper cylinder section 6 and follows upwardly the lower plunger 21 therein. During this upward stroke, the water which is in the lower cylinder section 24, above the upper plunger 33 therein being unable to pass upwardly by the closed valve 30 is forced to flow downwardly through the ports 34 of said upper plunger, past the open valve 35 controlling said ports, and being stopped by the lower closed valve 38 from passing through the ports of the lower plunger 36, is forced to flow through the ports 32, of the coupling 31 into the hollow plunger-rod section 15 and thence upwardly through the entire length of all the plunger rod sections into the discharge pipe 1, and to the surface of the ground. In like manner, the water which is above the upper plunger 18 in cylinder section 6, being unable to pass the closed valve 11 above is forced downwardly through the ports 19 of said upper plunger, past the open valve 20 which controls said ports, and being unable to pass through the ports 22, of the lower plunger 21, because of their closed valve 23, is forced to flow through the ports 17 of the coupling 16 into the lower end of the upper plunger rod section 13 and thence upwardly to the discharge pipe 1 and the surface of the ground.

On the return or down stroke, as seen in Fig. 2, the water which entered the lower cylinder section 24 below the lower plunger 36 being unable to pass back through the now closed lower valve 43, will be forced up through the ports 37 of said lower plunger, past the open valve 38 controlling said ports, and through the ports 32 of the coupling 31 into the hollow plunger rod and thence to the surface. At the same time, water from space 9 will flow through the ports 26 of the cylinder section coupling 25, and down through the port 28 and open valve 30 and will fill the cylinder section 24 above the upper plunger 33 therein. In similar manner the water will flow in the upper stage or cylinder section of the pump. By

this construction, any number of cylinders may be connected end to end. The water can be taken in at the end of each cylinder, each of which may be used as single or as double acting pump. All the plungers can be operated by one plunger rod.

The capacity of the pump is limited only by the practical flowing velocity of water through the discharge pipe instead of being controlled by the area of its plunger.

The extension 2 of the discharge pipe, not only serves to guide and steady the cylinder at its bottom, but also serves as a suction pipe in case the water recedes below the top of the upper cylinder section 6. In case, however, that said cylinder section is at all times sufficiently submerged, even while operating at its maximum capacity, the extension 2 is not necessary.

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

1. A deep-well pump, comprising a plurality of connected alined cylinders, each cylinder having at one end its own independent inlet communicating directly with the exterior water at a point below the upper end of the lower cylinder; a pair of spaced plungers in each of said cylinders, each plunger being provided with ports; valves controlling said plunger ports; a hollow plunger rod common to and connected with all the plungers to operate them simultaneously in the same direction; said plunger rod being closed at its lower end and having a valveless port at a point between the members of each pair of ported plungers, whereby each cylinder communicates with the cavity in said plunger rod; the cylinders at their meeting ends providing an auxiliary inlet intermediate the pairs of plungers; valves to control all the cylinder inlets; and a discharge pipe to which the hollow plunger rod delivers.

2. In a pump of the character described, the combination of a cylinder, a plurality of alined hollow plunger rods mounted within the cylinder, a coupling member secured to the adjacent ends of the plunger rods, the coupling member having an opening intermediate its ends communicating with an opening between the adjacent ends of the plunger rods, and ported plungers sleeved upon said coupling upon opposite sides of the opening in said coupling member, and valves for the ports of the plungers.

3. In a pump of the character described, the combination of a plurality of alined hollow plunger rods, a coupling member secured to the adjacent ends of the plunger rods, the coupling member having an opening intermediate its ends communicating with an opening between the adjacent ends of the plunger rods, and ported plungers sleeved upon said coupling upon opposite sides of the opening

in said coupling member, and valves for the ports of the plungers, a sleeve upon the end of one of said plunger rods and having an opening communicating with an opening in the plunger rod, and ported plungers upon said sleeve upon opposite sides of the opening, and valves for said ports, and a cylinder surrounding the plungers, the cylinder being open at its ends and having an intermediate opening at a point between said coupling member and sleeve.

4. In a pump of the character described, the combination of a plurality of alined hollow plunger rods, a coupling member secured to the adjacent ends of the plunger rods, the coupling member having an opening intermediate its ends communicating with an opening between the adjacent ends of the plunger rods, and ported plungers sleeved upon said coupling upon opposite sides of the opening in said coupling member, and valves for the ports of the plungers, a sleeve upon the end of one of said plunger rods and having an opening communicating with an opening in the plunger rod, and ported plungers sleeved upon the last mentioned sleeve upon opposite sides of the opening, and valves for said ports, a cylinder surrounding the plungers, the cylinder being open at its ends and having an intermediate opening at a point between said coupling member and sleeve, and a casing extending continuously from top to bottom of the cylinders, the casing being free from openings except at its ends.

5. A deep-well pump comprising plural, alined and connected pipes, the upper one of which serves as a discharge pipe; a plurality of connected, alined cylinders, suspended in the discharge pipe, and thence passing down into the extensions thereof and separated therefrom by a space, each cylinder having its own independent inlets communicating with said space; valves controlling said inlets; a pair of spaced plungers in each cylinder, each plunger being provided with ports; valves controlling said plunger-ports; and a hollow plunger-rod common to and connected with all the plungers to operate them simultaneously in the same direction, said plunger-rod having its upper end communicating with the discharge pipe, and having also a port at a point between the members of each pair of ported plungers, whereby each cylinder communicates with the cavity of said plunger-rod.

6. A deep-well pump comprising a discharge pipe; an extension pipe therefrom passing down into the well; a coupling connecting the discharge pipe and its extension, said coupling having an internal annular flange; a cylinder head supported on said flange and having an annular series of ports communicating with the interior of the ex-

tension pipe, and having also downwardly opening ports leading through its bottom from the annular series of ports; a valve on the cylinder head to control said bottom ports; a cylinder section secured to said head and extending down within and separated from the extension pipe, said cylinder section communicating through the head ports with the separating space between the extension pipe and cylinder; a second cylinder section in line with the first; a coupling uniting the two cylinder sections, said coupling having ports communicating with the space exterior thereto and with each cylinder section; valves on the coupling controlling the communication of said ports with the cylinder section, a foot valve in the lower end of the second cylinder section; a hollow plunger rod section communicating above with the discharge pipe; a second plunger rod section; a coupling uniting the two sections of the plunger rod, said coupling having a port through which the upper cylinder section communicates with the upper plunger rod section; a second coupling on the lower end of the second plunger-rod section, said coupling having a port through which the second cylinder section communicates with the second plunger rod section; a pair of ported plungers on each plunger rod-section, one plunger of each pair being above and the other below the said ports in said plunger-rod sections, and valves on the plunger-rod couplings controlling the ports of the plungers.

7. A deep-well pump comprising a discharge pipe; an extension pipe therefrom passing down into the well; a coupling connecting the discharge pipe and its extension, said coupling having an internal annular flange; a cylinder head supported on said flange, and having an annular series of ports communicating with the interior of the extension pipe, and having also downwardly opening ports leading through its bottom from the annular series of ports; a valve on the cylinder head to control said bottom ports; a cylinder section secured to said head and extending down within and separated from the extension pipe, said cylinder section communicating through the head ports with the separating space between the extension pipe and cylinder; a second cylinder section in line with the first; a coupling uniting the two cylinder sections, said coupling having ports communicating with the space exterior thereto and with each cylinder section; valves on the coupling controlling the communication of said ports with the cylinder sections; a foot valve in the lower end of the second cylinder section; a hollow plunger rod section communicating above with the discharge pipe; a second plunger rod section; a coupling uniting the two sections of the plunger rod, said

coupling having a port through which the upper cylinder section communicates with the upper plunger rod section; a second coupling on the lower end of the second plunger-rod section, said coupling having a port through which the second cylinder section communicates with the second plunger rod section; a plunger on each plunger-rod section, said plunger having ports through them and valves controlling said ports.

8. In a pumping apparatus of the character described, a cylinder having openings at its respective ends, a hollow plunger rod operating therein and having intermediate its ends a transverse ported extension, apertured plungers on the rod one on each side of said extension, valves for the plunger, and springs arranged between the valves and contacting with the ported extension for normally holding the valves seated.

9. In a pumping apparatus of the character described, a cylinder having inlet openings at its respective ends, a valve for each inlet, a hollow plunger rod operating within the cylinder, the rod being closed at its lower end and open at its upper end to discharge the contents of the apparatus, a transverse ported extension intermediate the ends of the rod, apertured plungers on the rod on each side of said extension, valves for the plungers, and spring members arranged between the valves and contacting with the ported extension for normally holding the plunger valves seated.

10. In a pumping apparatus of the character described, the combination of a plurality of cylinders and a discharge pipe, all in alignment, the lower cylinder having at its lower end an inlet, a casing extending throughout the length of both cylinders and connecting with the discharge pipe, said casing having a single inlet adjacent the inlet of said lower cylinder, a coupling member for the respective cylinders, said coupling member having apertures communicating with the casing and each cylinder, a ported cap member for the upper end of the upper cylinder communicating with the casing, a hollow plunger rod communicating with the discharge pipe and closed at its lower end, the plunger rod having a port in each cylinder, apertured plungers mounted on the rod two for each cylinder and one upon each side of the plunger rod ports, and valves for the cylinder inlets and plunger ports constructed and arranged to permit all of said plungers to simultaneously force the water in to the hollow rod and thence to the discharge pipe in both directions of the plunger movement.

11. A pump of the character described, comprising two aligned hollow open ended cylinders communicating directly with the water supply, a centrally arranged hollow plunger rod, a coupling member comprising a tubular portion loosely sleeved on said

hollow rod and having outward extensions constituting seats for the adjacent terminals of the cylinders, an interlocking connection between the said outward extensions and the said cylinders, and said coupling members having openings communicating with the respective cylinders and the outside, valves at each of the cylinder ends, and a ported plunger in each cylinder on said plunger rod, the rod having openings communicating with the cylinders adjacent said plungers.

12. A pump of the character described comprising two alined hollow open ended cylinders communicating directly with the water supply, a centrally arranged hollow plunger rod, a coupling member comprising a tubular portion loosely sleeved on said hollow rod and having outward extensions constituting seats for the adjacent terminals of the cylinders, an interlocking connection between the said outward extensions and the

said cylinders, and said coupling members having openings communicating with the respective cylinders and the outside, valves at each of the cylinder ends, a ported plunger in each cylinder on said plunger rod, the rod having openings communicating with the cylinders adjacent said plungers, and a casing extending continuously from a point adjacent the lower end of the lower cylinder to a point adjacent the upper end of the upper cylinder, the casing being open at its lower end and communicating at its upper end with the upper end of the upper cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GOMER W. PRICE.

Witnesses:

WM. F. BOOTH,
D. B. RICHARDS.