G. K. OSBORN.

Hydraulic Air-Pump.

No. 220,726. Patented Oct. 21, 1879.

Fig. 1.

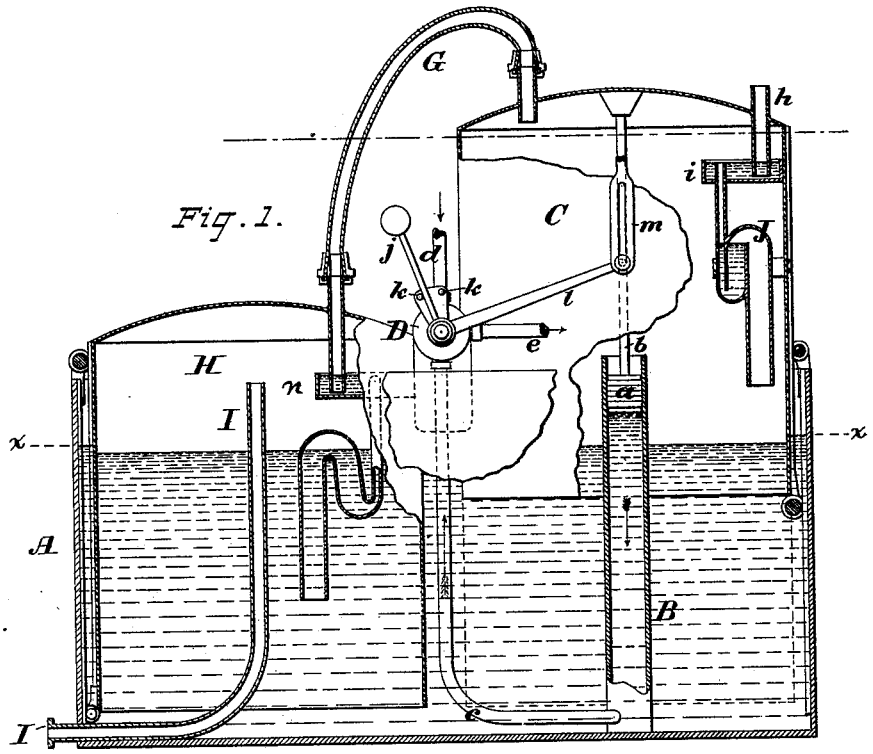


Fig. 2.

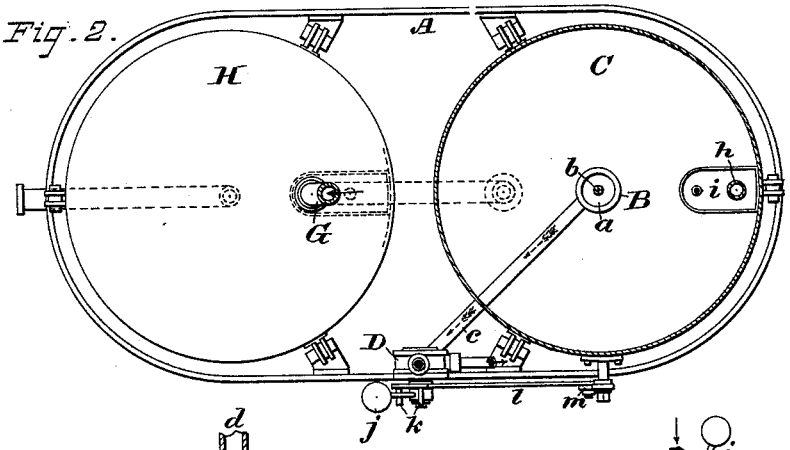


Fig. 3.

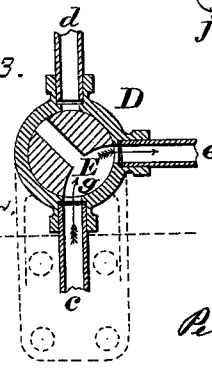
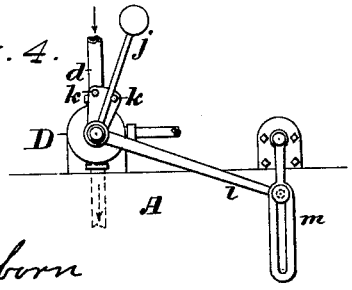


Fig. 4.



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GEORGE K. OSBORN, OF BROOKLYN, ASSIGNOR TO THE UNITED STATES ILLUMINATING COMPANY, OF NEW YORK, N. Y.

IMPROVEMENT IN HYDRAULIC AIR-PUMPS.

Specification forming part of Letters Patent No. **220,726**, dated October 21, 1879; application filed September 19, 1879.

To all whom it may concern:

Be it known that I, GEORGE K. OSBORN, of Brooklyn, Kings county, New York, have invented certain Improvements in Hydraulic Air-Pumps, of which the following is a specification.

The object of my invention is to provide a convenient and cheap air forcing or compressing apparatus, to be operated by water from city mains or other convenient sources.

The invention consists, essentially, in the combination and arrangement of a hydraulic engine with an air-pump and an air-holder, and in various other constructions, arrangements, and combinations of parts, all as will be hereinafter set forth.

In the drawings, Figure 1 is a vertical sectional view of my invention. Fig. 2 is a plan of the same, partly in section. Figs. 3 and 4 are enlarged detail views of the valve mechanism, the former being a vertical section, and the latter an elevation.

A is a tank or vessel filled with water up to the line *x x*, or thereabout. Into this vessel is fixed the cylinder B of the hydraulic engine, which stands vertically in the same. In this cylinder is fitted a piston, *a*, having a rod, *b*, extending upward and attached to the cover or roof of an air-pump bell, C.

The cylinder B is tapped at the bottom by a water-pipe, *c*, from a valve, which I will now describe, having especial reference to Figs. 4 and 5.

D is a valve-chamber, which is tapped by three pipes—the pipe *c* to the engine-cylinder, the supply-pipe *d* from the main or water-supply, and the waste-pipe *e*. E is the valve, which is a species of three-way cock.

The port *g* is always open to the engine-cylinder, but is opened alternately by the oscillation of the valve to the inlet and waste openings.

Referring again to the first two figures, the bell C rises and falls in the tank A, in the manner of a gasometer, as the piston *a* rises and falls in the cylinder B, and, as the bottom is sealed by the water in the tank A, when the bell rises a vacuum is created, and air rushes in at the air-inlet pipe *h*, the bottom of which is sealed by dipping or opening into a pan, *i*, of water of the proper depth.

The valve E is provided with a weighted arm, *j*, and a free collar having projecting arms *k k*, to catch and operate the weighted arm *j*. This collar is also provided with an arm, *l*, that engages a slot in a vertical rod, *m*, attached to the bell C.

To illustrate the operation of the above-described mechanism, suppose the piston *a* to have reached the bottom of the cylinder B and the valve E turned so as to admit the water from the main through the pipes *d* and *c* to the cylinder B. The piston *a* rises, carrying the bell C up with it, the vacuum formed in the latter causing the air to enter at the pipe *h*. When the piston has risen to a prearranged height in its cylinder the rod *l* is caught by the termination of the slot in the rod *m* and lifted, thus causing one of the arms *k* to lift the weighted arm *j*, which at this moment reposes against it, to a point a trifle beyond the perpendicular, whereupon it falls over to the other side, shutting off the incoming water by shifting the valve and opening the cylinder to the waste or exhaust pipe *e*. Very little resistance being now offered to the descent of the piston *a*, the weight of the bell C carries it down again, forcing the air out through the tube G into an air-holder, H. This inlet-pipe is also sealed by a water-pan, *n*, to prevent the air from escaping by the same. An outlet-pipe, I, may be provided at the top of the holder, or as shown in Fig. 1, the latter being, perhaps, preferable, as it is not connected with moving parts. When the bell C reaches the bottom the rod *m* trips the valve again, and the ascent of the bell is assured. Thus the action is kept up indefinitely.

The bells C and H may have suitable guides to steady them in ascending and descending, and be weighted to insure proper pressure on the contents of the air-holder.

The waste-water from the pipe *e* may be carried away in any suitable manner. The valve above described will serve the purpose; but I do not wish to confine myself to this par-

ticular construction, as other forms capable of shifting at the ends of the piston's travel might be devised.

The method of tripping the valve through the rise and fall of the bell C may also be varied without material departure from my invention.

To provide against evaporation of the water in the sealing-pans *i n*, I provide each with what I call a "siphon-pump," J. A slender tube passes up through the bottom of the pan to a height corresponding with the proposed level of the water in the same. The lower end of this pipe enters the lower bend of an enlarged S-trap, from which another and larger branch depends, as shown. An amount of water remains in the trap that is in excess of the capacity of the slender tube which connects the trap with the pan. When the bell descends the lower tube enters the water, and the confined air drives the water retained in the trap up the slender tube, whence it overflows into the sealing-pan. This in turn, if too full, overflows into the vessel A.

The pump J should be submerged deep enough to keep the trap portion full of water.

Other means may be used for keeping the pans full of water—as, for instance, the waste-water from the pipe *e* may run into the tank A, and the water in this be maintained at a constant level by a waste-opening. Then, the proper level being assured, the sealing-pans *i n* might be fixed at the proper point to effect their submersion at each descent of the bell.

The tank A might be partitioned, or each bell might be provided with a separate tank, if required.

I claim—

1. An air bell or pump arranged within a sealing-vessel, as shown, in combination with an engine-cylinder arranged centrally inside of it, a piston arranged to play in said cylinder, and a piston-rod arranged to take under the roof of the air-bell and lift the bell when the piston rises from the pressure of the water under it, substantially as set forth.

2. The combination of an air bell or pump, C, a hydraulic engine arranged centrally within it to lift it, and a valve to admit water to the engine, adapted to be tripped or shifted by the rise and fall of the air-bell, substantially as set forth.

3. The combination of the air bell or pump C, a hydraulic engine arranged to lift it, a valve to admit water to the engine, adapted to be tripped or shifted by the rise and fall of the air-bell, and an air-holder, H, connected in some suitable manner with the bell C, substantially as set forth.

4. The air bell or pump C, provided with a sealed inlet-pipe, *h*, a sealing tray or vessel, *i*, a supply-pump, J, or its substantial equivalent, and an outlet-pipe, G, the said bell being sealed by submerging its lower edge in a sealing-liquid, and adapted to be raised and lowered by suitable mechanism, substantially as set forth.

5. The combination of the bell C, provided with a sealed inlet-tube, *h*, and sealing-vessel *i*, the air-holder H, provided with a sealing-vessel, *n*, and outlet for the air, and the flexible connecting pipe or tube G, substantially as set forth.

6. The combination of the air-inlet pipe, the sealing-vessel, and the siphon-pump J, arranged to operate substantially as set forth.

7. The combination of the valve-chamber D, provided with inlet *d* and outlets *c e*, the valve E, with ports *g*, always open to the outlet *c*, the weighted lever *j*, collar with arms *k k*, the rods *l m*, and the bell C, all arranged to operate substantially as set forth.

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Witnesses:
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