(No Model.)

2 Sheets—Sheet 1.

N. CURTIS.

HYDRAULIC AIR PUMP.

No. 246,089. Patented Aug. 23, 1881.

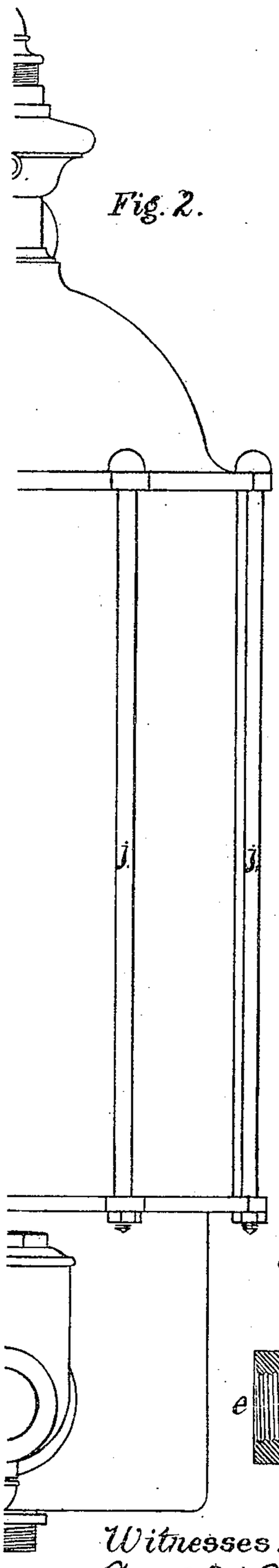

Fig. 2.

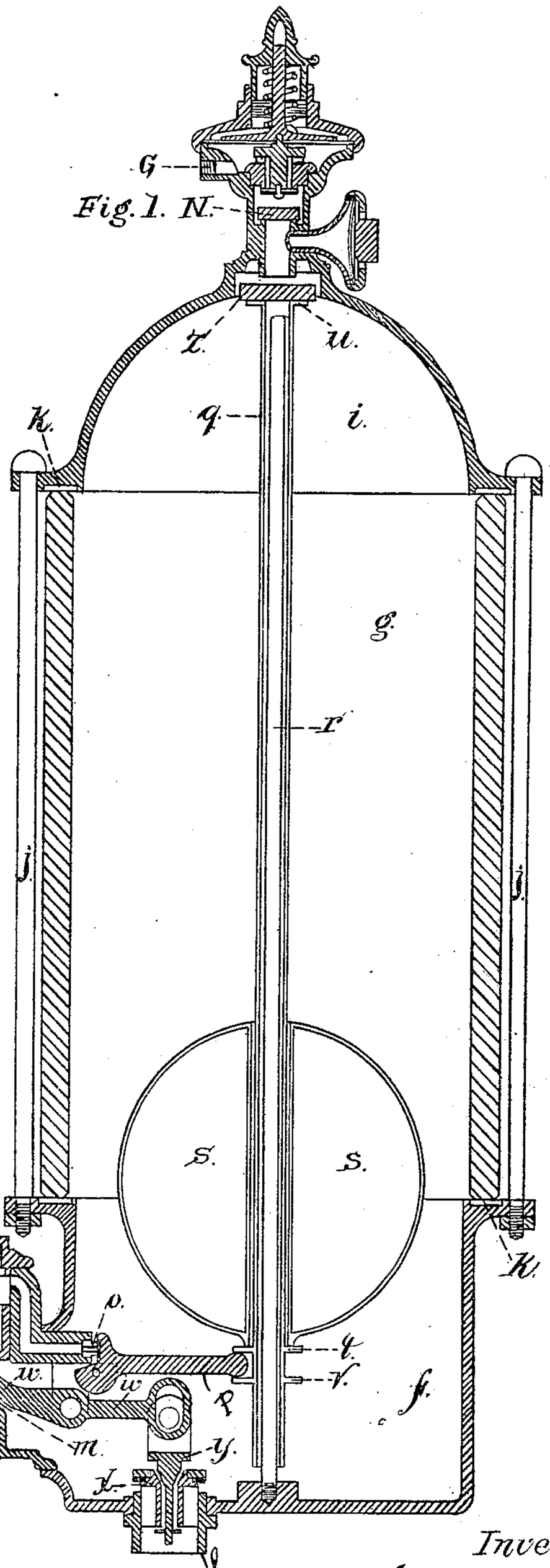

Fig. 1.

Witnesses:
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Alfred Bleof

Inventor.
Nelson Curtis

(No Model.)

2 Sheets—Sheet 2.

N. CURTIS.

HYDRAULIC AIR PUMP.

No. 246,089. Patented Aug. 23, 1881.

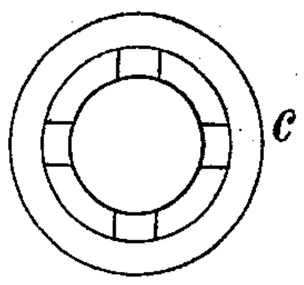


Fig. 8.

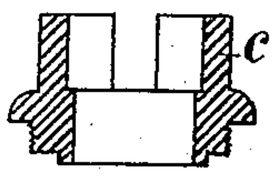


Fig. 7.

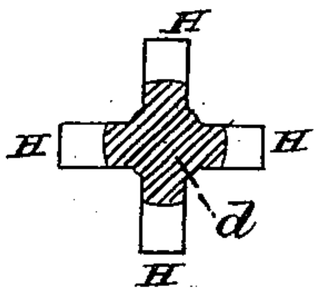


Fig. 6.

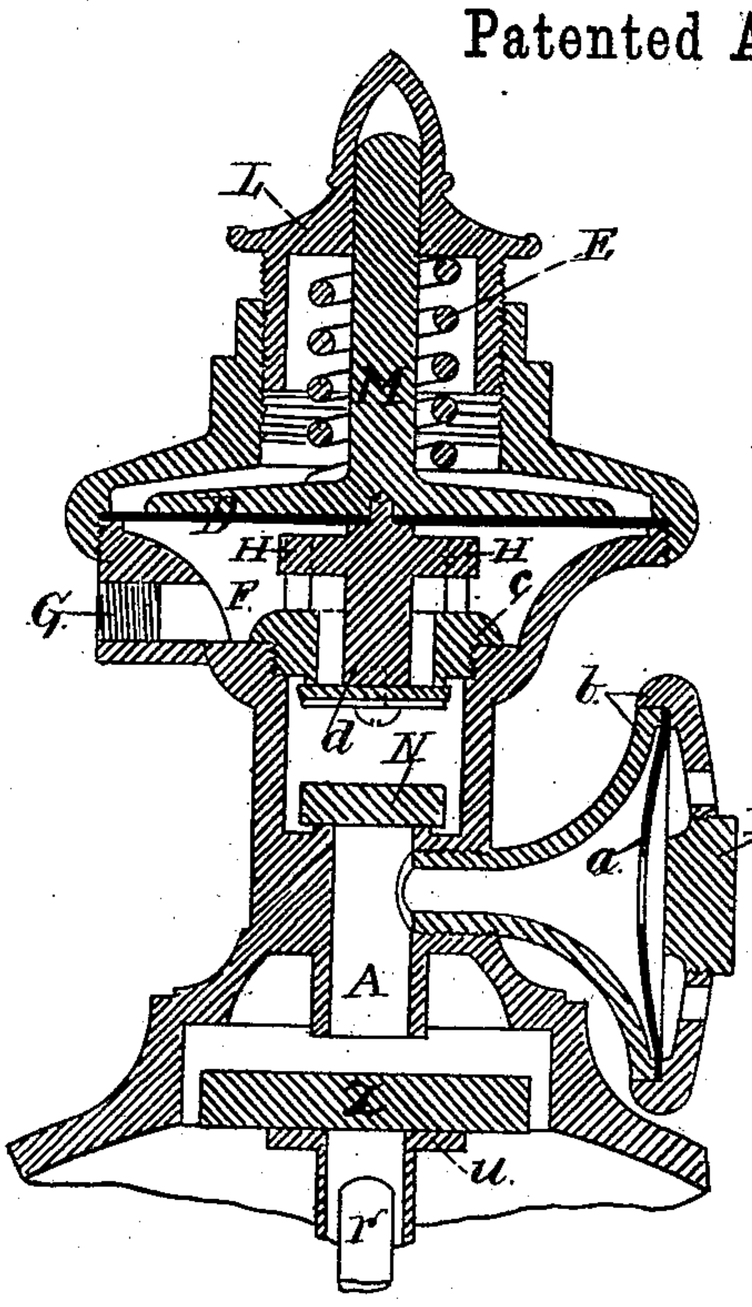


Fig. 4.

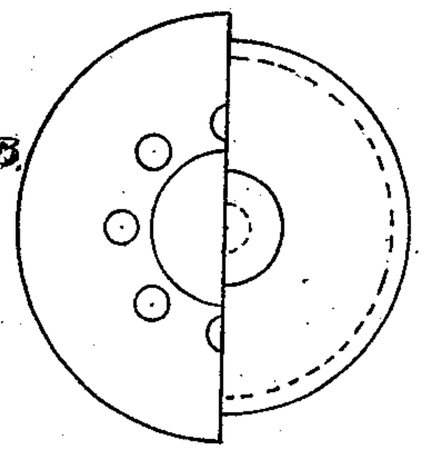
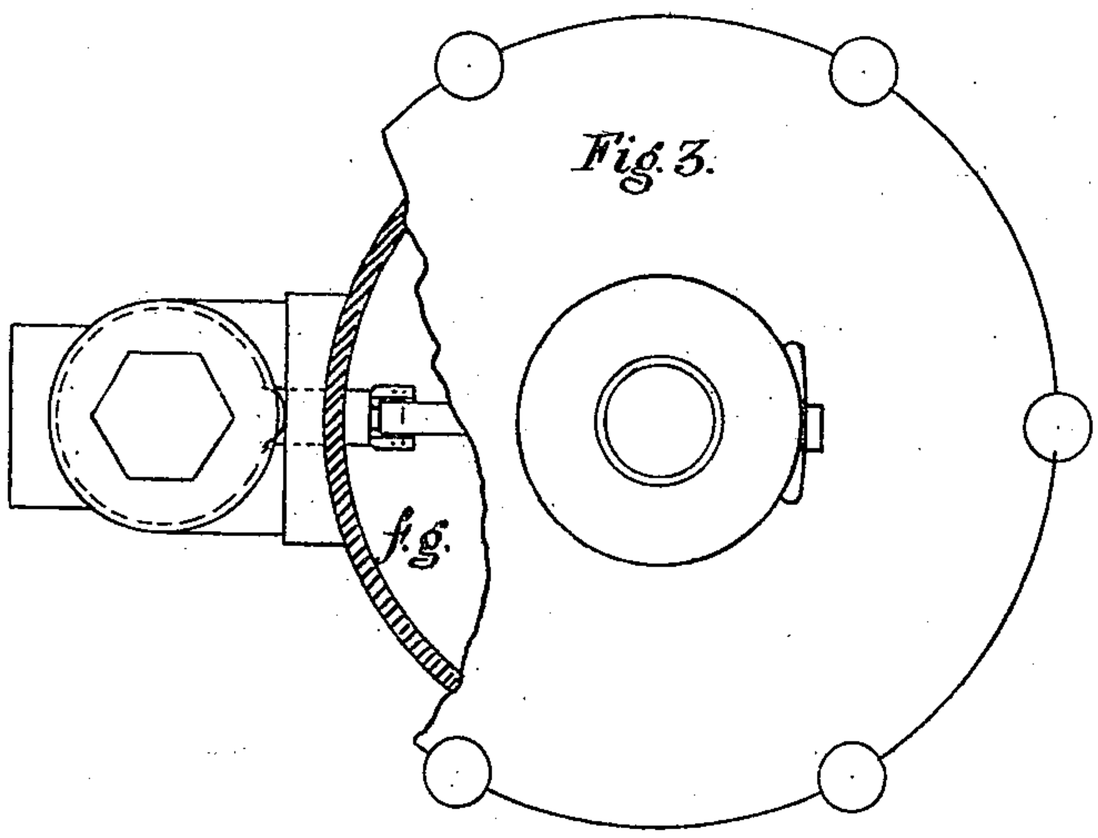


Fig. 5.



Witnesses:
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UNITED STATES PATENT OFFICE.

NELSON CURTIS, OF NEWTON, MASSACHUSETTS.

HYDRAULIC AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 246,089, dated August 23, 1881.

Application filed March 28, 1881. (No model.)

To all whom it may concern:

Be it known that I, NELSON CURTIS, of the city of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Hydraulic Air-Pumps; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, the same forming part of this specification.

The nature of my invention relates to the construction, arrangement of parts, and their combination, in the manner substantially as hereinafter more fully described, to produce a compact and automatic machine, which, by means of the flow of water under pressure in a connected pipe, will be available for forcing air or other fluid into a reservoir, and for maintaining a given pressure therein.

With reference to the drawings, like letters refer to the same or corresponding parts in all the figures.

Figure 1 is a sectional elevation of the machine. Fig. 2 is an elevation of one half, the other half being symmetrical, of the machine viewed at right angles with the view of Fig. 1. Fig. 3 is a plan, a part being broken out to show parts below. Fig. 4 is an enlarged sectional elevation of the upper part of the machine corresponding to Fig. 1. Fig. 5 is a view of the air-valve and case *a b*. Fig. 6 is a plan of the check-valve seat and guide *c*. Fig. 7 is a vertical sectional view of same. Fig. 8 is an under view of check-valve *d*.

e is an inlet-orifice for the supply-pipe, where the water enters under pressure into the float and forcing-cylinder *f g*, and *h* is an outlet-passage. The float and pressure or forcing chamber *f g* is made in the illustration here of a metal base, *f*, a glass cylinder, *g*, and a metal dome or top, *i*. These are secured together by suitable connections or screw-rods, *j*, the joints being suitably packed, as at *k*.

A piston, *l*, with valve *m* attached, is arranged to operate in a cylinder or chamber, *n*, and communication by a small orifice is kept up between chamber *n* and the supply-pipe, which enters at *e*. Chamber *n* has an outlet closed by a valve, *o*, delivering into chamber *f g*. The valve *o* is opened and closed by the attached lever *p*, which receives its movements from sleeve *q*. Sleeve *q* is guided by rod *r*, upon which it is freely fitted, with a slight frictional contact sufficient (or thereabout) to sustain its weight at any point to which it may be moved. The friction may be obtained by slightly bending the sleeve or rod, or otherwise. The float *s* is fitted freely about the sleeve, and is free to travel up and down upon it between the limits fixed by flanges *t u*.

The sleeve *q* embraces the end of lever *p* between two flanges, *t v*, or their equivalents.

A pivoted lever, *w*, is actuated by the valve *m* or piston *l*, and communicates to valve *x* and a secondary or supplemental valve, *y*, their movements, which are simultaneous with, but opposite to, the movements of valve *m*. The secondary valve *y* opens first, and being small opens easily, relieving the pressure somewhat on the valve *m*, so that it may open easily.

Referring to the upper part of the drawings, *z* is a floating valve, which, in case the forcing water or liquid rises so far, will be floated up and close the passage A, which is the air-escape or exit-passage from chamber *f g*.

a is an inletting air-supply valve; and it consists of an annular diaphragm or flap, closing against the blank seat B and opening inward. *d* is a wing, puppet, or suitable valve, closing the air-exit passage beyond A whenever the pressure in this passage is great enough to press the diaphragm D upward against the pressure of spring E, thus preventing the forcing of any more air into chamber F and its outlet G. The outlet G is to be connected by pipe to any other pipe, reservoir, or receiver where a given pressure is required to be maintained. The apparatus will also work, irrespective of a given pressure being required, up to a certain limit of pressure proportionate to the pressure of the water that actuates the machine.

The valve *d* is provided with wings H for convenience in the construction. The spring E is graduated to any given pressure by means of the adjusting-screw L. The spring E acts on the diaphragm D through the piston M.

N is a check-valve, preventing the air from returning into the chamber *f g*.

The operation is substantially as follows: The water has nearly escaped through valves

x y. This allows float *s* to strike flange *t*, thus moving the sleeve *q* downward, depressing lever *p* and opening valve *o*, which relieves pressure in chamber *n*. In consequence the pressure in pipe *e* opens valve *m*, and at the same instant lever *w* allows valves *x y* to close. The water then rises in the chamber *f g*, carrying upward the float *s s* until it strikes the flange *u*. Meanwhile the rising water forces the air from chamber *f g* through passage A past valve N, through valve *d* out into pipe G. When the float strikes flange *u* it lifts sleeve *q*, lever *p*, and closes valve *o*, causing pressure to accumulate in chamber *n* from pipe *e*. This pressure acts on piston *l* and closes valve *m*, causing lever *w* simultaneously, or nearly so, to open valves *y x*, when the water flows out again, as before, from chamber *f g* through valves *x y*, completing the process, which continues to repeat itself until the pressure in chamber under diaphragm D is sufficient to lift said diaphragm, and thereby allow valve *d* to close, so limiting the increase of pressure to the degree for which spring E has been adjusted. During the escape of the water from chamber *f g* through valves *x y* the air-valve *a* B admits air to refill the chamber *f g*.

Instead of the pressure-regulating device D E L, &c., a pressure-regulator may be applied to inlet-pipe *e*, and the ultimate pressure in pipe G thereby controlled in some cases.

I claim—

1. The combination of the float *s* and sleeve *q* and its flanges with the pivoted valve *o*, lever *p*, and piston *l*, substantially as and for the purposes set forth.

2. The lever *w*, in combination with the piston *l*, valve *x*, and valve *m*, whereby is secured the simultaneous, or approximately simultaneous, inverse action of the valve *x* and valve *m*, substantially as described.

3. The combination of the valve *y* with valve *x*, lever *w*, and valve *m*, piston *l*, and valve *o*, substantially as described.

4. The pivoted valve *o* and lever *p*, in combination with the sleeve *q* and float *s*, substantially as and for the purpose set forth.

5. The chamber F, valve *d*, diaphragm D, spring E, and adjusting screw-cap L, in combination with the pipes A and G, substantially as described.

6. The air-pump constructed as described, combining the base *f*, cylinder *g*, dome *i*, inlet *e*, valve *m*, piston *l*, chamber *n*, communicating with inlet *e*, lever *w*, valve *o*, lever *p*, valves *x y*, float *s*, sleeve *q*, guide *r*, flanges *u t*, and outlet-passage A, check-valve N, and air-valve *a*, all substantially as described.

7. The lever *w*, in combination with the piston *l*, valves *y x*, and valve *m*, substantially as described.

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