P. BREIDENBACH.

Double-Acting Force-Pump.

No. 217,328. Patented July 8, 1879.

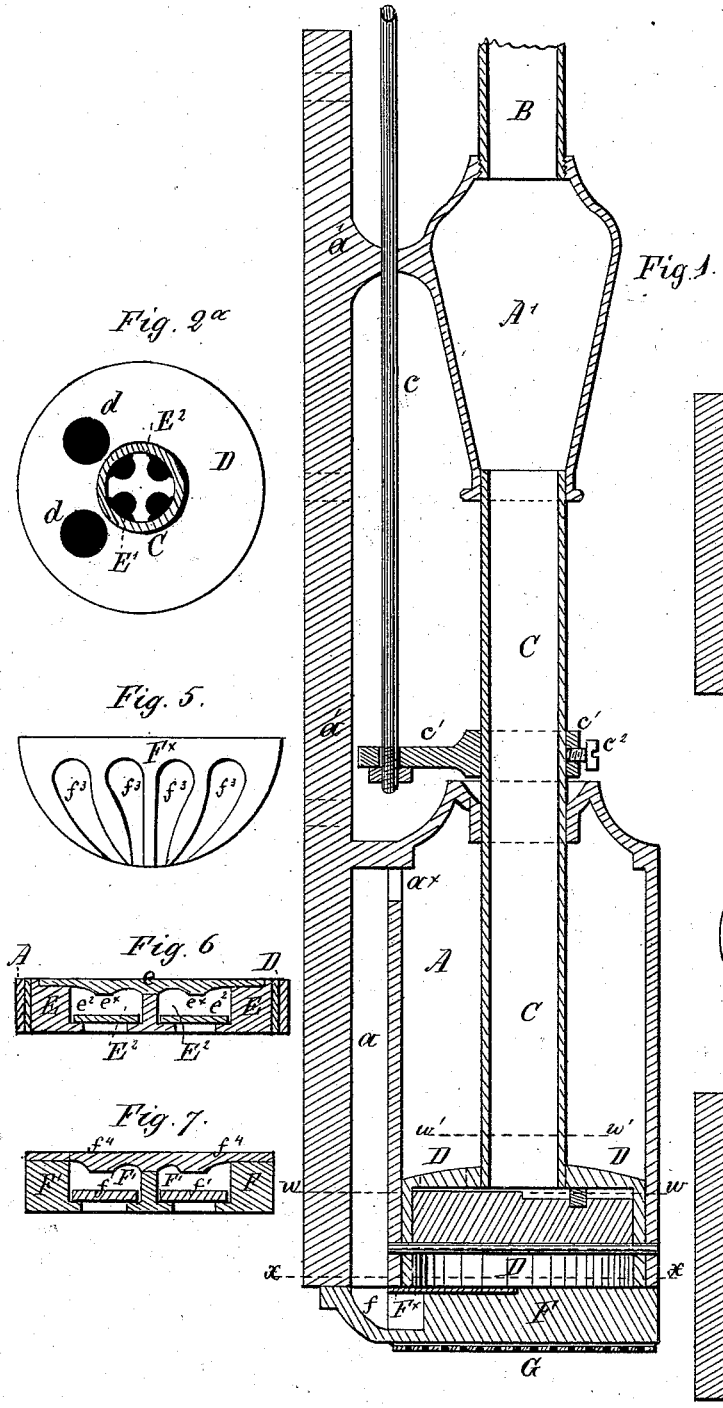


Fig. 1.

Fig. 2x

Fig. 3.

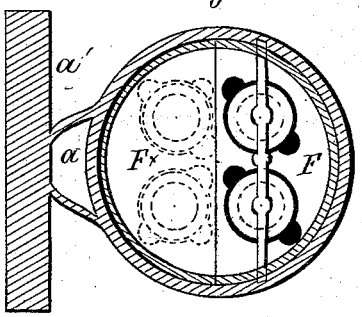


Fig. 5.

Fig. 4.

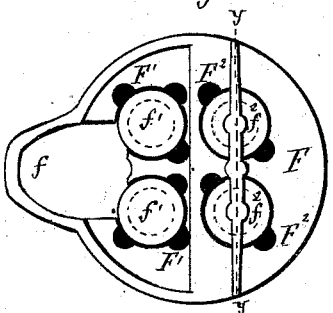
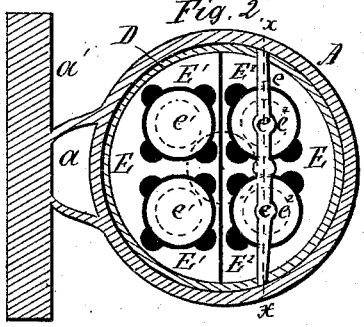


Fig. 6

Fig. 7.

Fig. 2.



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PETER BREIDENBACH, OF KENTON, OHIO.

IMPROVEMENT IN DOUBLE-ACTING FORCE-PUMPS.

Specification forming part of Letters Patent No. **217,328**, dated July 8, 1879; application filed December 7, 1878.

To all whom it may concern:

Be it known that I, PETER BREIDENBACH, of Kenton, in the county of Hardin and State of Ohio, have invented new and useful Improvements in Double-Acting Force-Pumps, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section of my improved pump. Figs. 2 and 2^a are transverse sections of the same on lines *w* and *w'* of Fig. 1, respectively. Fig. 3 is a similar view on line *x x* of Fig. 1. Fig. 4 is a top-plan view of the cylinder valve-casing, the diaphragm or plate F^x being removed. Fig. 5 is an under-side view of said plate F^x; and Figs. 6 and 7 are transverse sections on lines *x x y y* of Figs. 2 and 4, respectively.

My invention relates to that class of double-acting submerged force-pumps of which the Watters pump is a type, and in which the water is ejected through a hollow piston-rod.

In the accompanying drawings, A represents the pump-cylinder, having an exterior water-passage or vertical chamber, *a*, open at bottom and communicating with the interior of the pump-cylinder A at top by means of a port, a^x. A' represents an air and water chamber, located some distance above the pump-cylinder A; and *a'* is a supporting-plate or back, from which the air and water chamber A' and the pump-cylinder are supported, said plate or back being provided with suitable bolt-holes to attach it to the wall of a water-reservoir or well.

In pumps of this class these parts have heretofore been cast separately, to be attached to a supporting-plate or back, or to be attached directly to the wall of the well. In so constructing the parts A, *a*, A', and *a'* there are difficulties encountered in adjusting them so as to get the parts in proper position to allow the pumping-rod to work true in the cylinder and chamber, and still greater difficulties in maintaining those parts in proper working relation to each other when once adjusted in the well.

It is well known that pumps of this class, when constructed as set forth above, will within a comparatively short time become loose upon their attachments, and the pump will then either work very hard or be entirely disabled. In either of these cases it is necessary that the parts be lifted out of the well to be adjusted upon the supporting-plate, and, as the pump is submerged, to replace it in position the additional labor of first pumping the well nearly dry is necessary, thus requiring from time to time the employment of a practical man to reset the pump, and causing the farmer an unnecessary outlay of money, and giving him a great deal of annoyance and inconvenience.

To remedy these disadvantages, I cast the pump-cylinder A, with its lateral chamber and port, and the superposed water and air chamber A', with their common supporting-plate or back, all in one piece, by means of which these drawbacks are obviated, and the parts can also be manufactured at considerably less cost, thus effecting a material saving in first cost, as well as a saving in the subsequent cost arising from the occasional necessity of having to lift the pump out to readjust it.

B is the eduction-pipe, screwed or otherwise secured to the upper end of chamber A', as shown in Fig. 1. The distance between said chamber and the pump-cylinder is slightly greater than that traversed by the piston-rod at each stroke of the piston, while the vertical diameter of said chamber is equal to or slightly greater than the length of the stroke of the piston.

By means of this arrangement and construction I am enabled to employ a hollow piston-rod whose entire length is only slightly greater than twice the length of the stroke of the piston, thereby saving great power, and at the same time facilitating the operation and adjustment of the parts.

Instead of the dome or chamber A' a sleeve may be employed; but I prefer the former, as the piston-rod not only has freer play in case of a slight displacement of the pump-cylinder with regard to the actuating devices, but I obtain greater force to expel the water.

C is the hollow piston-rod, connected at its lower end to the piston-head D, while its upper end is free to reciprocate within the chamber A'.

The piston-rod is actuated by means of a connecting-rod, *c*, carrying at its lower end a sleeve, c^1, within which the piston-rod is held

by means of a set-screw, c^2, whereby the stroke may be adjusted. The upper end of rod *c* is connected with the usual pump-brake. (Not shown.)

The piston-head is provided with or carries a valve casing or plate, E, having four valve-chambers, E^1 E^1 E^2 E^2, and disk-valves e^1 e^1 e^2 e^2, the casing being recessed at that portion having the valve-chambers E^2 E^2 to furnish a free passage for the water from said chambers to the piston-rod, the valves being prevented from rising out of their chambers or being tilted and become wedged by means of a removable bridge-piece or abutment, *e*, having projections or abutments $e^\times$ centrally of each of the chambers E^2 E^2, as clearly shown in Fig. 6, while the face of the casing having chambers E^1 E^1 is flush, or practically flush, with the under face of the piston-head, the water-passage being formed by the hollow piston-rod projecting over the chambers E^1 E^1, as shown in dotted lines, Fig. 2. The upper face of the piston-head, immediately over the valves e^1 e^1, is provided with two ports, *d d*, for a purpose hereinafter explained.

F is the induction-valve casing or plate, provided with four valve-chambers, F^1 F^1 F^2 F^2, and disk-valves f^1 f^1 f^2 f^2, the latter valves admitting water below the piston within the pump-cylinder, while the former, or valves f^1 f^1, are shut off from the lower end of the cylinder A by a plate or diaphragm, $F^\times$, removably connected therewith, that part of the casing F being recessed to receive the plate, as shown by Fig. 1.

The plate $F^\times$ is provided on its under side with a series of channels or water-passages, f^3, for a purpose hereinafter explained. These valves f^1 f^1 admit water to the chamber *a*, with which they communicate through port *f*, and are prevented from being lifted out of their chambers or become tilted by the said plate $F^\times$, while the valves f^2 f^2 are similarly confined within their chambers by a bridge-piece, f^4, removably connected with the chambers, and of a construction similar to the bridge-piece *e*, above described, the plate $F^\times$ and bridge f^4 being securely held in their respective positions by the pump-cylinder when the valve-casing F is bolted or otherwise secured thereto.

It will be seen that both the valve-casings are detachably connected with the piston-head and pump-cylinder, and that the partition $F^\times$ and the bridge-pieces *e* f^4 are also made removable. By this means free access is had to all the valves when such is required from any cause, which is not the case in any of the pumps of this class as heretofore constructed, in which either one or all the valves are permanently cast within their chambers, rendering access thereto or repair thereof impossible, the parts having to be replaced by new ones.

I have described above two valve-casings, each having four valve-ports, chambers, and valves, the one located within the piston-head and the other connected to the lower end of the pump-cylinder, and a piston-head having two ports, *d d*, the capacity or area of which is equal to, or practically equal to, the capacity or area of any two of the other sets of ports to equalize the eduction with the induction, to obtain a greater volume of water by the increased capacity, and to reduce the power for working the pump. The same result may be obtained with seven valves, dispensing with one of the yalves e^2, and making the one valve of a capacity equal to two; or six valves may be employed by using one valve and port, f^1, of a capacity equal to the two; or, finally, five valves and ports may be employed by using only one valve and port, f^2, of a capacity equal to two ports and valves, f^2, which in all cases will produce the same result.

I have, however, found in practice that either of the last above-described arrangements could be advantageously employed in pumps of large caliber and give perfect results. This could not be well done in those pumps of small caliber and now in general use, for want of sufficient room upon the diametrical line of the valve-casings to locate sufficiently large valve-ports and chambers to admit of a considerable volume of water being forced through the pump, and hence for all pumps of small caliber I prefer the arrangement hereinbefore described.

The under face of the valve-casing F is provided with the usual perforated guard or strainer G, removably connected therewith in any desired manner.

It will thus be seen that I employ two sets of valves and ports, each composed of four of such in each set, to equalize the delivery or eduction of the volume of water with that admitted to the cylinder A and the chamber *a*, and at the same time increase both the induction and eduction areas, so that a pump constructed and having its ports and valves disposed as shown and described will not only work much easier from the fact that the volume of water ejected is equal, or nearly so, to the volume of water admitted to the pump, but this volume of water is at the same time largely increased, doing about three times the work of a pump of the same caliber as heretofore constructed.

In the old construction of this class of pumps the one port in the piston-head to admit water from above the latter to the hollow piston-rod could not be made of sufficient area to deliver a volume of water equal or any way near equal to the volume admitted, for want of sufficient space around the piston-rod, and all attempts to increase this area led necessarily to the contraction of the diameter of the piston-rod, which only shifted the difficulty from the former to the latter, in fact rendered it still greater, as the rod then became of insufficient area to eject the water on the upstroke. Furthermore, the disposition of the two valves in the piston-head, one opposite each other, or the one valve pivoted or adapted to slide within

a chamber to close either one or the other of two opposite water-passages, left but a comparatively small area—entirely inadequate to deliver the volume of water admitted; this being especially the case in the upstroke, in which the water from above the piston-head is forced through one small port in the upper face of the said head; hence the increase of power required to work the pump irrespective of the weight of a long piston-rod to be lifted.

In order to further increase the area of the valve-chambers and water-passages, and to equalize the eduction capacity of the pump with, or nearly or practically with, its induction capacity at both strokes of the piston, I form lateral water-passages in each of the valve-chambers, two or more to each chamber, and similar passages radiating from port *f* over the valve-chambers in the under side of plate $F^{\times}$, so that the moment any of the valves are raised out of their seats the water will freely pass from the chambers and through their respective passages E^3 E^3 F^3 F^3 and the passages in plate $F^{\times}$, to penetrate into the pump-cylinder below the piston, and through valves e^2 e^2 to the hollow piston-rod, or through port *f* into chamber *a*, and port $a^{\times}$ into cylinder A above the piston, thence through the two ports *d d* to the hollow piston-rod.

From what has been said it will be seen (it being understood that the submersion of the pump primes it at the same time) that on the upstroke water is admitted through valves f^2 f^2 of casing F and ports e^3 e^3 of the piston-head. The valves e^1 e^1 and e^2 e^2 and f^1 f^1 remain in their seats—that is to say, the water from above the piston-head is ejected. On the downstroke, on the contrary, the valves *f* f^1 admit water to again fill chamber *a* and the cylinder above the piston-head, the valves f^2 f^2 remaining in their seats, while the valves e^1 e^1 e^2 e^2 are lifted out of their seats, the former to close ports *d d*, and the latter to permit the water to pass to the hollow piston-rod, through which the water at each stroke is forced into chamber A′, thence into eduction-pipe B, as will be readily understood.

By employing two ports, e^3, and a short hollow piston-rod, I am enabled not only to double the induction-area from above the piston-head, but I am also enabled to increase the diameter of the piston-rod to equalize the induction with the eduction, deliver a larger volume of water, and reduce the power required to work the pump to a minimum, and reduce the cost of the pumps considerable.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The valve-casing F, provided with two or four valve-chambers, each chamber having one or more lateral water-passages and a disk-valve, in combination with the removable channeled plate $F^{\times}$, arranged to form a port, *f*, and to confine the one set of valves within their chambers, and the bridge-piece f^4, to confine the other set of valves to their chambers, substantially as described.

2. In combination, the valve-casing F and valves f^1 f^1, the chamber *a*, the cylinder A, the piston-head D, having ports *d d*, the valve-casing E, and valves e^1 e^1 e^2 e^2, and the hollow piston-rod, substantially as described, and constructed and operating as set forth.

3. In combination, the valve-casing F and valves f^1 f^1, the piston-head D, valve-casing and valves e^1 e^1 e^2 e^2, and the hollow piston-rod, substantially as described, and constructed and operating as set forth.

In witness that I claim the foregoing I have hereunto set my hand this 6th day of December, 1878.

PETER BREIDENBACH.

Witnesses:
W. SIFERES,
N. WINEBEINNER.