2 Sheets—Sheet 1.

J. ROBERTSON.

DOUBLE-ACTING PUMP.

No. 192,937. Patented July 10, 1877.

Fig. 1.

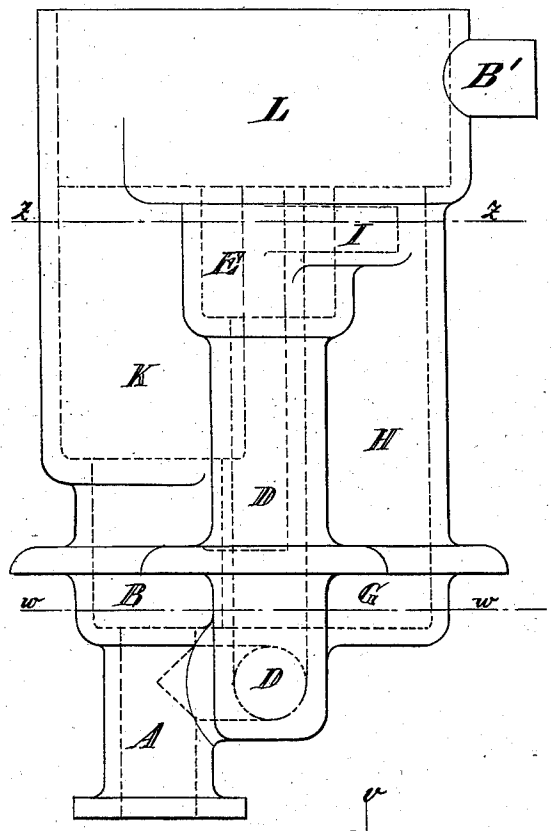


Fig. 3.

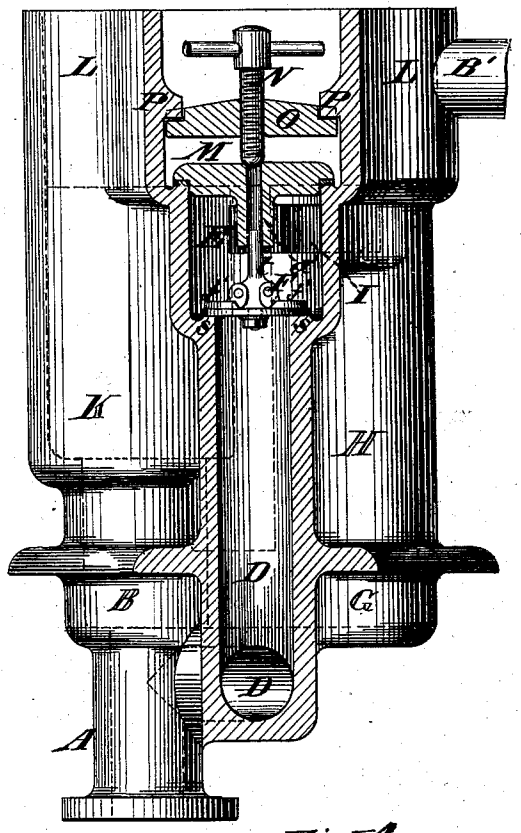


Fig. 2.

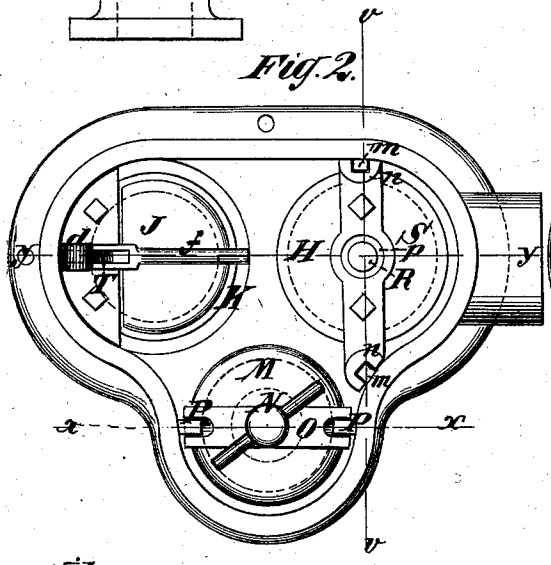
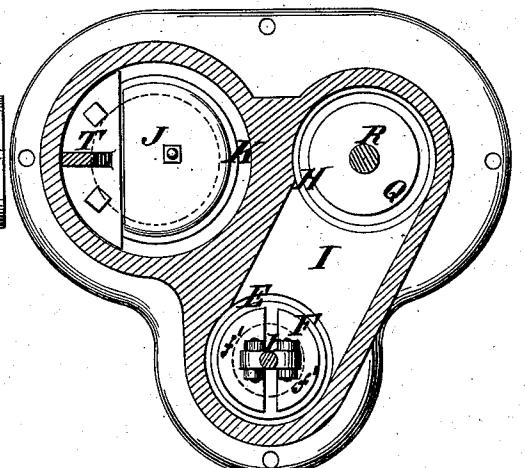


Fig. 4.



Witnesses
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2 Sheets—Sheet 2.

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Fig. 5.

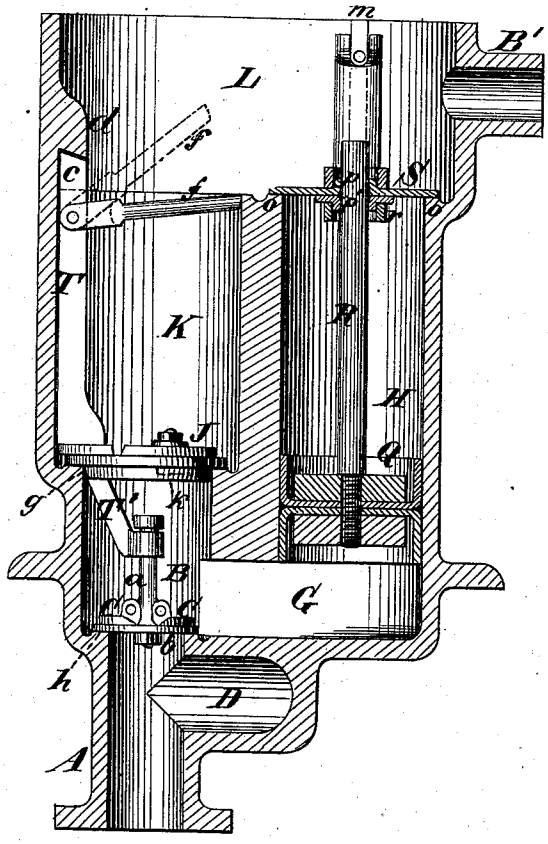


Fig. 7.

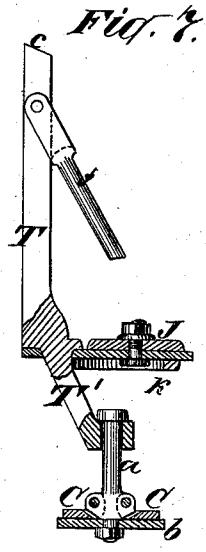


Fig. 8.

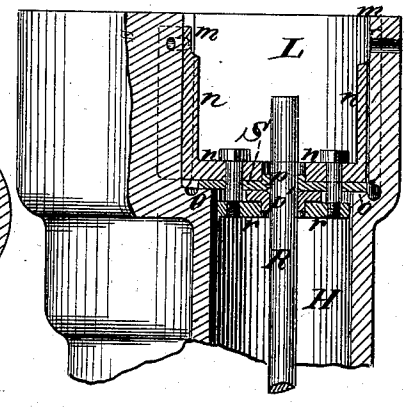
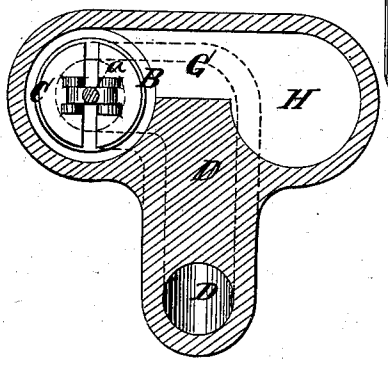


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES ROBERTSON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN DOUBLE-ACTING PUMPS.

Specification forming part of Letters Patent No. **192,937**, dated July 10, 1877; application filed June 18, 1877.

To all whom it may concern:

Be it known that I, JAMES ROBERTSON, of Brooklyn, in the county of Kings and State of New York, have invented an Improvement in Pumps; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to improvements upon a pump Letters Patent for which were granted to me, dated September 1, 1874, and numbered 154,566, said patent being for an improvement in double-acting pumps, more especially applicable to ships' pumps, but also applicable to draining mines, and for other purposes.

The object of my present invention is to render said pump more efficient for use as a ship's pump, and for other purposes, by rendering it less liable to choke, by making the working parts of valves more easily accessible, by facilitating the operation of sounding through the pump, and by such changes in the construction of parts as will enable the pump to be worked with less power, and render the pump generally more serviceable.

Figure 1 in the accompanying drawings is a side elevation of a pump comprising my improvements. Fig. 2 is a top view of the same. Fig. 3 is a sectional elevation, the vertical section being on the line *x x* in Fig. 2. Fig. 4 is a horizontal section on the line *z z* in Fig. 1. Fig. 5 is a vertical section on the line *y y* in Fig. 2. Fig. 6 is a horizontal section on the line *w w* in Fig. 1. Fig. 7 is a detail view of two connected detachable valves and their connection. Fig. 8 is a detail vertical section on the line *v v* in Fig. 2.

The general construction of the pump, as originally constructed, is as follows: A is the suction-pipe, separated from the lower valve-chamber B by a valve, C. From the tube A a passage, D, leads to the upper valve-chamber E, from which it is separated by a valve, F. From the lower valve-chamber B a passage, G, leads into the lower part of the piston-chamber H, and from the upper valve-chamber E a passage, I, leads into the upper part of the said piston-chamber H. The upper end of the lower valve-chamber B is closed by a valve, J, from which a passage K, leads to the head L of the pump. The upper end of the upper valve-chamber E is closed by a plate, M, which is held down to its seat by a screw, N, which passes through a screw-hole in the bar O, the ends of which are placed beneath lugs P, cast upon the head L. Q is the piston, the rod R of which passes up through the valve S, which rests upon the upper end of the piston-chamber H, and serves as a discharge-valve to said chamber. The piston-rod R is reciprocated by any suitable means, and the pump operates as follows:

As the piston Q rises, water passes up through the pipe A, raises the valve C, passes into the chamber B, and thence through the passage G into the piston-chamber H, under the piston Q, whence it is forced out by the next downward stroke of the piston. While rising the piston Q also lifts the water which lies above it out of the piston-chamber H, through the valve S, into the head L of the pump, whence it flows out through a spout, B′. The downward stroke of the piston Q forces the water out of the chamber H from below said piston, through the chamber B, up through the valve J and passage K, into the head of the pump L. At the same time the valve S closes, and a vacuum is produced in the space above the piston, below said valve S and in the chamber E, communicating with said space by the passage I. To fill this vacuum, water rises through the pipe A, passage D, and valve F, said water being lifted by the next upstroke of the piston Q, through the valve S, into the head L, whence it flows out through the spout B′.

In my former invention, of which the general features of construction and operation are above described, the valves C and J were puppet or drop valves, independently inserted, and requiring separate removal for sounding the pump, which sounding was and now is done, after removing said valves, through the straight (and after removal of the valves) continuous passage L K B A. An improvement upon that construction, which constitutes one feature of my present invention, is a novel connection of said valves together in such manner that they may be simultaneously inserted into or removed from the pump-barrel, and novel means for securely holding

said valves in the pump-barrel, which at the same time afford the utmost facility in taking out said valves. This feature of my invention is shown in Figs. 2, 5, 6, and 7.

The valve J and its guide *k*, Figs. 5 and 7, are attached to a clamping and lifting bar, T, preferably formed in one piece with the guide *k*. Below said guide *k* projects downward and inwardly a lifting-bar, T′, Figs. 5 and 7, also preferably formed in one piece with the clamping and lifting bar T and guide *k;* but the said parts T, T′, and *k* may be separately formed, and afterward conjoined, by any suitable means.

Through the lower end of the lifting-bar T′, I pass a bolt, *a*, which also passes down through the valve C. Said bolt *a* is fitted loosely in the end of the lifting-bar T′, and acts partly as a stem for the valve C. The upper end of the clamping and lifting bar T is beveled or inclined, as shown at *c*, Figs. 5 and 7, to fit under a lug, *d*, Fig. 5, when the said bar and the attached valves are placed in the pump. To the upper part of the clamping and lifting bar T is pivoted a clamping cross-bar, *f*, Figs. 5 and 7, which, when placed within the pump-barrel in the position shown in Fig. 5, and pressed down against the side of the barrel, firmly presses and clamps the bar T against the opposite side of said barrel.

The valve-seats, when the valves are placed in the pump-barrel, are respectively formed upon shoulders *g* and *h*, Fig. 5, formed in the pump-barrel.

This construction permits great rapidity in taking out or putting in the valves J and C. To take them out the clamping cross-bar *f* is pulled upward into the position shown in dotted outline in Fig. 5, the clamping and lifting bar is pushed out from under the lug *d*, and the said clamping and lifting bar T, valve J, valve-guide *k*, lifting-bar T′, bolt *a*, and valve C are all together lifted out of the pump-barrel. The said valves are replaced by putting all the parts so lifted out together back in the pump-barrel, crowding the beveled end of the clamping and lifting bar T under the lug *d*, and pressing the clamping cross-bar *f* down against the inner wall of the pump-barrel, as shown in full outline in Fig. 5.

Another improvement on the original invention consists in the novel construction of and novel method of inserting the valve S in the head of the pump, to cover the top of the piston-chamber H.

In the invention for which the Letters Patent above referred to were granted to me, said valve S was a flat plate, and had the piston-rod R passed through its center, serving as a guide for said valve. In this method of construction the said valve, in order to have the requisite free play, had to be loosely fitted to said piston-rod, such loose fitting permitting leakage of air into and impairing the efficiency of the pump.

In the present invention I fit the valve to the piston-rod in such manner that it is practically air-tight around the piston yet it retains all the necessary freedom of motion on the piston-rod.

Said valve S may be a centrally-perforated disk or a double flap-valve, made of metal plates attached to a perforated piece of leather, rubber, or other suitable flexible material, or it may be a metal plate packed around said piston-rod, as hereinafter described, and carrying puppet or drop-valves; but whatever may be the material or construction of the valve, the method of inserting and holding it in the pump, and packing it around the piston-rod, forming features of the present invention, are the same, and they will be sufficiently illustrated by the description of the same, as when a double flap-valve is used.

On the interior of the head L of the pump are formed vertical guides *m*, Figs. 2 and 8. To said guides is fitted the yoke-guide *n* for the piston-rod R, the vertical portions of said yoke-guide being externally grooved to fit said guides *m*, as shown in the top view, Fig. 2, or otherwise fitted to said guides and centrally perforated, as shown in Figs. 2 and 8, for the passage and reciprocation through the same of the piston-rod R.

The valve S is, by bolts or otherwise, attached to the under side of the horizontal part of the said yoke-guide *n*, which thus forms a support for said valve, the seat of the valve being on the shoulder *o*, Figs. 5 and 8, at the top of the piston-chamber H. The parts of the valve S, lying, respectively, on opposite sides of the horizontal part of the yoke *n*, act together as a double flap-valve. The weight of the yoke-guide *n* is sufficient to hold the valve S in place; but pins may be used, if desired, for this purpose.

Either in the leather of the valve S, or in a separate piece of leather, or other suitable material, is formed an upturned packing, *p*, Figs. 2, 5, and 8, to pack the central perforation in said valve, and its supporting-yoke *n* around the piston-rod R; and of a separate piece of similar material I form a turned-down cup-packing, *p′*, for the same purpose, said packings being interposed and held between the horizontal part of the yoke-guide *n* and a plate, *r*, Figs. 5 and 8, bolted or otherwise attached to the said yoke-guide; but the said valve may be packed around the piston-rod in other ways.

In my former invention the valve F in the chamber E was a simple clapper-valve, which required a special appliance for its removal, in order to open and clear out the passage D after the removal of the plate M, which tightly closes the top of the said chamber, as hereinbefore described.

In my present invention I employ, as an improvement over the former construction, a combined double flap and puppet valve, F, which seats on a shoulder, *s*, Fig. 3, at the top of the passage D. The flaps *f′ f′*, Figs. 3 and 4, of said valve are hinged to a central T-shaped stem, *t*, which is fitted loosely

in a sleeve, *a'*, Fig. 3, that projects downward from the plate M. Said stem *t* and sleeve *a'* form guides for said valve F, said valve acting under ordinary circumstances as a flap-valve; but when any floating obstruction too large to pass easily through the valve reaches said valve, the whole valve and the stem *t* rise bodily to permit the passage of such obstruction by and through said valve, and thus prevent choking of said valve.

The stem *t*, moreover, acts as a convenient handle for lifting out the valve F when it is desired to open the passage D.

By these improvements are removed important defects existing in the former invention, and a pump is supplied which it is well nigh impossible to choke, and all the working parts of which are accessible with a much shorter expenditure of time than in other ships' pumps heretofore known in the art—a most important advantage in such pumps, in the use of which a brief stoppage is often a serious disaster.

The valve C is constructed in like manner, to act both as a double flap and puppet valve, the bolt *a* acting as a stem for said valve, playing vertically in the perforated end of the lifting-bar T'.

I claim—

1. The combination, with the clamping and lifting bar T, having the valve J and its seat attached thereto, of the lug *d* and the clamping cross-bar *f*, pivoted to the said bar T, for clamping said valve in the pump-barrel, and for lifting said valve and seat out of said pump-barrel, substantially as and for the purpose specified.

2. The combination, with the lug *d*, clamping and lifting bar T, and pivoted clamping cross-bar *f*, of the lifting-bar T' and bolt *a*, attached to the valve C, for lifting said valve out of the pump-barrel, substantially as and for the purpose specified.

3. The combination of the yoke-guide *n*, perforated in the center of its horizontal part, having the valve S attached to it, and acting as a guide both for said valve and the piston-rod R, with the vertical guides *m*, provided inside of the head L of the pump, and fitted to the vertical parts of said yoke-guide, substantially as and for the purpose described.

4. The combination, with a pump piston-rod, and a centrally-perforated valve playing on said piston-rod, of packing applied within said valve to prevent passage of air through said valve around the piston-rod, substantially as and for the purpose set forth.

5. The combination, with a pump-barrel, of a combined flap and puppet valve or valves, substantially as and for the purpose specified.

JAMES ROBERTSON.

Witnesses:

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