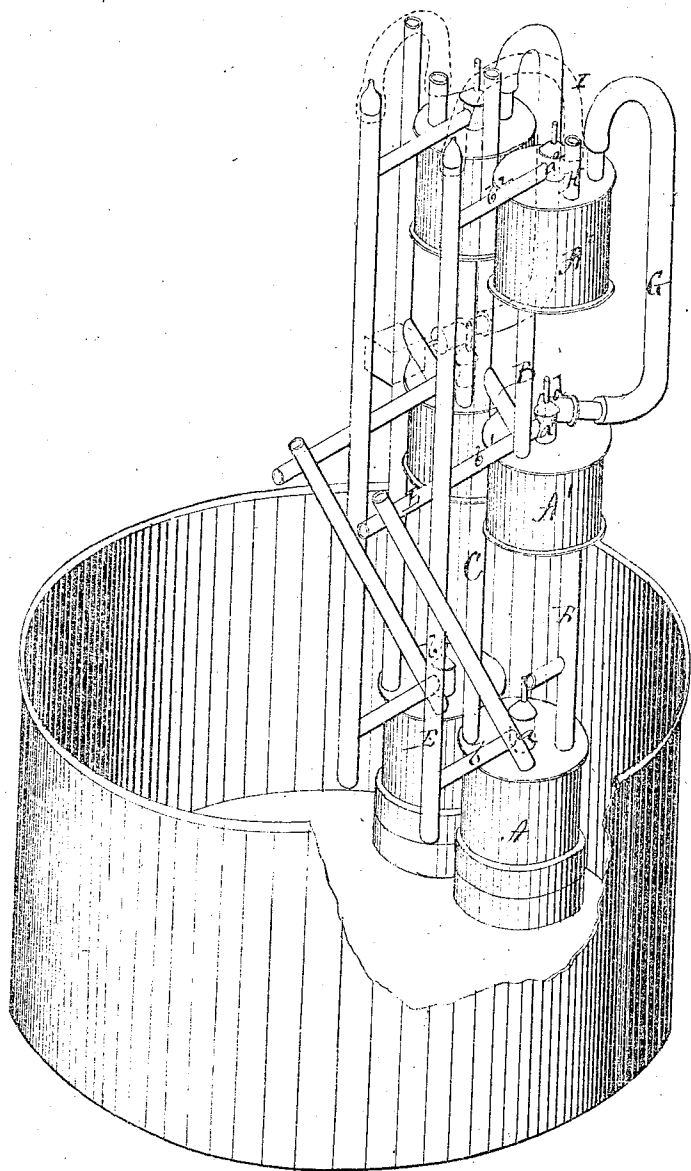


H. Spear's Water Elevator.

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PATENTED MAY 24 1870



Witnesses
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UNITED STATES PATENT OFFICE.

HATHERLY SPEAR, OF CAPE ELIZABETH, MAINE.

IMPROVEMENT IN WATER-ELEVATOR.

Specification forming part of Letters Patent No. 103,518, dated May 24, 1870.

To all whom it may concern:

Be it known that I, HATHERLY SPEAR, of Cape Elizabeth, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Water-Elevators by Compressed Air; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The nature of my invention consists in the construction and arrangement of a machine for raising water in relays, by means of compressed air, to any height desired.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, which represent a perspective view of my machine.

A represents a reservoir, of any suitable dimensions, made so as to withstand any amount of pressure it may be desired to submit it to. This reservoir is provided with any desired number of holes through its bottom. These holes or openings radiate from a central vertical opening to the circumference of the same.

The central opening within the reservoir is provided with a valve so constructed that it will allow the water to pass in, but as soon as any extra pressure is brought to bear within the reservoir it will close and prevent the water from passing out through the same.

The object of providing the reservoir A with the holes in the bottom above mentioned is, that by such an arrangement no mud or other sediment can stop up the valve, which would very likely often be the case if the reservoir rested immediately on the bottom of the place where it is intended to use the same—for instance, in mines for draining purposes, which is the chief object for which I have designed my machine, although it may be used for a variety of other purposes.

A tube, B, leads from near the bottom of the reservoir A upward through its top a suitable height, and passes then through the bottom of another reservoir, A¹, and to near the top of the same.

C is the tube through which the compressed air is conducted from the condensing engine

or reservoir to the reservoir A, where it is admitted on top of the water contained therein. When the water first passes into the reservoir A, the force should, of course, be shut off, and any air that may be in said reservoir will then pass out through a leak-valve, *a*, in the top of the reservoir. This leak-valve is so constructed that a very small pressure will open it and keep it open; but as soon as a stronger pressure is brought to bear it will close. Hence, the force being shut off and water entering the reservoir, the leak-valve allows the air contained in the reservoir to pass out; but as soon as the power is admitted through the conduit C, said valve closes. The compressed air then forces the water through the tube B into the reservoir A¹.

When in use, the machine should be set so that the water around it will be up to the top of the reservoir A; but in case the water should rise above this point the leak-valve *a* would become inoperative. To obviate this difficulty I provide a tube of suitable height on top of said reservoir, within which the leak-valve is placed, and operates in the same manner. The air that passes out through the leak-valve *a* is carried through tubes *b b* into another tube, E, and thence out where needed.

The water having, as above described, been forced up into the second reservoir, the air follows the water and forces it up through similar tubes to the third, fourth, fifth, or as many reservoirs as may be required, until it reaches the top, the air continuing to be admitted into the lower cylinder from the power source, and passing from the same to and through all the intermediate reservoirs until the supply of air is shut off, as will be presently described.

I have not deemed it necessary to represent more than one intermediate reservoir, as they are all constructed in precisely the same manner and operate for the same purpose.

The water, in passing up through the pipe B into the intermediate reservoir, A¹, expels any air that may be contained therein through the leak-valve *a*¹, said air passing through the pipe E. When this intermediate reservoir is filled with water and the compressed air follows, the water passes through a similar tube, B¹, up into the next reservoir, and so on into the last or top reservoir. This last reservoir, A², is also, for the same purpose as the others, pro-

vided with a leak-valve, a^2 , the air passing through the pipes b^2 into the tube E.

When the water has been raised to the top reservoir and the compressed air commences to come into the same, a portion of the air at once passes through the tube G and closes a valve, d , in the power-conduit C, thus shutting off the supply of compressed air; or this valve may be closed at any desired point and the water further elevated by the expansion of the compressed air contained in the lower reservoirs. The air now forces the water out from the top reservoir A^2 through the pipe H. This pipe is bent or curved within the reservoir, and provided with a valve of such construction that it will close as soon as the water has been reduced to a certain point, and prevent the air from escaping through the same pipe. The air now passes through another pipe, I, into the pipe b^2 or E, and all the air which, as above set forth, is exhausted from the different reservoirs through the pipe E, may be used for ventilating the mine or for other purposes. As soon as the pressure of the air escaping through the pipe I becomes sufficiently reduced, a spring acting upon the valve d opens the power-conduit, and lets the compressed air have free passage into the bottom reservoir, A, which in the meantime, while the power was shut off, has become full of water, as mentioned in the first part of this specification.

Thus it will be seen that I do not raise the water at once to the required height, but perform it by relays, using for that purpose the expansive power of the air in the lower reservoirs.

It would in many instances be almost impossible to condense air to a sufficient density to raise water from deep mines; but by my method of relays it can be accomplished with very little trouble or expense.

In the practical operations of this machine

it would perhaps be advisable to have more than one, as if one of them should by some accident get out of order, the other could be at once put in operation, and the work in the mine need not be stopped.

If it is deemed necessary, I may attach another tube, J, to the bottom reservoir, A, for the purpose of exhausting the air therein. This may or may not be used at pleasure.

In very long relays it may be necessary between the reservoirs to have separate pipes or conduits for the air and the water, as a much smaller pipe only is needed for the air than for the water. In that case, however, the air-pipe should not extend as far down as the water-pipe in the lower reservoir; but in the reservoir above it should be higher than the water-pipe, for obvious reasons. In this case, however, the water-pipe will be provided with a valve closing with a downward pressure.

I do not claim, broadly, the employment of relays, or a succession of receptacles for water, when one is placed above the other, as it is known that suction-pumps have been thus constructed; but

What I do claim, and desire to secure by Letters Patent, is—

A series of reservoirs, receptacles, or relays, one placed above the other, for the purpose of elevating water to any desired height by means of compressed air, pursuing the water from the lowest, through the intermediate, to the highest reservoir, and thence out, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HATHERLY SPEAR.

Witnesses:

C. ALEXANDER,
JNO. A. ELLIS.