

(No Model.)

2 Sheets—Sheet 1.

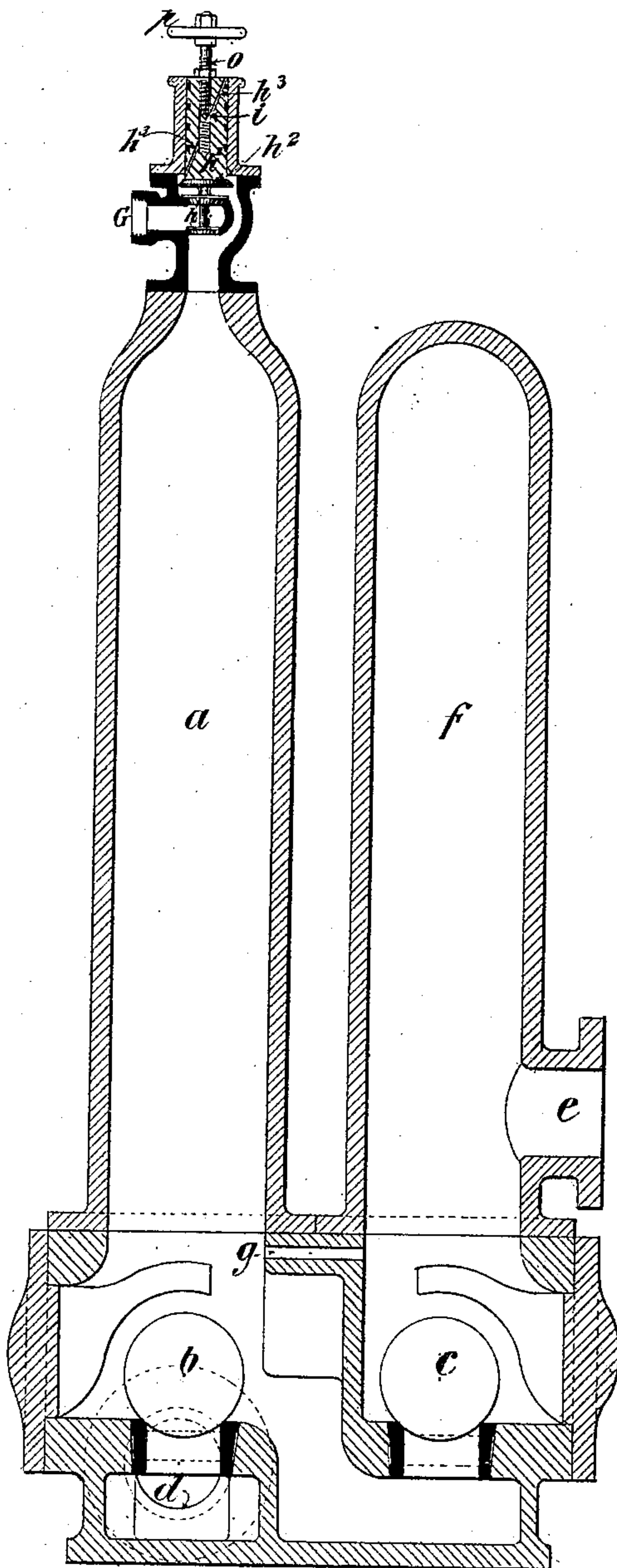
C. BURNETT.

APPARATUS FOR RAISING WATER.

No. 326,267.

Patented Sept. 15, 1885.

Fig. 1.



Witness

Charles Smith
J. Staib

Inventor

Cuthbert Burnett
per Lemuel W. Perrell atty.

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Fig. 3.

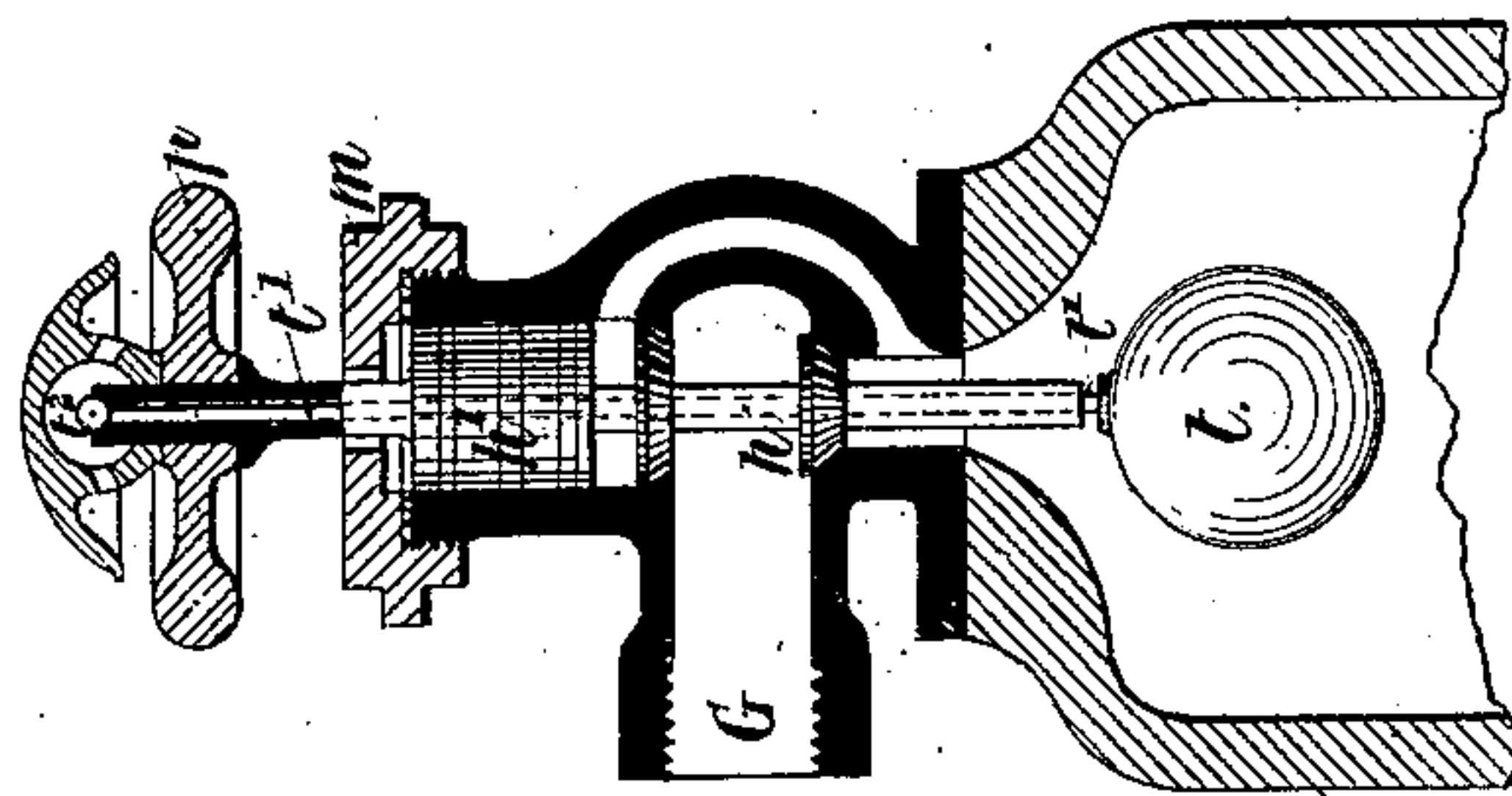
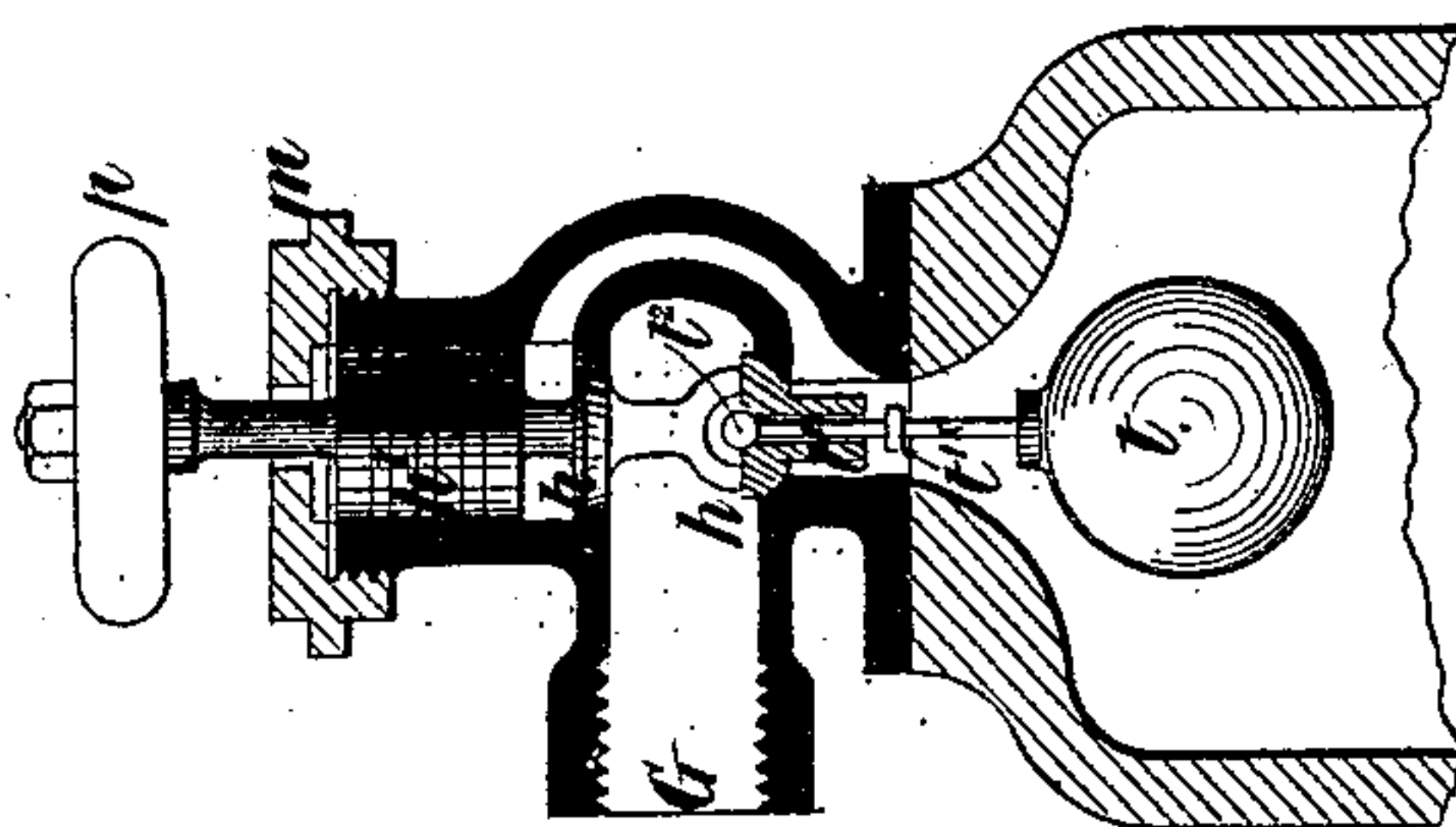


Fig. 2.



Witness

Chas. H. Smith
J. Stail

Inventor

Cuthbert Burnett
per Lemuel W. Seerell atty

UNITED STATES PATENT OFFICE.

CUTHBERT BURNETT, OF HARTLEPOOL, COUNTY OF DURHAM, ENGLAND.

APPARATUS FOR RAISING WATER.

SPECIFICATION forming part of Letters Patent No. 326,267, dated September 15, 1885.

Application filed October 24, 1884. (No model.) Patented in England October 6, 1883, No. 4,755; in France May 15, 1884, No. 162,136; in Belgium May 24, 1884, No. 65,262, and in Germany June 29, 1884, No. 30,762.

To all whom it may concern:

Be it known that I, CUTHBERT BURNETT, a subject of the Queen of Great Britain, residing at Hartlepool, in the county of Durham, England, engineer, have invented certain new and useful Improvements in Apparatus for Raising Water and other Liquids; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the construction of an improved apparatus or pump for raising water and other liquids, the object of the invention being to provide an apparatus or pump which shall combine simplicity and economy of construction with efficiency and simplicity of action.

In constructing a single-acting apparatus or pump according to my invention I employ a cylindrical or other suitably-shaped body provided with the usual suction and delivery valves, and at a convenient point above the latter is placed an injection-pipe. The said injection-pipe may be provided with a cock, whereby only the necessary quantity of water may be admitted. Instead of a pipe or cock-piece, as above named, a portway could be cast or drilled in the valve-box. On the top of the apparatus is fixed an equilibrium-valve for the admission of steam, and attached to the said valve is a piston, the top of which is open to the atmosphere. A spindle for purpose of starting the valve is provided. In some cases I may employ a spring or weight to assist the valves in closing promptly, although neither are necessary. In the piston there is placed a "snifting" valve for the admission of a small quantity of air. On starting the machine a portion of the rising main and body of the machine is, in most instances, charged with water, and on the admission of steam by the above-named spindle the water will be expelled through the delivery-valve, when a portion of the water will flow back through the same and will establish a vacuum, whereupon the water required to be raised will flow in through the suction-valve, and, with the air admitted through snifting-valve, will fill the machine and open the steam-valve, when the said water and air will be

again expelled through the delivery-valve, and so on, the apparatus being automatic in its action. To effect the opening and closing of the steam-valve, it will be evident that while the vacuum is being formed in the body of the apparatus the atmosphere, acting on the hereinbefore-described piston, will cause it to descend, and thus force the valves to their seats, and so shut off the steam, and on the vessel filling with water and air the latter, on reaching the under side of the piston, will cause the same to rise and thus open the valves, and steam being admitted to the under side of the piston the said piston is forced up, and the valves are fully opened for the free admission of steam. By duplicating the parts the machine can be made double-acting. It would, however, require only one steam-valve, and I prefer to use a cylindrical piston-valve with steam-cushion at either end, so that when the vacuum is formed at one side the valve will instantly pass over and admit steam to the other side, and vice versa. The apparatus may be fitted with an air-vessel, and the pump-valves may be arranged to suit different circumstances.

In order that my invention may be fully understood, I will now proceed to describe the same with reference to the accompanying drawings.

Figure 1 is a longitudinal vertical section of a single-acting apparatus or pump for raising water and other liquids, fitted with valve arrangements whereby the air-snifting valve is operated and maintained by the piston of the steam-admission valve, constructed according to my invention. Fig. 2 is a sectional elevation of a modified form of steam-admission and air-snifting valve, and Fig. 3 is a sectional elevation of steam-admission and air-snifting valve hereinafter referred to.

a is the body. *b* is the suction valve or valves, and *c* is the delivery valve or valves, of the pump. *d* is the suction, and *e* the delivery pipe. *f* is the air-vessel. *g* is the injection-pipe. *h* is the steam-admission valves for opening and closing the main steam-inlet *G*. *h'* is the piston with conical valve-like end *h''*, which, on the piston *h'* and steam-valve *h* opening and rising, rests on a suitably-formed seating, and thus, while acting as a stop for the

piston, prevents any leakage of the steam which might occur by the wear of the piston. h^3 is a small hole through the piston, drilled diagonally, and by screwing the end of the spindle o , which is for the purpose of starting the valve, into the end of the cylinder or piston h' forms the air-snifting valve i , for controlling the admission of air sufficient to prevent the water fouling the valves, and when adjusted to any required position can be secured by a check-nut. It will be noticed that the hole h^3 opens out immediately above the valve h^2 , and that on the rising of the piston all communication with the atmosphere is cut off. p is a weight acting on the spindle o , although such weight is not absolutely necessary. I sometimes employ a weight or its equivalent to assist the prompt closing of the valve h . The weight may consist of a plain weight or hollow ball weighted to the desired weight by introducing shot or other substance.

The action of the machine is as follows: The body of the pump, a , and part of the rising main being supposed to be filled with fluid, the pump is started by simply turning on steam; or in some cases it may be necessary to raise and lower the valves h by hand or otherwise, after which it will continue working automatically. The steam thus being admitted through the steam-supply G , it acts on the under side of valves h and piston h' and keeps the steam-supply passage open, and the pressure of the steam, acting at the same time on the surface of the water, forces it through the delivery-valve e and rising main and delivery pipe e . The pressure of steam having fallen to or below the pressure of water in the rising main, a small quantity of water is returned in the form of a jet through the injection-pipe g , and condenses the steam in the body of the pump a . The vacuum thus produced causes the inflow through suction valve or valves b , the simultaneous closing of the steam-admission valves h , and the indrawing through the snifting-valve i of a small quantity of air, which, as the water reaches a defined height, (regulated or decided by the quantity of air admitted by the snifting-valve,) becomes, compressed and acting on the piston h' and admission valve or valves h , the opening of which allows the steam again to act on the surface of the water; the above-described round of operations will continue automatically.

In order that the steam may not be discharged into the delivery-pipe e , I may regulate the opening or closing of the steam-admission valve or valves h so that as the level of the water is reduced the force of the steam will be reduced to pressure of column. Another method is to weight the valve as previously described, so that it may close at any desired point. The steam would thus work expansively.

It is obvious that the injection-port would be equally effective if placed at any higher point of working-cylinder, as the water could

not flow into the steam or working chamber unless the pressure of water be equal to or greater than the pressure of steam; but from the fact that the injection be effective at any part of the stroke I prefer to have it in position as shown. I can work the pump at any desired speed within its limits; and in the case of a single-acting pump of four thousand gallons per hour capacity at fifteen feet elevation I can so regulate the admission of steam that it will perform as few as five strokes per minute and discharge as little as one pint per stroke, although its capacity is nearly three gallons. It will thus be seen that it is capable of the finest adjustment. In some cases it may be advisable to shut or close the injection-port when the vacuum is established and during the inflow of water. This may be done automatically; but other expedients may of course be adapted for effecting the closure of the injection-pipe.

In the case of double-acting pumps constructed according to my invention the principle of the action is essentially the same as previously described, with reference to my single-acting pump, the motion and position of the steam-admission valve or valves being effected either by the force of the inflowing water on one side or by the vacuum forming on the other, or by both these causes simultaneously.

I in some cases propose to dispense with air and use steam for the purpose of destroying the vacuum and opening the valves. For this purpose a valve, as shown at Fig. 2, will answer the purpose, which will admit a small quantity of steam, destroying the vacuum, when, owing to the superior area of the piston, the said piston, and with it the main steam-admission valve, is raised, and a further supply of steam is admitted to eject the water.

In Fig 2 t is the float; t' , the loosely-fitting spindle; t^2 , the valve, but in this case opening into the steam-admission-passage instead of to the atmosphere, as in Fig. 3. The spindle of this description of snifting-valve may be provided with a collar, t^{IV} , as shown, which, striking against the spindle of main steam-valve, will assist in forcing it from its seat.

When air is used to prevent fouling the valves by the inrush of water, I admit the least possible quantity of air, so that it is sufficient for its purpose; but in some cases I prefer not to admit any air at all until the water rising in the cylinder through the suction-valve has reached an approved or desired height, and then, when the height has been reached, a small and sufficient quantity of air is admitted by a float or other mechanical contrivance acting on a suitable valve. One arrangement is shown at Fig. 3 of accomplishing the above object. t is the ball or float attached to a rod, t' , passing loosely through the spindle of the steam-admission valve. In Figs. 2 and 3 there is a stop, m , for the piston h' .

Pumps constructed according to my invention do not require to be immersed in water, as is the case with many pumps, but work atmospherically, and when air is admitted its admission is capable of regulation to a very great nicety, allowing a sufficient vacuum to be formed in the cylinder; and when air is not admitted steam takes its place, as before described.

10 I am aware that prior to the invention of the steam-engine attempts had been made to force water by the direct pressure of steam thereon. I am also aware that equilibrium-valves, as applied to steam-pumps, are not
15 new; neither is it new to admit air in large or uncontrollable volumes, whereby steam is condensed, and thus wasted, and a vacuum is at any rate with very great difficulty prevented from being formed at all.

20 I claim as my invention—

1. In a pump, the combination, with the vessels *a* and *f*, the inlet-pipe *d*, discharge-pipe *e*, and valves *b c*, of the steam-inlet pipe *G* and valves *h*, the piston *h'* and valve *h''*, spindle *o*, and air-inlet tube at *i*, substantially 25 as specified.

2. In a pump, the combination, with the vessels *a* and *f*, the inlet-pipe *d*, discharge-pipe *e*, and valves *b c*, of the injection-pipe *g*, for water to pass into the vessel *a* and con- 30 dense the steam, the steam-inlet pipe *G*, and valves *h* and *h''*, and air-inlet tube at *i*, substantially as specified.

CUTHBERT BURNETT.

Witnesses:

J. R. FRYER,
Solicitor, West Hartlepool.

THOS. ALDERSON,
Clerk to J. R. Fryer, West Hartlepool.