

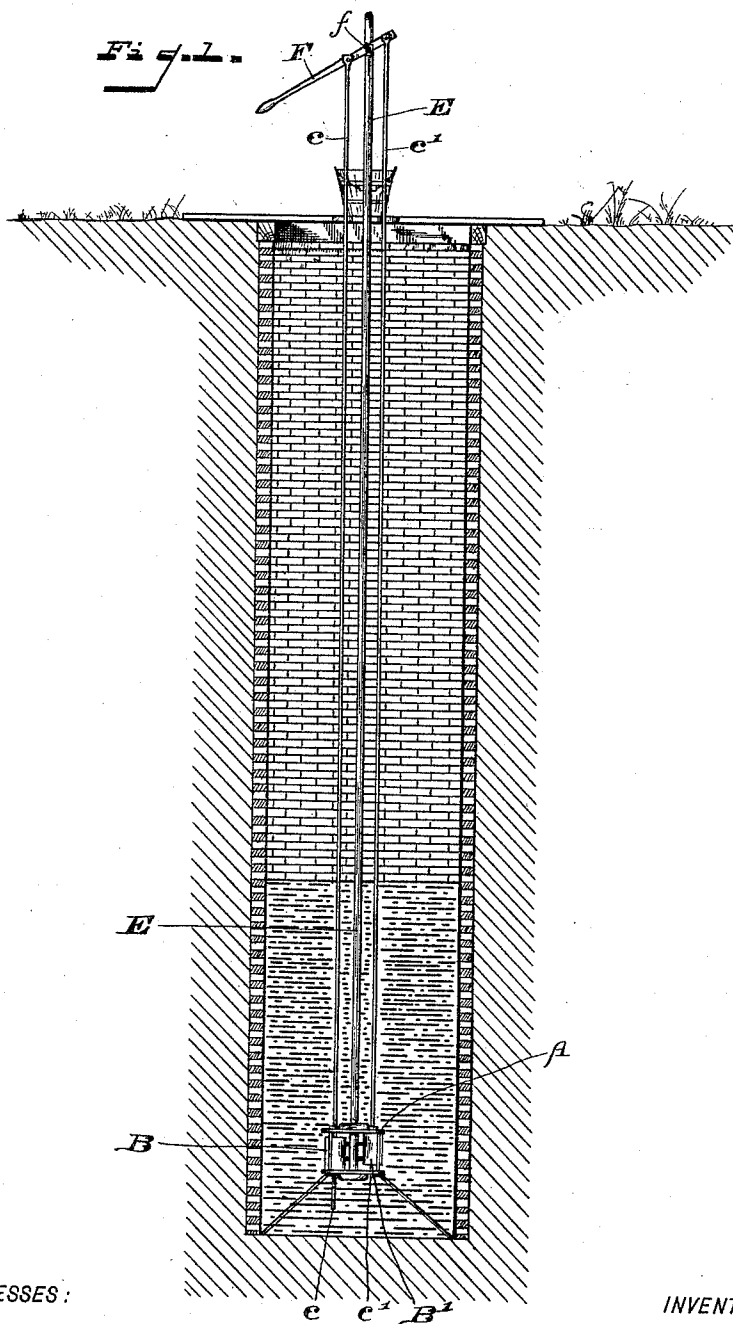
(No Model.)

2 Sheets—Sheet 1.

T. C. WORKMAN.
SUBMERGED FORCE PUMP.

No. 495,447.

Patented Apr. 11, 1893.



WITNESSES:

J. W. Warner
J. A. Walsh

INVENTOR

Thomas L. Workman

per

W. E. Bradford
ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

T. C. WORKMAN.
SUBMERGED FORCE PUMP.

No. 495,447.

Patented Apr. 11, 1893.

Fig. 2.

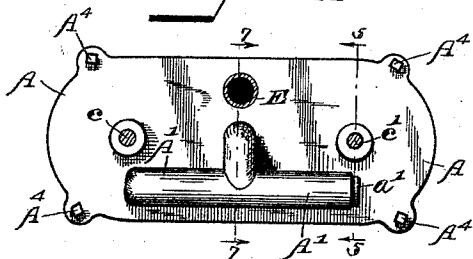


Fig. 3.

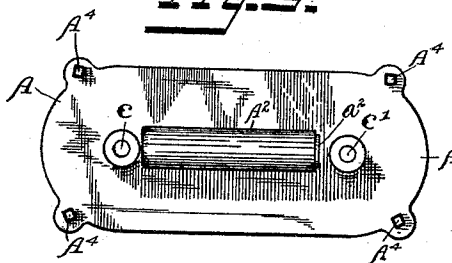


Fig. 4.

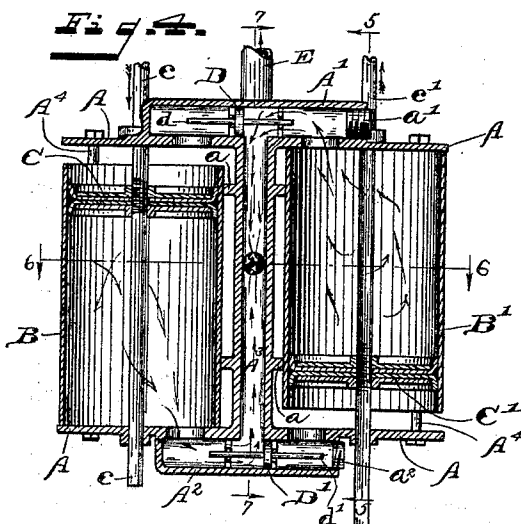


Fig. 5.

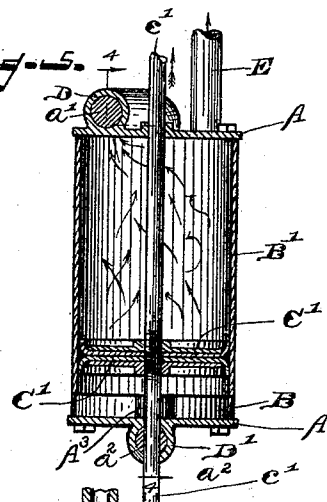


Fig. 6.

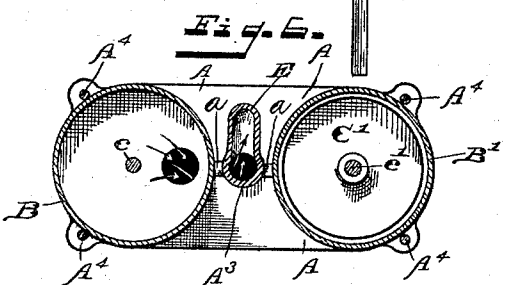
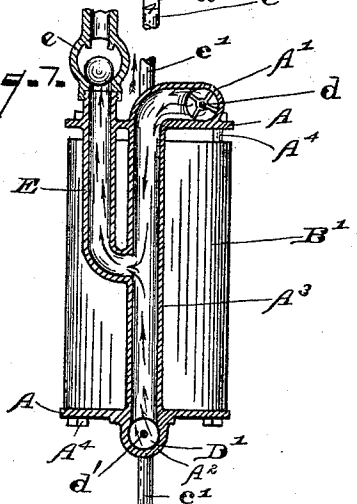


Fig. 7.



WITNESSES:

J. H. Warner.
J. M. Walsh.

INVENTOR

Thomas C. Workman.

per

Est. E. W. Bradford,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS C. WORKMAN, OF LEBANON, INDIANA.

SUBMERGED FORCE-PUMP.

SPECIFICATION forming part of Letters Patent No. 495,447, dated April 11, 1893.

Application filed May 9, 1892. Serial No. 432,321. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. WORKMAN, a citizen of the United States, residing at Lebanon, in the county of Boone and State of Indiana, have invented certain new and useful Improvements in Submerged Force-Pumps, of which the following is a specification.

The principal object of my said invention is to produce a pump wherein the surrounding body of water shall constitute an essential part of the pump itself. Such a pump will be first fully described, and the novel features thereof will then be pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a sectional view of a well in which is a pump embodying my said invention; Fig. 2 a top or plan view of the lower or operative part of the pump; Fig. 3 a bottom or under side plan; Fig. 4 a central vertical sectional view looking toward the right from the dotted line 4 4 in Fig. 5; Fig. 5 a transverse vertical sectional view looking toward the left from the dotted lines 5 5 in Figs. 2 and 4; Fig. 6 a horizontal sectional view looking downwardly from the dotted line 6 6 in Fig. 4; and Fig. 7 a vertical sectional view looking toward the right from the dotted lines 7 7 in Figs. 2 and 4.

In said drawings the portions marked A represent the crib or frame-work of my improved pump; B B' movable cylinders secured in said crib; C C' the pistons; D D' the valves; E the discharge pipe to the pump, and F the handle.

The crib A consists practically of two heads or plates arranged at a determinate distance apart, between which the cylinders B and B' are located. The crib is shown as cast in one piece, although, of course, it may be built of a number of pieces. At the top and bottom, respectively, it is provided with valve chambers A' and A², in which the valves D and D' are placed. The upper valve chamber, A', is shown as partly to one side of the center, for convenience in manufacture, but it obviously could be located centrally (similarly to the valve chamber A²), by making it somewhat shorter, although in that case access thereto

would be interfered with by the piston rod c'. These chambers are finished interiorly by boring in from one end, as will be readily understood, and, after being finished, they are closed, respectively, by the screw plugs a' a², or otherwise. The valve chambers are united centrally by a pipe A³, which may also be formed integrally with the crib, as shown most plainly in Fig. 4, and from a central point in this connecting pipe the discharge pipe of the pump leads, as will be presently described. Near the ends of the cribs are rods A⁴, which, with the lugs a on the central pipe A³, form guides (or supplemental guides) for the cylinders B B'. The surfaces of the heads or plates of the crib which are adjacent to the ends of the cylinders B and B' are finished off smooth and true, so that there shall be a close fit between said cylinders and said heads when they are in contact.

The cylinders B and B' are placed, as indicated, between the heads or ends of the crib A, and are held in place, either by the piston rods, extended, or by the guides consisting of the lugs a and the rods A⁴. They are somewhat shorter than the distance between the heads of the crib, as shown most plainly in Figs. 1 and 4, and are thus enabled to fit tightly against one of said heads at one end, while there is a considerable space between them and the said heads at the other end. In the operation of the pump, as will be hereinafter more fully described, these cylinders reciprocate, and are in contact with said heads first at one end and then at the other.

The pistons C and C' are or may be of an ordinary and well known form. They are packed rather more tightly than usual, so that there shall be enough friction between them and their respective cylinders to enable them to move said cylinders from one position to the other, at the beginning of each stroke, before themselves moving longitudinally of said cylinders. They have the usual piston-rods c and c', which extend up through stuffing boxes in the upper head of the crib, and thence on upwardly until they are connected with the handle or other operating part. They are also preferably extended down through the lower plate, and such extensions, when employed, serve to constitute the pis-

tons also guides for the cylinders, and the rods A^4 , if used, then become supplemental guides, or, in some cases, mere bolts to hold the parts together, when, as may be the case, the crib is built up of several parts.

The valves D and D' are located respectively in the valve chambers A' and A^2 at the top and bottom of the pump. Said valves are adapted to reciprocate, and close the opening or port leading to one cylinder or the other, in the operation of the pump, as will be fully explained in describing said operation. An ordinary construction of valve is shown, and any other may be employed that is desired. The valves illustrated are shown as mounted on rods d d' , which rods rest in appropriate bearings, and said valves are thereby supported, guided, and limited in their movements.

The discharge pipe E is connected at an appropriate point to the pipe A^3 . It is shown as connected centrally thereto. It leads from said point of connection to wherever it is desired to discharge the water which is being pumped. A check valve e should be placed in this pipe near its lower end, for the usual purposes of check valves in the discharge pipes of pumps.

The handle F is shown as an ordinary pump-handle supported on a pivot f mounted on any appropriate standard,—which may be the discharge pipe itself. The piston-rods c c' are also connected thereto at points equidistant from said pivot support. These piston-rods may be jointed or not near the points where they enter the cylinders, as may be rendered desirable by their length or the construction of the other parts.

The operation of my said invention is as follows:—The pump being located as shown in Fig. 1 below the surface of the body of water from which the supply is to be drawn, and the parts being arranged as shown most plainly in Fig. 4, with the piston C' moving up and the piston C moving down, the first operation is to bring the cylinder B' against the upper head of the crib, and the cylinder B against the lower head, as shown in said figure. The pistons then, in moving longitudinally of said cylinders toward their respective closed ends, force the water through the ports leading into the valve chambers, which first forces the valves D and D' to the positions shown, which establishes the communication between said ports and the central pipe A^3 , into which the water from both cylinders is thus forced by the operation of said pistons, and thence out through the discharge pipe E . Upon the completion of one stroke, and upon reversing the direction of motion of the pistons, the positions of the pistons and valves are immediately changed, and the water forced from the other ends of the cylinders to the central pipe, and out as before. As will be readily understood by an examination of the drawings, (bearing in mind the change in position just stated,) there is at

all times, with this pump, irrespective of direction of motion of the pistons, water flowing from both cylinders into the central pipe A^3 , and thence to the discharge pipe. In other words, the pistons are operative while moving in both directions. The cylinders B and B' shift immediately upon the change of direction, and thus, in effect, become the cylinders of oppositely working pumps. Being shorter than the space in which they are placed, the water from the outside, during the time in which the water within them has been undergoing the process of being forced out, as just described, has flowed in behind the pistons, and, upon the change of position, is already inclosed within said pistons, ready to be forced out, as before.

It will be readily understood that by removing one of the cylinders and pistons and closing the ports in the heads of the crib which lead thereto, and introducing a shifting valve at the entrance to the discharging pipe, that a single pump with precisely the same operation will be produced, but, of course, with only half the forcing capacity. With either the single or double pump, by reason of the change of position and the inflowing water behind the pistons into the cylinder while that within it is being forced out, a continuous flow of water is secured by the ordinary movement of the piston as actuated by the pump-handle or otherwise. That is, the piston forces water out while moving in either direction, and not in one only, as in the ordinary form of pump.

Among the other advantages resultant from my improved arrangement, the pump being submerged, outer casings or suction pipes are rendered wholly unnecessary, and are dispensed with, thus materially simplifying the pump and reducing the cost.

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

1. The combination, in a pump, of an open crib, submerged in the water which is to be drawn, having plates and valve chambers at the ends, and ports leading into said valve chambers, one or more movable cylinders, shorter than the distance between said plates and located and secured between them, pistons within said cylinders, the rods whereof extend through one of said plates, valves in said valve chambers, and passages from said valve chambers to the discharge pipe of the pump, and said discharge pipe, the whole constituting a submerged force pump, substantially as set forth.

2. In a double submerged force pump, a crib consisting of plates extending in each direction from a central point, valve chambers on the outer surfaces of said plates, ports leading through said plates into each end of both of said valve chambers, a passage extending between said valve chambers which passage connects with the discharge pipe of the pump, said discharge pipe, two cylinders

arranged between the plates of the crib one
on each side, said cylinders being each a lit-
tle shorter than the distance between said
plates and adapted to be moved in operation
5 to bear against one and the other alternately,
and pistons within said cylinders the rods
whereof extend up through one of said plates,
said pistons being packed tightly enough to
move said cylinders from one position to the
10 other at the beginning of each stroke before
beginning to force the water out of said cyl-
inders, substantially as shown and described.

3. The combination of the open-sided crib,
the one or more movable cylinders, and the
guides or rods A⁴, whereby said cylinders are 15
held in position and guided in operation, sub-
stantially as set forth.

In witness whereof I have hereunto set my
hand and seal, at Indianapolis, Indiana, this
5th day of May, A. D. 1892.

THOMAS C. WORKMAN. [L. s.]

Witnesses:

CHESTER BRADFORD,
J. A. WALSH.