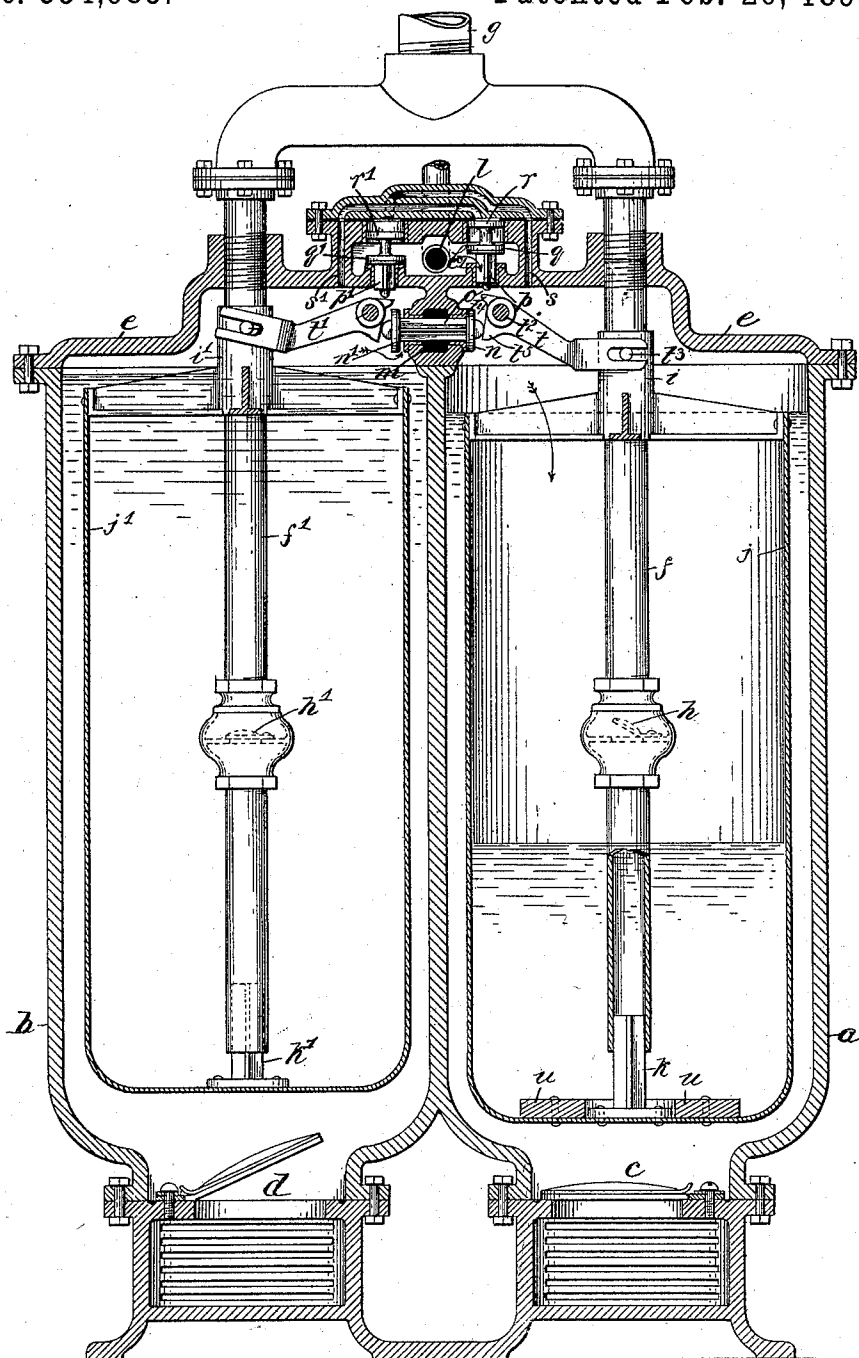


(No Model.)

F. H. MERRILL.
LIQUID RAISING APPARATUS.

No. 534,985.

Patented Feb. 26, 1895.



Witnesses

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FRANK H. MERRILL, OF BOUND BROOK, NEW JERSEY, ASSIGNOR TO THE
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LIQUID-RAISING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 534,985, dated February 26, 1895.

Application filed July 6, 1892. Renewed July 31, 1894. Serial No. 519,078. (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 Liquid-Raising Apparatus, of which the following is a specification.

The accompanying drawing shows a sectional elevation of an apparatus containing my invention, the section being on a plane through the centers of the water compartments and the valve chambers, excepting certain of the parts which for clearness are unsectioned, such as the valves, the pipes *f*, *f'*, the sleeves *i*, *i'*, the levers *t*, *t'* and the studs *k*, *k'*.

a and *b* are two water compartments containing respectively, the bottom valved water inlet openings *c* and *d*. These water compartments are cast together, as shown, and are closed at the top by a cap *e*.

f and *f'* are two branches from the water delivery pipe *g* which respectively extend down toward the bottom of the compartments *a* and *b* and which are provided with check-valves *h* and *h'*.

i and *i'* are sleeves free to slide vertically on the pipes *f* and *f'*. *j* and *j'* are buckets, one of which is suspended from each of said sleeves. The bucket *j* incloses the lower end of the pipe *f* and the bucket *j'* incloses the lower end of the pipe *f'*. The vertical movements of these buckets are controlled by the sleeves *i* and *i'* and also by the star shaped studs *k* and *k'* one of which is secured to the bottom of each bucket and projects up into the mouth of the pipe in which it is free to slide.

l is an entrance passage for compressed air and *m* is an exit passage for the same.

The valve *n* closes the connection between the compartment *a* and the exit passage and the valve *n'* closes the connection between the compartment *b* and the exit passage. These two valves are fixed upon the same stem *o*. The entrance passage *l* empties into a pressure chamber *l'* which is connected with the compartment *a* by the port *p* and with the compartment *b* by the port *p'*. These ports are closed by the upwardly opening valves *q* and *q'* which are fixed to the same stems with the pistons *r* and *r'* working in cyl-

inders extending into the walls of the pressure chamber *l'* as shown.

s is a passage leading from the compartment *a* to the upper end of the cylinder occupied by the piston *r'*; and *s'* is a passage leading from the compartment *b* to the upper part of the cylinder occupied by the piston *r*.

t and *t'* are levers of similar construction and operation, a description of one of which, *t*, will be sufficient. It is pivoted at *t²*. Its long arm is forked so as to engage with a pin *t³* on the sleeve *i* whereby the lever is oscillated as the sleeve reciprocates. On the other side of the fulcrum *t²* the lever is provided with the fingers *t⁴* and *t⁵*. The finger *t⁴* as the sleeve moves down, is adapted to press against the stem of the valve *q* and raise it while the same motion of the sleeve causes the finger *t⁵* to press against the valve *n* and close it.

The operation of the apparatus is as follows: When the parts are in the position shown in the figure with the valves *q* and *n'* open and the valves *q'* and *n* closed, the compressed air will enter the compartment *a* and drive the water out of the bucket *j* into the water delivery pipe *f*. At the same time, the compressed air in the compartment *b* will escape and permit the water to enter the passage *d* and pass up around the bucket *j'* and over its brim and fill it. After a time, however, the buoyancy of the bucket *j*, it being emptied, and the weight of the bucket *j'* it being filled will cause the bucket *j* to rise and the bucket *j'* to fall, oscillating the levers *t* and *t'* accordingly. This will close the valve *n'* and open the valve *n*. It will also start the valve *q'* from its seat and permit the valve *q* to descend onto its seat. As soon as the valve *q'* is started from its seat, compressed air will commence to enter through the port *p'* and, passing up through the passage *s*, will press downward on the piston *r* until the valve *q* is forced down onto its seat where it will be firmly held. As soon as the compartment *a* is connected with the exit passage *m* by the opening of the valve *n*, the pressure of compressed air on top of the piston *r'* will be relieved and the pressure under the valve *q'* will force that valve and the piston *r'* quickly upward to the top of its stroke. The compressed air will now force the water out of the bucket

j' into the delivery pipe f' and the absence of pressure in the compartment a will permit the water to enter through the passage c and pass up around the bucket j and over its brim and fill it; but the bucket j will quickly overbalance the bucket j' again and the parts will be returned to the positions shown in the drawing. These operations will be repeated indefinitely. u is a weight attached to the bucket j so as to make that bucket sufficiently heavier than the other to prevent the apparatus stopping at a point of equilibrium.

I claim—

1. In a liquid raising apparatus in combination, two liquid compartments, a bucket free to rise or fall in each compartment, a liquid delivery pipe leading from the lower part of each bucket and means whereby the movement of said buckets connects said compartments alternately with the pressure and exhaust passages, substantially as described.

2. In a liquid raising apparatus in combination, two liquid compartments, a bucket free to rise or fall in each, a liquid delivery pipe leading from the lower part of each bucket, gas entrance and exit openings to and from each compartment, valves controlling the same and a member connected with each bucket and arranged to open the entrance passage valve of one compartment and the exit passage valve of the other compartment and to permit the closing of the exit passage valve of one compartment and the entrance passage valve of the other compartment upon the movement of said buckets, substantially as described.

3. In a liquid raising apparatus in combination, two liquid compartments, a bucket free to rise or fall in each, a liquid delivery pipe leading from the lower part of each bucket, a weight connected with one of the buckets and means whereby the movement of said buckets connects said compartments alternately with pressure and exhaust passages, substantially as described.

4. In a liquid raising apparatus in combination,

two liquid compartments, a bucket free to rise or fall in each, a liquid delivery pipe leading from the lower part of each bucket, a bearing for each bucket upon its liquid delivery pipe whereby it is guided in its rising and falling movements and means whereby the movement of said buckets connects said compartments alternately with pressure and exhaust passages, substantially as described.

5. In a liquid raising apparatus in combination, two liquid compartments, a compressed air passage leading into each, a valve for each passage, a piston connected with each valve, a cylinder for each piston, a passage leading from each compartment to the cylinder of the other compartment and means whereby said valves are alternately raised from their seats, substantially as described.

6. In a liquid raising apparatus in combination, the two liquid compartments, a compressed air passage leading into each, a valve for each passage, a piston connected with each valve, a cylinder for each piston, a passage leading from each compartment to the cylinder of the other compartment, an exhaust passage from each compartment, a valve for each exhaust passage and means whereby the valve in the exhaust passage of each compartment is closed as the valve in the compressed air passage to the same compartment is raised, from its seat, substantially as described.

7. In combination the liquid compartments a and b , the air passage m connected therewith, the valves n and n' , the connecting valve stem o , the air passage l , the valves q and q' and lever mechanism whereby the stem o with its valves is shoved in one direction as the valve q is raised and is shoved in the opposite direction as the valve q' is raised, substantially as described.

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Witnesses:

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