

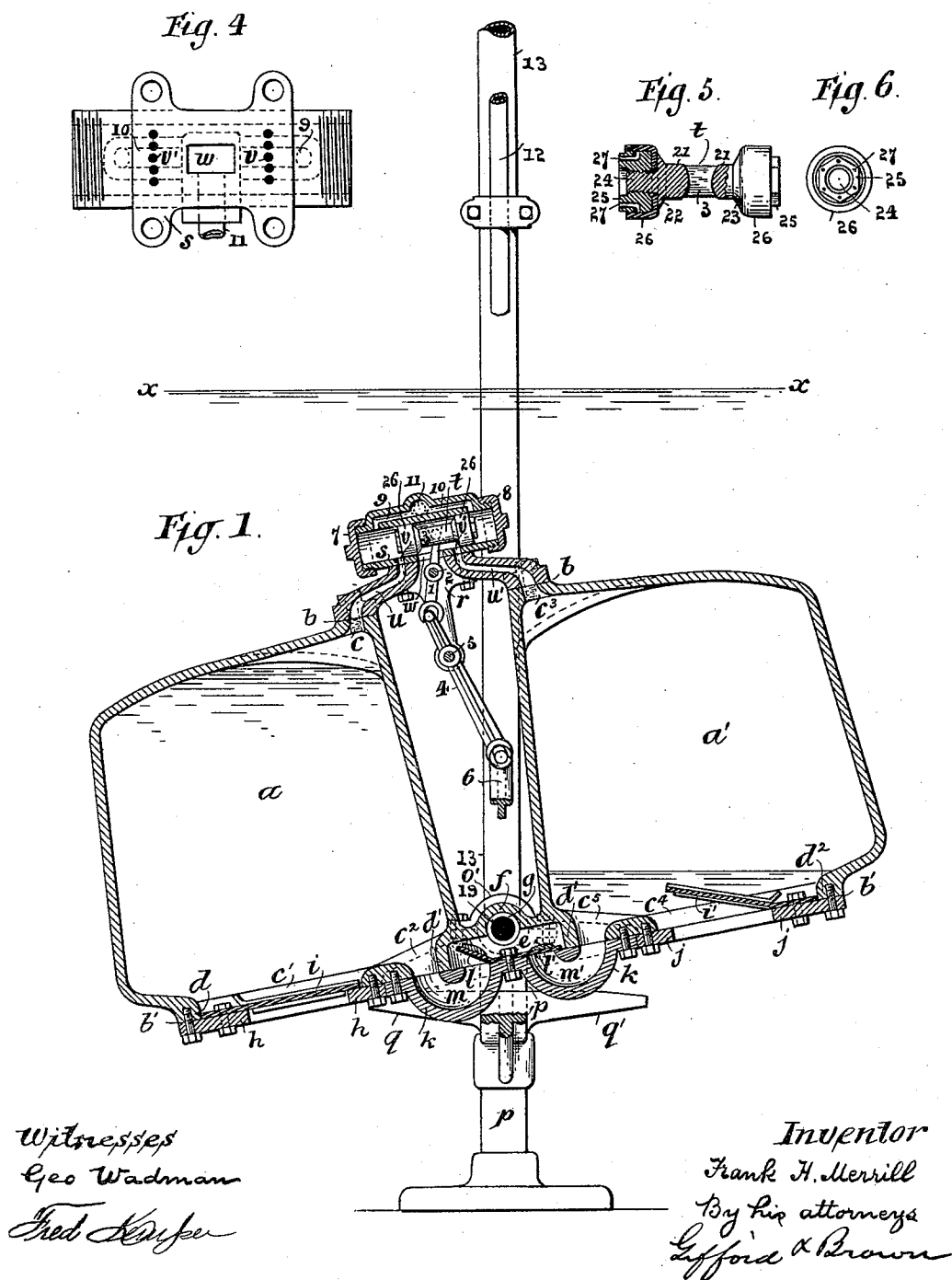
(No Model.)

2 Sheets—Sheet 1.

F. H. MERRILL.
WATER RAISING APPARATUS.

No. 461,192.

Patented Oct. 13, 1891.



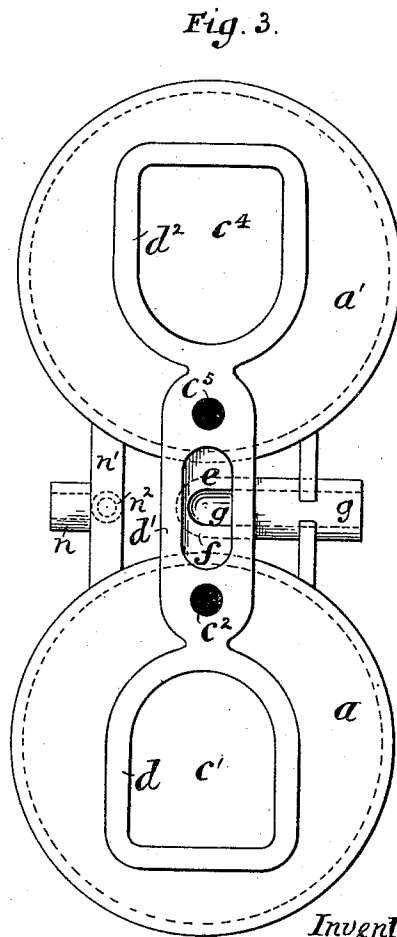
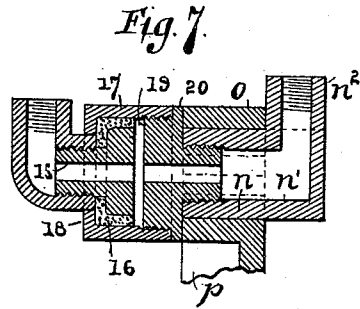
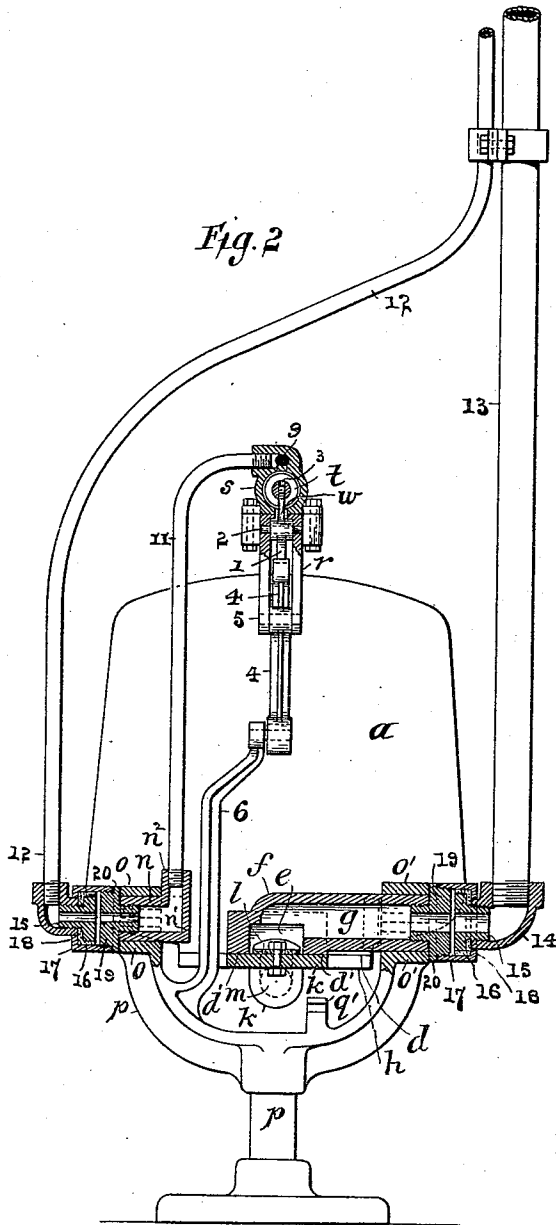
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WATER RAISING APPARATUS.

No. 461,192.

Patented Oct. 13, 1891.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANK H. MERRILL, OF BOUND BROOK, NEW JERSEY.

WATER-RAISING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 461,192, dated October 13, 1891.

Application filed April 12, 1890. Serial No 347,668. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. MERRILL, of Bound Brook, in the State of New Jersey, have invented a new and useful Improvement in
5 Water-Raising Apparatus, of which the following is a specification.

In English Patent No. 4,140 of 1876 and United States Letters Patent No. 137,754, dated April 15, 1873, to J. A. Ayres, is described
10 an oscillating water-elevator similar in many respects to the one about to be described by me. It has, however, met with only a limited success, among other reasons because of the employment of flexible pipes both for the supply
15 of air to and the delivery of water from the oscillating chambers, which flexible pipes lack durability and strength to stand pressure; also, because the means employed for regulating and directing the flow of compressed air was inefficient.
20

My present invention consists in extensive improvements upon the apparatus described in said patent.

Figure 1 is a vertical section taken longitudinally of the main valve. Fig. 2 is a vertical section taken transversely of the main valve. Fig. 3 is an inverted plan view with the stand removed. Fig. 4 is an inverted plan view of the casting containing the main valve.
25 Figs. 5 and 6 are a side and end view of the valve detached. Fig. 7 is a detail showing the form of packing connection with the pipe-journals.

a a' are two receptacles or compartments
35 adapted to contain water, and air-tight, excepting as they communicate with certain passages, hereinafter referred to. The shells of these compartments and the connections between them shown between the lines b b
40 and b' b' , Fig. 1, are all cast together, leaving in the shell of compartment a the openings c c' c^2 and in the shell of compartment a' the openings c^3 c^4 c^5 . The openings c' c^2 c^4 c^5 are surrounded on the exterior of the casting by
45 a plane surface of the form shown at d , d' , and d^2 in Fig. 3, adapted to receive the bottom plate, hereinafter more fully described.

Within the casting above the surface d' is an opening e , which extends upward and is
50 covered by a portion f of the casting. This opening, however, communicates with the pas-

sage g , extending out horizontally between the two receptacles a and a' . The bottom plate is made in three parts: h , which carries the valve i ; j , which carries the valve i' , and
55 k , which carries the valves l and l' . The part h is bolted onto the surface d , so as to hold the valve i in the position shown in Fig. 1, where it controls the opening c' . The part j is bolted onto the surface d^2 , so as to hold the
60 valve i' in the position shown in Fig. 1, where it controls the opening c^4 . The part k contains the passages m and m' , so arranged that when k is in position, as shown in Fig. 1, the passage m will connect the opening c^2 with
65 the opening e , and the passage m' will connect the opening c^3 with the opening e . The passage m is controlled by the valve l and the passage m' by the valve l' .

n is a horizontal pipe in alignment with the
70 pipe g . It is secured to the receptacles a a' by the cross-piece n' and is provided with an upward opening n^2 . The pipes n and g are properly constructed to form journals for the support of all the parts heretofore referred to,
75 and they are so located that the parts supported by them on one side of their axial line will substantially balance the parts supported by them on the opposite side. o and o' are the bearings, in which the pipes n and g are
80 respectively mounted. These bearings form part of a stand p , adapted to stand at the bottom of the well or other source of water and to hold the bearings in proper horizontal position.

q and q' are two arms, which extend out
85 horizontally under each of the receptacles a and a' , so as to form stops to arrest their downward motion.

r is a casting connecting the two receptacles at the top, as shown in Fig. 1, and upon the top of this casting is mounted a casting s , containing the valve-cylinder for the valve t .

u and u' are passages leading from the ports v v' , respectively, of the valve-cylinder to the
95 receptacles a and a' , respectively. An opening w is made through the castings r and s to receive the lever 1, which is pivoted to the casting at 2 and enters a slot 3 in the valve t . The lower end of this lever 1 forms a slotted
100 pivotal connection with the lever 4, which is fulcrumed to the casting at 5, and forms at its

opposite end a slotted pivotal connection with the stationary arm 6, projecting upward from the stand *p*.

7 and 8 are caps screwed onto the end of the valve-cylinder, so as to inclose the same air-tight.

9 and 10 are passages leading, respectively, to each end of the valve-cylinder from pipe 11, by which the compressed air is supplied for driving the pump. This pipe 11 connects with the opening *n*², already referred to.

The valve *t* consists of a body portion 21, connecting two flanges 22 and 23. A screw-threaded portion 24 projects outside of each flange, and upon each is screwed a follower-nut 25. The leather 26 is clamped between the follower-nut and the flange and extends over the outside of the follower-nut, as shown. Small passages 27 may be made in the follower-nut to enable the compressed air to get under the leather packing and hold it tightly against the interior of the valve-cylinder. The valve therefore may be said to consist of two piston-heads connected by the piece 21.

12 is the pipe for supplying compressed air from any suitable air-forcing apparatus. 13 is the pipe for delivering water from the pump to any point desired. These pipes may be inflexible and of any strength desired, and are therefore stationary, and it remains to connect them in such way with the parts of the pump already described as to admit of the oscillating motion of those parts. For this purpose a packed connection is made between the pipe 12 and the end of the pipe *n* outside of the bearing *o*, and a similar packed connection is made between the pipe 13 and the end of the pipe *g* outside of the bearing *o'*, these connections being each so constructed as to be tight and at the same time permit of the oscillating motion of the pipes *n* and *g*. Many forms of packed connections may be employed for this purpose, but I prefer that shown particularly in Figs. 2 and 7, which may be described as follows, the description for one connection sufficing for an understanding of both:

14 is an elbow connected with the lower end of the pipe 13. Within this elbow is screw-threaded the flanged hollow plug 15, the leather 16 being interposed between the flange and the end of the elbow. A sleeve 17, containing an inwardly-extending flange 18, is placed over the leather, so that the leather is clamped between the inwardly-extending flange of the sleeve and the outwardly-extending flange of the plug. This sleeve is screw-threaded onto a second hollow flanged plug 19, and this plug 19 is in turn screw-threaded inside of the pipe *g*. A supplemental flange 20 projects between the bearing *o'* and the sleeve 17.

The operation of the pump is as follows: The whole apparatus which I have described will be submerged in the water, which may rise to the level *x x*, Fig. 1, or higher, if convenient. Starting with the apparatus in the position shown in Fig. 1, the compartment *a*

will be filled with water, and the compartment *a'* will be largely filled with air, which is free to escape through the passage *u'* and the opening *w*, so as to admit water through the open valve *i'*. Now the valve *t* is in position to direct the compressed air from the pipe 11 through the passage *u* into the compartment *a*, producing therein a pressure which will close the valve *i* and force the contained water out through the opening *c*² and the passages *m*, *e*, and *g* into the pipe 13. This condition of things will continue until the compressed air has forced the water out of the compartment *a* sufficiently and the water has entered the compartment *a'* sufficiently, so that the compartment *a'* will overbalance the compartment *a* and cause the whole apparatus to oscillate into the oppositely-inclined position. The extent of its oscillation will be limited by the stop *q'*. As the two compartments oscillate in this manner the levers 4 and 1 will operate to throw the valve *t* to the opposite end of its stroke, so as to close the passage between the pipe 11 and passage *u* and open the connection between the pipe 11 and the passage *u'* at the same time the connection will be opened between the passages *u* and *w*. Now the pressure will be removed from the compartment *a* and the valve *i* will close, and new water will be allowed to fill that compartment by the opening of the valve *i*. The contained compressed air will escape through the passages *u* and *w*. At the same time the pressure of the air will be exerted in the compartment *a'*, so as to close the valve *i'*, open the valve *i*, and force the water contained in that compartment through the passages *m'*, *e*, and *g* into the pipe 13. This will continue until the water has entered the compartment *a* and been driven out of the compartment *a'* sufficiently to cause the compartment *a* to again overbalance the compartment *a'*, when the apparatus will oscillate back to the position shown in Fig. 1 and the operation already described will be repeated.

It will be observed that the spool-shaped valve which I have described is similar in some respects to the valve shown in patent granted to me, as assignor, No. 403,125, dated May 14, 1889; but it will also be observed (though I do not limit myself to this feature) that the pressure of the air is not exerted between the heads of the valve, as in said patent, but in that part of the cylinder beyond the ends of the valve. This change enables me to secure connection between the spool-shaped valve and the actuating-lever 1 by a single connection with the valve and at the same time without interfering with the tightness of those parts of the valve-cylinder where the pressure is exerted, the pressure of air in one end of the cylinder balancing that in the other for all positions of the valve and therefore not interfering with the operations of the lever.

It will be observed that the valve *i* is mounted on the piece *h*, which is simply

bolted to the compartment *a*; also, that the valve *i'* is mounted upon the piece *j*, similarly bolted to the bottom of the compartment *a'*; also, that the valves *l* and *l'* are mounted upon the piece *k*, similarly bolted to the bottom of both compartments. This construction enables all of the valves at the lower portion of the apparatus to be adjusted or repaired before the parts bearing them are bolted fast, and this is a very important feature.

As the water-compartments oscillate, the elbow 14 and plug 15 will remain stationary, while the sleeve 17 will turn, the packing 16 between serving to keep the joint tight, and the flange 18 serving to protect the packing from the entrance of any foreign substances from the outside.

I do not desire to limit myself to the form of apparatus shown and described, since I am well aware that the form may be varied to a

very large extent without departing from the principle of my invention.

I claim—

In a water-raising apparatus, the combination, with the oscillating compartments having formed together therewith the hollow journals, and the openings *c'*, *c''*, *e*, *c'''*, and *c''''*, surrounded on the exterior of the casting by the plane surface *d d' d''*, of the parts *h* and *j* for holding the valves *i i'* in place and secured, respectively, to the plane surfaces around the openings *c' c''*, and the part *k*, formed with the openings *m m'* and secured to the plane surfaces around the openings *c''*, *e*, and *c'''*, substantially as and for the purposes set forth.

FRANK H. MERRILL.

Witnesses:

FRED KEMPER,
WM. M. ILIFF.