Self-acting Hydraulic Air-compressing Machine.

Michael Hey.

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Fig. 1

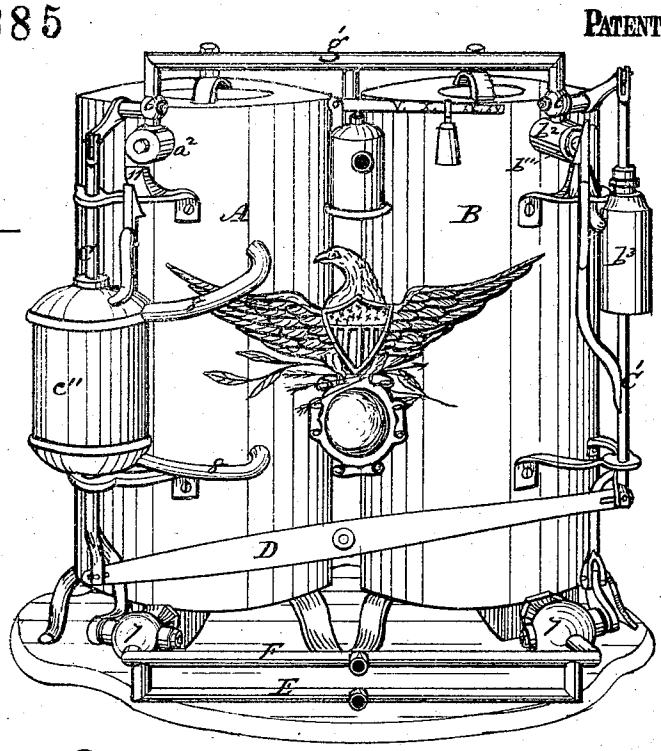


Fig. 4.

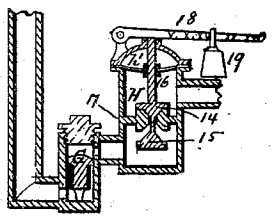


Fig. 2

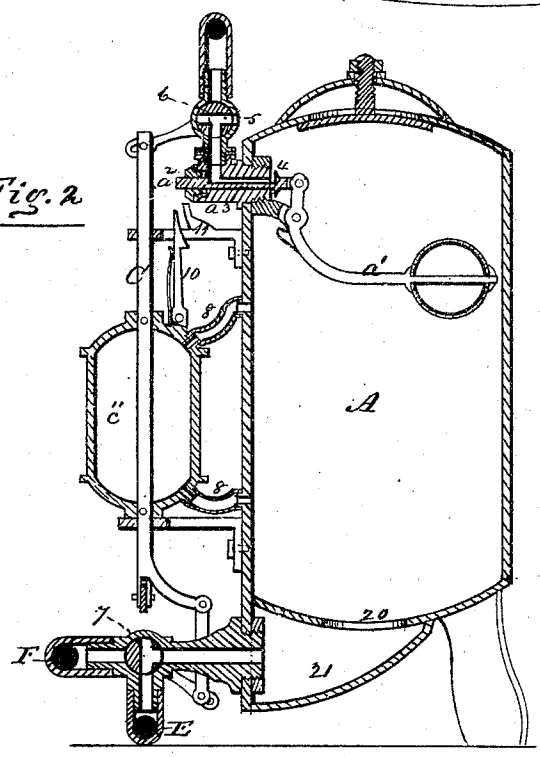
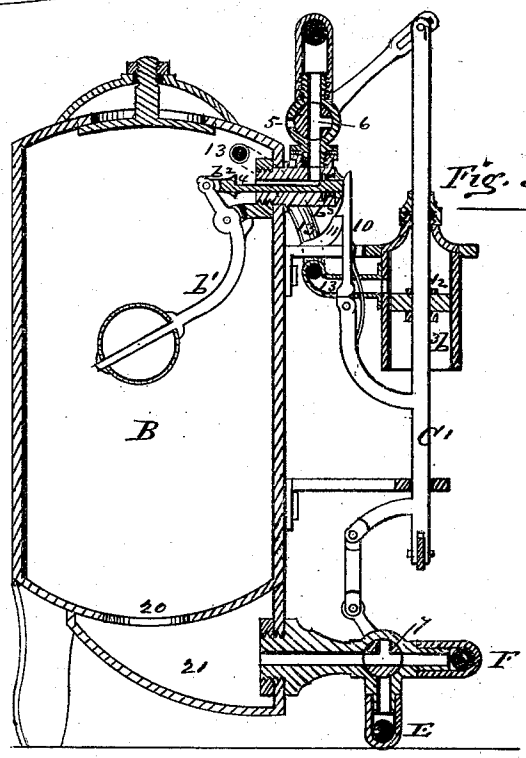


Fig. 3.



Witnesses:

Wm. Morrison

Wm. H. Morrison

Inventor:

Michael Hey

UNITED STATES PATENT OFFICE.

MICHAEL HEY, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN HYDRAULIC AIR-COMPRESSORS.

Specification forming part of Letters Patent No. 117,285, dated July 25, 1871.

To all whom it may concern:

Be it known that I, MICHAEL HEY, of the city of Philadelphia, in the State of Pennsylvania, have invented certain Improvements in Self-Acting Hydraulic Air-Compressing Machines, of which the following is a specification:

My improvements relate to the hydraulic machines used in connection with hydrants or other water-supplying sources under head-pressure for the purpose of forcing air into a reservoir to be used as a motive power for the elevation of liquids; and the first part of my invention relates to the construction and combined arrangement of two hydraulic pressure-cylinders communicating with each other and with the sources of water-supply and discharge, and also with a pair of outward vertically-moving bars (released by the operation of floats in the pressure-cylinders) connected to each other by a horizontally-arranged lever; and also to water and air-valves of the pressure-cylinders in such a manner that the falling motion of either one of the two said vertically-moving bars causes the rising of the other, and thus together causing the supply and discharge of the water and air required to give alternate action to the pressure-cylinders; the object of this part of my invention being to effect and keep up a constant air-compressing action in the machine. The second part of my invention relates to the devices whereby the floats in the pressure-cylinders are caused to release and elevate alternately the outside vertically-moving devices.

Figure 1 is a perspective view of the front side of my improved machine. Fig. 2 is a vertical section of the pressure-cylinder and its immediate attachments, which, together, form the left-hand half of Fig. 1. Fig. 3 is a vertical section of the pressure-cylinder and its immediate attachments, which, together, form the right-hand half of Fig. 1. Fig. 4 is a vertical central section of the usual check-valve, with the regulating-valve between it and the usual receiver, the latter not being shown.

The hydraulic pressure-cylinders A and B are of like size and form, are supported close beside each other upon the same platform, and each provided with a floating bent lever, a^1 b^1, the fulcrum of which is supported in a stationary projection in the inside near the upper end of the cylinders, and the weight end articulated to a horizontally-sliding stem, a^2 b^2, which moves easily through the air-valve way-tube a^3 b^3 of its respective pressure-cylinder. The inner end of the stem has a surrounding flange, 4, which closes water-tight the inner end of the tube when the float is at its full elevation, as shown in the cylinder A, the outer end of the said stem at the same time projecting a short distance beyond the outer end of the tube. The upper half of that part of the stem which is between its flange 4 and the portion which will project at the outer end of the tube is cut away so as to leave a passage-way for the external air to enter the cylinder through the opening 5 in the air-valve 6 at the upper end of the pressure-cylinder when the water outlet-valve 7 at the bottom of the cylinder is opened to run off the water. The valves 6 and 7 of each cylinder A and B are what are called "two-way cocks," and the two of each cylinder are operated simultaneously by means of the outside vertically-moving bars C C′, with which the valves are respectively connected by levers, so that each of the said valves 6 and 7 will be rotated a quarter circle around, to either open or close them during each vertical movement of the bar C C′. The two bars C C′ are articulated to the respective ends of a horizontal connecting-lever, D, the middle or fulcrum-pin of which is fixed by a bracket or otherwise to the pressure-cylinders A B, so that the downward movement in one of the vertically-moving bars C will cause an upward movement in the other bar. Movement is given to the respective bars C C′ either by the weight of water, or by compressed air, or by both, as the construction of the machine may require. The bar C of the left-hand pressure-cylinder A is, in this instance, operated by water, and the bar C′ of the right-hand pressure-cylinder B is operated by compressed air. Fixed around the bar C of the cylinder A is a small hollow cylinder, c'', the upper and lower ends of which communicate with the pressure-cylinder A through the flexible tubes 8 8. Attached to the upper end of cylinder c'' is a spring-catch, 10, which, when the said cylinder c'' has been elevated to its highest position by the lever D, (as will be explained,) catches upon a rest, 11, with its upper end directly opposite to the sliding stem a^2, so that when the said stem is pushed outward by the rising float the catch will be detached from its rest and the weight of

the filled cylinder c'' will cause the bar C to fall suddenly, and thus tilt the lever D and cause it to elevate the bar C′ of the cylinder B, and at the same time turn the two-way cock 7 so as to let the water run out of A and c'', and the two-way cock 6 so as to let air enter at the same time. Fixed to the outside of cylinder B is a small cylinder, b^3, the lower end of which is open. Through its contracted upper end the bar C′ moves, surrounded by a close packing. A piston, 12, fixed to the bar C′, moves in the cylinder, and at a point just above the said piston, when at its highest position, (see Fig. 3,) the cylinder b^3 communicates, through a tube, 13, with the interior of the upper end of the pressure-cylinder B. The upper and the lower ends of the said bar C′ are articulated to the respective water and air-valves 7 and 6 of the pressure-cylinder B in the same manner as the bar C of cylinder A, so that when either of the bars is at its highest position the water in its pressure-cylinder will pass out through the waste-pipe E, and when either of the bars C is at its lowest position the water will enter its pressure-cylinder through the supply-pipe, F, which is intended to be in communication with the hydrant or other water-head supply. The check-valve G allows the confined air to pass from the upper ends of the pressure-cylinders A and B, through the connecting-tube g' and valve, into the regulating-valve H, and through the latter into the receiver (not shown) in which the fluid to be forced or elevated by pressure is placed. The regulating-valve H consists of a hollow cylinder communicating with the check-valve G on one side and with the intended receiver of the compressed air on the other side. It has two opposite conical valves, 14 15, fixed to a vertically-moving stem, 16, which is suspended from a thin spring-disk, h, which closes the valve-case air-tight with each one of the two conical valves at a short distance from their respective seats in a partition, 17, between them, while the upper end of the stem 16 projects upward and supports a lever, 18, with a weight, 19, adjusted thereon to allow the air to pass at any desired degree of compression, but to yield upward and close the valve and thus stop the action of the machine when the pressure exceeds the degree required, and opens again when the pressure in the receiver is diminished to the degree required; and, when the pressure is too weak, to continue moving in the same direction downward until it closes the valve and thus stops the machine. The lower end of each of the pressure-cylinders A B is concave, has a large hole, 20, in its center, which opens into a downward-sloping spout, 21, to the lower part of which the outlet or waste-water valve 7 is attached, so that the deposit of mud, &c., from the water in the cylinder will run out with the waste water.

In the operation of this hydraulic air-compressing machine, one of the cylinders being emptied of its water, and the outlet of its water-valve 7 and the inlet of its air-valve 6 being open, as in cylinder A, the water enters the cylinder B, compresses and forces the contained air through the check and regulating-valves into the receiver, and eventually raises the float-lever b^1, which pushes outward the stem b^2, dislodges the spring-catch 10 of the rod C′, and the piston 12, in its cylinder b^3, is then forced suddenly downward by the compressed air which has access through the tube 13, and thus opens the outlet of the water-valve 7 and the inlet of the air-valve 6, and at the same time elevates the opposite end of the horizontal lever D, which carries up the cylinder c'' until its spring-hook 10 catches over its receiver-stay 11; at the same time the upward movement of the said bar of cylinder A opens the water-supply way of its valve 7 and closes the air-inlet way of its valve 6. The water now enters, compressing the contained air and forcing it through the pipe g' and valves G and H into the receiver until the stem a^2 of its float-lever a^1 dislodges the hook 10 and allows the bar C to be suddenly forced downward by the weight of the water with which its cylinder C became filled from the pressure-cylinder A, and so on, each pressure-cylinder A and B alternately compressing and forcing air into the receiver.

I claim as my invention—

1. The communicating hydraulic cylinders A and B, in combination with their respective floats a^1 b^1, vertically-moving bars C C′, and connecting-lever D, water-valves 7 7, and air-valves 6 6, all constructed and arranged to operate in relation to each other, substantially as and for the purpose hereinbefore set forth.

2. The water-cylinder c'', in combination with its vertically-moving bar C and pressure-cylinder A, arranged to operate together, substantially as and for the purpose hereinbefore set forth.

3. The sliding stem a^2, in combination with the float-lever a^1 and valve-way tube a^3, and the spring-catch 10, in combination with the vertically-moving bar c and water-vessel c'' in communication with the cylinder A through the flexible tubes 8 8, all constructed and arranged to operate substantially as and for the purpose hereinbefore set forth.

4. The sliding-stem b^2, in combination with the float-lever b^1 and valve-way tube b^3, and the spring-catch 10, in combination with the vertically-moving bar C′, piston 12, cylinder b^3, and air-passage way 13 in communication with cylinder B, all constructed and arranged to operate substantially as and for the purpose hereinbefore set forth.

Witnesses: MICHAEL HEY.

BENJ. MORISON,
WM. H. MORISON.