G. M. MOWBRAY.

AIR PUMP.

No. 45,168. Patented Nov. 22, 1864.

Fig: 2.

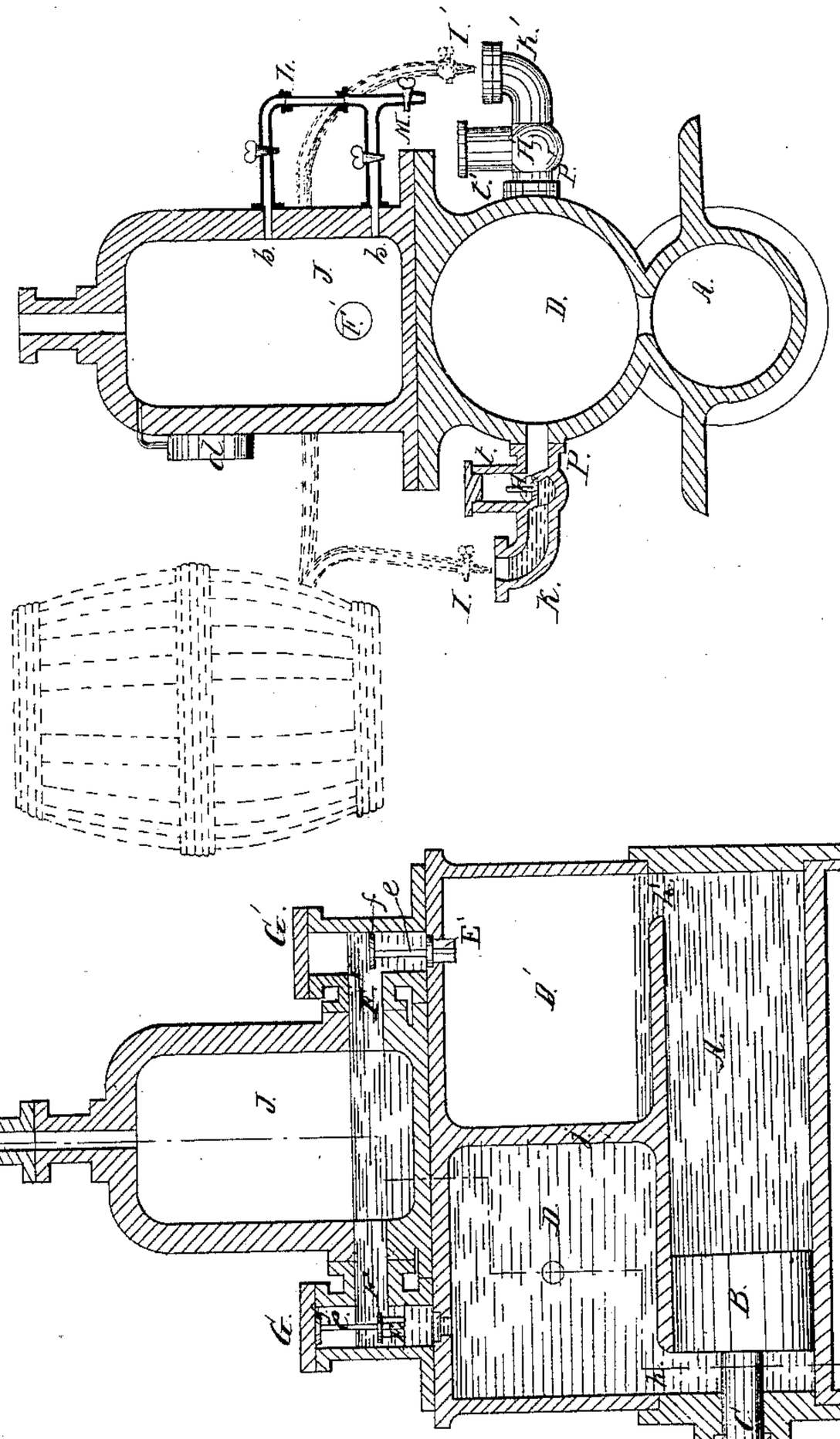

Fig: 1.

Witnesses:
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UNITED STATES PATENT OFFICE.

G. M. MOWBRAY, OF TITUSVILLE, PENNSYLVANIA.

IMPROVEMENT IN AIR-PUMPS.

Specification forming part of Letters Patent No. **45,168,** dated November 22, 1864.

To all whom it may concern:

Be it known that I, GEORGE M. MOWBRAY, of Titusville, in the county of Crawford and State of Pennsylvania, have invented an Improvement in Pumps for Compressing Air, Vapor, and Gaseous Bodies; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section taken longitudinally through the pump. Fig. 2 is an elevation of a vertical section taken on the irregular line *x* of Fig. 1.

Similar letters of reference indicate like parts.

The object of my invention is to compress atmospheric air, vapor, or gases, and store them in a proper reservoir, which must be of great strength and thickness, for use in oil and other wells, including those called "Artesian," for the purpose of obtaining a flow of liquid from such wells, upon the principle of the oil-ejector; and it consists in placing water, oil, or saline solutions in the chambers and passages of an air-pump, or, in other words, immersing the piston of an air pump in a liquid comparatively incompressible, in lieu of air, for the purposes and in the manner hereinafter described.

In fetching the liquid contents of such wells up to the surface of the earth by the method practiced in using ejectors, it is necessary to use highly-compressed air—say, for wells one thousand feet in depth, air under a pressure of four hundred and fifty pounds to the square inch. This great pressure is obtained, if at all, with great difficulty and expense by means of the air-pumps now in use, even when constructed in the most approved manner at present known. The great heat produced in the working of the pump causes the oil used for lubricating it to ignite and burn the packing and make the pump inefficient and useless. I have attempted to construct a pump which shall enable me to compress air or any other compressible fluid up to any desired or useful point, and I accomplish it by employing a mobile packing in the cylinder and its connected parts which surrounds the piston, under a construction and mode of operation hereinafter set forth.

In constructing and arranging my air-pump I prefer to lay it horizontally instead of vertically, bolting it to a bed-plate similar to those used for horizontal steam-engines, the piston B of the pump receiving its motion through the piston-rod C, connecting with a cross-head, guides, connecting-rod, crank, and other usual devices, aided by a fly-wheel. (Not here shown.)

The pump-cylinder is designated by the letter A, having openings *h h′* in its upper side at each end, communicating, respectively, with chambers D D′, set immediately over the cylinder and separated from each other by a partition, *j*. Conduits F F′, leading, respectively, from the chambers D D′, open into a common air-reservoir, J, placed above the chambers, the communication between the chamber D and its conduit F being governed by a valve, E, and that between the chamber D′ and its conduit F′ being governed by a valve, E′. These valves are self-acting, and may be globe or ball valves, or flat valves, like those shown, in which case they should be guided to and from their seats by a feather-stem, as usual. These valves have their seats in the highest part of the chambers D D′, and are accessible through bonnets G G′, to adjust them or grind them true without disturbing the conduits. The valve-stems *e* sustain buttons *f*, which strike the inside of the bonnet at each ascent of the valves, the latter being limited in their movements upward by this means.

At the side or some other convenient part of each chamber I place an inlet or check valve, H H′, opening inward to admit air, and also sufficient water to compensate for the loss of that which may escape from the pump in the form of spray when the piston is operated rapidly, it being desirable to maintain a uniform volume of water in the pump during its operation. These valves are located in pipes P P′, which open, respectively, into the chambers D D′, and these pipes have vertical branches *t t′*, to furnish access to the valves, and also branches *k k′*, formed by extending the pipes P P′ a short distance beyond the valve-seats and below the plane of their position. The ends of the branches *k k′* are turned upward, and are carried to a height exceeding the elevation of the valves H H′. Their upturned ends are open, and are connected with pipes I I′ (shown in red) to supply water to them,

which pipes are made open above the branches *k k'* without any close connection, so as to admit air through the branches *k k'*.

I prefer to place the air-reservoir J above the receiving-chambers D D', although it may be placed in other convenient positions. It is provided in its upper part with an outlet, controlled by a valve or stop-cock, K, and with a pressure-gage, *d*, so indicate the pressure of the compressed air, vapor, or gas, and with a water-gage, L, and discharge-cock to indicate the height of water and remove any surplus beyond the amount necessary to cover the valves F F', through which the air is discharged from the chambers into the conduits. The water-gage is connected to the reservoir by pipes *b b*.

In order to charge the pump, the piston is placed at the end of its stroke, and the chamber over the piston, when the latter is in that position, is filled with water. The piston is now moved toward and beneath the other chamber to the end of its stroke in that direction, and this other chamber is also filled with water. The pump is now ready for operation. It should be observed that the stroke of the piston or its travel does not extend in either direction beyond the openings *h h'*.

Motion being given to the piston, the water in one of the chambers—say D'—above the cylinder descends into the cylinder through the opening *h'*, following the piston, and thereby creating a vacuum in that chamber, which is immediately supplied with air through the check-valve H'. When the piston returns, it drives the water before it out of the cylinder into the chamber D', the air being expelled from the chamber by the water and escaping through the feather or globe valve E' into the air-reservoir J. The like action takes place in the other chamber on the return of the piston to its first position. The air-reservoir J receives at each motion of the piston from each chamber alternately, through the feather or globe valves, a volume of air equal to the volume of water displaced from the cylinder by the motion of the piston, while at the same time the other chamber receives through its proper check-valve as much air (with a little water, to compensate for waste in the form of spray) as is equal in volume to the volume of water which descends to fill the cylinder at each to-and-fro movement of the piston.

By the construction above described of the inlet-valves H H' and the water branch-pipes *k k'*, I balance the valves, so as to make them exceedingly sensitive to the diminution of pressure which takes place when the motion of the piston allows the water to run from either chamber into the cylinder, and I am also enabled to compensate for any loss of water which may have been carried up in the form of spray along with the air in its passage through the feather or globe valves into the air-reservoir.

I have described a double-acting pump, because with it I can compress air at each movement of the piston, but a single-acting pump is equally applicable, although not so economical, for the reason that two cylinders and pistons would be necessary to accomplish the same amount of work.

I do not claim the construction of the valves or receiving chamber or cylinder of the pump here shown; but

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. Compressing and forcing air in and through a pump by means of water or other comparatively incompressible liquid, so that the air is acted on directly by the water and does not come in contact with the piston, under a mode of operation and by a combination and arrangement of chambers D D' and cylinder A, substantially as above set forth.

2. Arranging the inlet or check valves so that while air is supplied through their seats to the chambers D D a small portion of water or other liquid may also be passed into the chambers to compensate for the waste of the supply in the pump, substantially as described.

3. The combination of the air-reservoir J with the water-gage L and water-discharge cock M, substantially as described.

4. Balancing or partially balancing the inlet or check valves by means of the compensating water-supply under a mode of construction and operation substantially as described.

GEO. M. MOWBRAY.

Witnesses:

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