

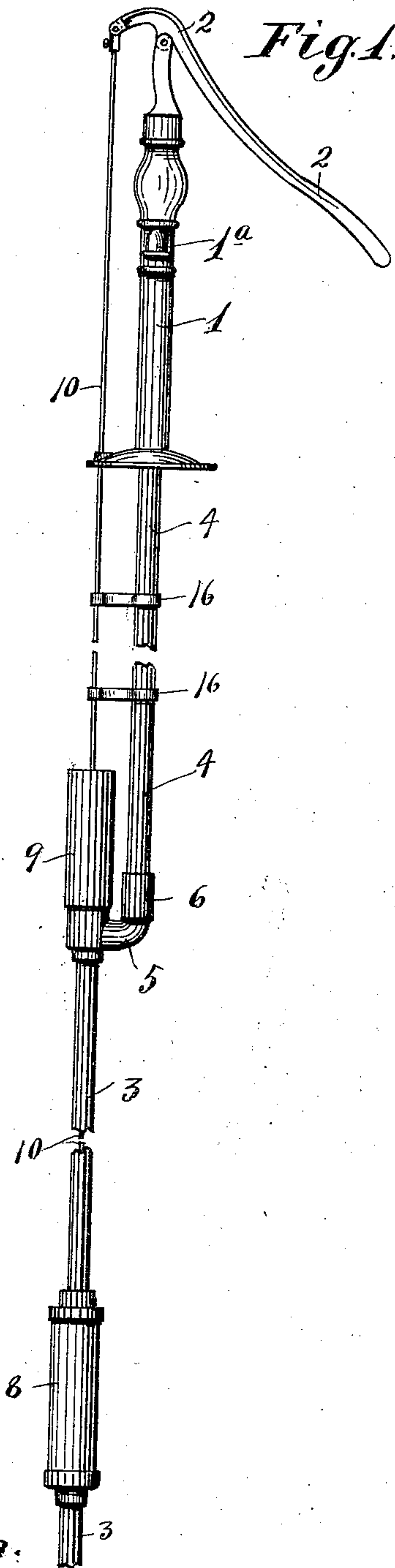
No. 724,569.

PATENTED APR. 7, 1903.

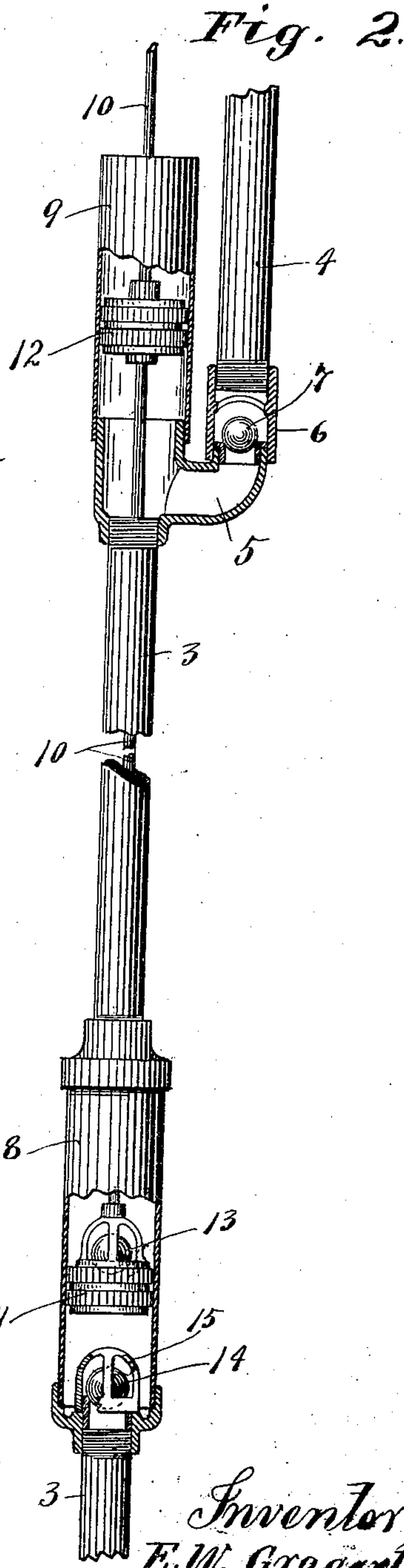
E. W. GRAGERT.  
RELAY PUMP.

APPLICATION FILED MAY 17, 1902.

NO MODEL.



Witnesses:  
A. B. Osbold  
H. D. Kilgore



Inventor  
E. W. Gragert  
By his Attorneys  
William M. Merchant



# UNITED STATES PATENT OFFICE.

ELMER W. GRAGERT, OF WHITEROCK, SOUTH DAKOTA.

## RELAY-PUMP.

SPECIFICATION forming part of Letters Patent No. 724,569, dated April 7, 1903.

Application filed May 17, 1902. Serial No. 107,719. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER W. GRAGERT, a citizen of the United States, residing at White-rock, in the county of Roberts and State of South Dakota, have invented certain new and useful Improvements in Relay-Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention has for its object to provide an improvement in pumps whereby the work of elevating the water is divided between both strokes of the pump-handle—that is, in which under the downstroke of the pump-handle the water will be elevated part of the distance and under the upstroke of the pump-handle the water will be elevated the rest of the distance or to the pump proper.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout both views.

Figure 1 is a view in side elevation showing my improved pump, including the pipe connections therefor; and Fig. 2 is an enlarged view, with some parts sectioned and others broken away, showing the pipe connections, cylinders, pistons, and valves of the pump.

The numeral 1 indicates the pump proper, which, as shown, is a force-pump provided with a discharge-spout 1<sup>a</sup> and a pivoted handle 2. This pump may of course be secured or supported in the ordinary or any suitable way above the surface of the ground or elsewhere, for that matter. The water-supply pipe leads from the bottom of the well to the barrel of the pump 1 and is formed in two sections, which may be distinguished as the “primary” section 3 and the “secondary” section 4. As shown, the secondary section 4 taps the primary section 3 through an elbow 5 and a sleeve 6, the latter of which connects to said elbow at the lower end of said pipe-section 4, and is provided with a valve-seat which is normally closed by an upwardly-

opening valve 7, preferably in the form of a ball.

Near its lower end the primary pipe-section 3 is provided with a cylinder 8, and at its upper end, above the elbow 5, it is provided with a cylinder 9, which is open at its upper end.

The pump-rod 10, which is of course connected to the short end of the pump-handle 2, works downward through the primary pipe-section 3 and through both of the cylinders 8 and 9, and it is provided with pistons 11 and 12, respectively, which work within the said cylinders 8 and 9. These pistons may be of the ordinary or any suitable construction; but the lower piston 11 must be provided with a water-passage, which is normally closed by an upwardly-opening check-valve 13 of any suitable construction, but preferably afforded by a so-called “ball” check-valve. In the lower portion of the primary pipe-section 3 or in the lower end of the cylinder 8, which amounts to the same thing, there must be another check-valve, which will freely open to permit the upward flow of the water, but which will close to prevent a downflow thereof. This check-valve is also preferably in the form of a ball, (indicated at 14,) shown as held within proper bounds by a cage 15.

The operation of the pump described is as follows: Under the downstroke of the pump-handle the water will of course be drawn upward through the primary pipe-section 3 first into the cylinder 8 and then into the cylinder 9 and of course also into the elbow 5. Then under the upward stroke of the pump-handle the lower check-valve 14 will of course close, and the check-valve 13 in the lower piston 11 will of course freely open to permit the free descent of the said piston; but the downward movement of the upper piston 12 will put the water confined within the two cylinders and the intermediate section of the pipe 3 under pressure, and as this water finds its only escape out through the elbow 5 and upward through the secondary pipe-section 4 it is of course evident that under the upstroke of the pump-handle and downward movement of the piston 12 the water will be forced upward to the pump proper and out through the spout 1<sup>a</sup> or other outlet from the pump-



barrel. It will thus be seen that under one stroke of the pump-handle the water is drawn upward or elevated a part of the distance and under the other stroke thereof is given the rest of its upward movement or elevation. This pump therefore acts on the relay principle, and hence I call the same a "relay-pump" to distinguish the same from double-acting pumps or pumps which force water under both strokes of the pump-handle, but in which under any given stroke the water is elevated the entire distance.

As a further illustration of the advantage gained by the use of my improved pump in pumping water from deep wells or great elevations let it be assumed that the pump is used in a well one hundred feet deep. It is of course evident that a column of water one hundred feet in height will exert a tremendous pressure on a pump-piston and will make the use of a pump-handle nearly or quite a practical impossibility, while a column of water of approximately one-half such height may be readily lifted by a hand-operated pump. Now it is evident that with my improved pump by locating the lower cylinder 8 near to the bottom of the well and the cylinder 9 about half-way up—say fifty feet from the bottom of a hundred-foot well—the downward movements of the pump-handle will serve to elevate the water approximately fifty feet while the column of water in the secondary pipe 4 is supported by the check-valve 7, and that, on the other hand, under the upward movement of the pump-handle the water will be given its second fifty feet of elevation while the column of water in the primary pipe 3 is supported by the check-valve 14. It will thus be seen that the check-valves 7 and 14 will be opened in reverse or alternate order.

Of course it is not necessary and probably not desirable that the upper cylinder 9 be located just one-half the distance between the bottom of the well and the pump. The best results would probably be obtained by locating the said cylinder 9 more than one-half way up, so that a little the heaviest work would be performed under the downward movement of the pump-handle. In this pump, however, the weight of the long pump-rod and both of the pistons is under the upward movement of the pump-handle rendered effective to assist in forcing the water upward through the secondary pipe-section. It will of course be understood that the pump-rod 10 would have to be made stiff enough to stand the downward endwise thrusts thereon, and it will also be understood that suitable guides may be provided at the desired points. In the drawings the pump-rod 10 is

shown as guided by the base of the pump 1 and by a pair of guide-brackets 16, secured to the pipe-section 3. It will also be understood that this improved pump is capable of many modifications within the scope of my invention as herein set forth and claimed. It may of course be either a hand or power operated pump, and it may be arranged either to elevate water from a depth in the earth or to elevate water from the ground or elsewhere to an elevated water tower or tank.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a pump, the combination with a primary and a secondary pipe-section, of a pair of cylinders in the primary pipe-section located one above and the other below the junction between the said two pipe-sections, a pump-rod provided with pistons working one in each of said cylinders, a pair of reversely-acting check-valves controlling the upward flow of the water under the action of the lower piston, and a check-valve in the secondary pipe-section permitting the upward flow but preventing the return flow of water therethrough, substantially as described.

2. In a pump, the combination with primary and secondary pipe-sections, of a pair of cylinders in the primary pipe-section, located one above and the other below the junction between the said two pipe-sections, a pump-rod, means for reciprocating said pump-rod, a pair of pistons carried by said pump-rod and working one in each of said cylinders, a check-valve in the lower piston, and a pair of alternately-operating check-valves, one in said primary pipe-section, below the lower piston, and the other in the secondary pipe-section, substantially as described.

3. The combination with the pump 1 having the pivoted handle 2, of the primary and secondary pipe-sections 3 and 4 connected by an elbow 5, which pipe-section 4 leads to the said pump 1 the cylinders 8 and 9 in said primary pipe-section 3, respectively, below and above said elbow 5, the piston-rod 10 operated by the pump-handle 2, the pistons 11 and 12 carried by said rod and working, respectively, in said cylinders 8 and 9, the check-valve 13 in said piston 11, and the alternately-operating check-valves 7 and 14, the former in said secondary pipe-section 4, and the latter in said primary pipe-section 3 below said piston 11, substantially as described.

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

ELMER W. GRAGERT.

Witnesses:

ELIZABETH H. KELHER,  
F. D. MERCHANT.