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W. G. COX.

HYDRAULIC AIR COMPRESSOR.

APPLICATION FILED JULY 27, 1904.

Fig. 3.

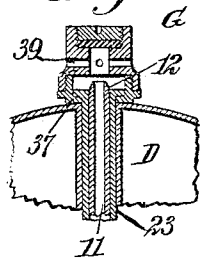
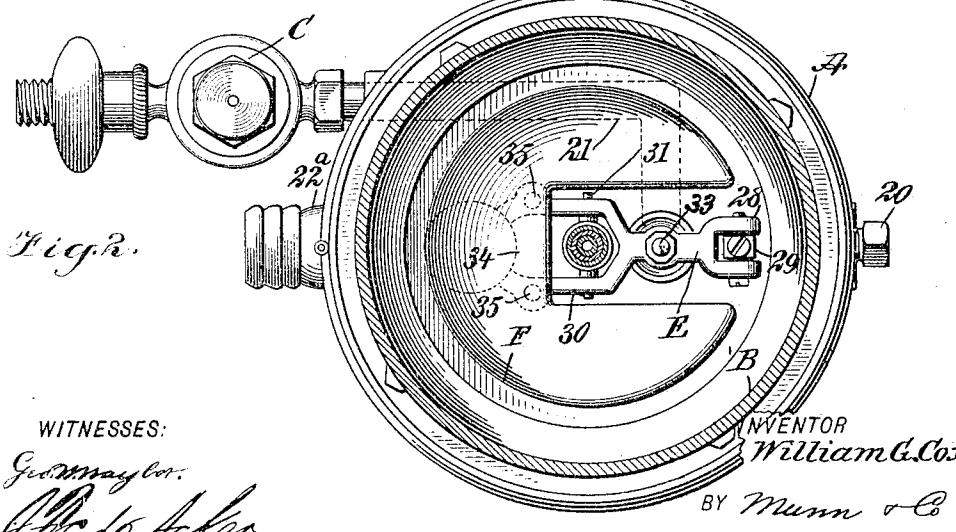


Fig. 1.

Fig. 2.



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No. 787,150. Patented April 11, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM G. COX, OF NEW YORK, N. Y.

HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 787,150, dated April 11, 1905.

Application filed July 27, 1904. Serial No. 218,364.

To all whom it may concern:

Be it known that I, WILLIAM G. COX, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Hydraulic Air-Compressor, of which the following is a full, clear, and exact description.

The purpose of the invention is to improve upon the hydraulic air-compressor for which Letters Patent were granted to me May 3, 1904, Serial No. 759,158, to such an extent that the mechanism is simplified and two floats instead of but one are employed, one of the floats being connected with the lever-arm controlling the outlet and inlet valves for the water.

Another purpose of the invention is to so construct the device that it will work equally well under high or under low pressure and so that no centering or balancing point is obtained, and, further, to so locate the floats that they will act as such only when submerged in water, but when out of the water will act as seating-weights for the outlet-valve and as factors to simultaneously unseat the inlet-valve.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a central vertical section through the improved device, showing the parts in their normal position. Fig. 2 is a horizontal section taken practically on the line 2 2 of Fig. 1, and Fig. 3 is a detail sectional view of the relief-valve for the air and a portion of the traveling float in operative position relative to the said valve.

A represents the base of the compressor, the base being preferably of the circular type, and said base is supported usually through the medium of legs 10, as is illustrated in Fig. 1.

B represents a casing, usually of dome shape and which constitutes a water-chamber, the said dome-shaped casing B being secured to the base A in any desired water-tight manner. An air-vent tube 11 is located at the central portion of the base A, extending up into the dome and into a neck 13 at the top of the dome, which neck is in communication with the interior of said dome, and, further, the upper end of the vent-tube 11 is made exteriorly conical, as is shown at 12 in Fig. 3. This air-vent tube 11 is open at the top and at the bottom, and at its bottom portion, as is illustrated at 14 in Fig. 1, the vent-tube is screwed into the base, passing beyond the lower face of the base, at which point it is provided with a suitable nut 15, holding the said vent-tube in its upright or standing position, the nut being of such type as to render the lower end of the tube 11 open to the air.

An inlet-valve is located in the base at one side of the air-vent tube 11. This inlet-valve consists usually of a thimble 16, removably placed in an opening in the base, the said thimble extending down into a water-supply tube 19, which is shown closed by a suitable plug 20, the water from the said supply-tube 19 having free access into the interior of said thimble. A ball 17 is free to move in the thimble 16, and when this valve is to be closed the ball 17 is floated upward by the water entering the thimble and seats itself against an inner annular shoulder at the upper portion of the said thimble. Also preferably in the construction of said thimble it is provided with an outer flange 18, resting on the top of the base, as is shown in Fig. 1, and the entrance to the thimble from its upper portion is more or less conical, as is also shown in Fig. 1.

In connection with the water-supply pipe 19, above mentioned, a main water-supply pipe 21 is formed or attached at the bottom portion of the base, and this main supply-pipe 21 connects with the supply-pipe 19 where the thimble of the inlet-valve enters. The supply-pipe 19 can be used, if desired, by removing the plug 20; but usually this pipe is kept closed and the water is supplied to the inlet-valve through the medium of the main supply-pipe 21, which at its outer end is provided with any approved form of check-valve C, adapted for connection with any source of water-supply.

At the opposite side of the vent-tube 11 an outlet-opening 22 is formed of necessary diameter, and this outlet-opening is in communication with an outlet-pipe 22^a, attached to or formed at the bottom of the base, as is best shown in Fig. 1, and this outlet-pipe 22^a is fitted for attachment to a rubber hose, for example, or it can be attached to a rigid pipe, as may be desired.

A second pipe or tube 23 is mounted to slide on the vent-tube 11. The outer tube, which is a guide-tube, does not extend to the upper end of the vent-tube, and at the upper end of the said guide-tube 23 a flange 23^a is provided. This guide-tube 23 is preferably made largest at its bottom portion and when in position on the vent-tube rests at its bottom on the upper face of the base A. The lower portion 24 of the guide-tube 23 is provided with a collar 25, on which a sleeve 26 rests. This sleeve enters a socket formed in the bore of a hollow float D, made of any suitable material, which float D is adapted to travel on the said guide-tube 23.

At the upper face of the base A, I mount a valve-lever E. This valve-lever is provided with a fork at its outer end, between the members of which a stud 29 is received extending up from the base. The fork portion 28 of this valve-lever is pivoted to the said stud 29. The inner end 30 of the valve-lever E is bifurcated, so that its members may pass one at each side of the guide-tube, and the members of the bifurcated portion 30 of the said valve-lever are pivoted to the lower portion of the guide-tube 23 by suitable pivot-pins or trunnions 31, as is best shown in Fig. 2.

Between the fork 28 of the valve-lever and its inner bifurcated end portion 30 a trip-pin 33 is adjustably secured. This trip-pin is rendered conical at its lower end, and its lower end is adapted to enter the thimble 16, forming a portion of the inlet-valve which admits water into the dome B, and when the said valve-lever E is in its normal position (shown in Fig. 1) the point of the trip-pin 33 will bear against the ball and unseat it, thus permitting the water from either of the inlet-pipes 21 or 16 employed to pass up freely through the inlet-valve and into the dome and raise the float D. At the inner end of the said valve-lever E a valve 34 is secured, the valve being preferably a disk valve, and this disk valve when the inlet-valve is opened closes the outlet 22 in the base connected with the dome B. When the valve 34 is raised to permit water to be discharged from the dome B, the trip-pin 33 is carried out from the thimble-section of the inlet-valve to such an extent as to permit the ball 17 to seat itself and temporarily shut off a further supply of water.

It may here be stated that the stationary vent-tube 11 under certain conditions conducts the confined air from the dome B and permits more or less air to enter the said dome. The vent-tube 11 is unobstructed throughout its length, the inner end being in direct communication with the interior of the dome when the upper portion of the tube is uncovered, while the lower end of the said vent-tube 11 is at all times in direct communication with the outside atmosphere.

A bonnet-valve G is employed to normally close the upper end of the vent-tube 11. This bonnet-valve is of sufficient depth to extend down below the flange 23^a on the movable tube 23 when the top of the valve rests upon the top of the stationary vent-tube 11, as is shown in Fig. 1, and a flange 37 at the bottom of the valve G extends beneath the flange 23^a on the said movable tube 23. The flange 37 is provided with a ring-like member, which is screwed into the bottom of the body of the valve, and the flange 37 of the valve has such relation to the flange 23^a on the movable tube 23 that the bonnet-valve G may be raised sufficiently to unseat it without acting upon the flange 23^a, and consequently on the valve-lever E. When the bonnet-valve G is thus raised, which is accomplished by the raising of the float D, air is admitted from the dome B through openings 39 in the side of the valve-body to the uncovered vent-tube 11, passing from thence to the atmosphere, thereby at such time reducing the air-pressure in the upper portion of the dome. As soon as the air-pressure in the dome is thus reduced the bonnet-valve G is caused to move farther upward by the continued upward movement of the float D, causing the movable tube 23 to be raised and the valve-lever to be operated to open the outlet-valve and to permit the water to flow out of the dome, the air at this time passing into the dome through the vent-tube 11 to promote the flow of water at the outlet-opening for the dome.

The especial feature of the invention relates to the lower float F, which controls the valve-lever E, and said float F is hollow and may be of any suitable material and practically horse-shoe in shape. The valve-lever E up to its connection with the lower portion of the guide-tube 23 is located in the space between the members of the float F; but at its inner end the said valve-lever is secured to the said float F by means of screws 35 or their equivalents, as is shown by dotted lines in Fig. 2.

The float D is provided with convexed upper and lower surfaces, while the auxiliary or additional float F is usually so constructed that its bottom is flat and its upper face is concaved or dished, as is illustrated in Fig. 1.

In the operation of the machine the float F is buoyant only when it is immersed in fluid and the fluid is relieved from air-pressure; but when the said float is not subjected to the action of fluid it becomes and serves as a weight.

When the machine is receiving water, the auxiliary float F is in the horizontal position shown in Fig. 1, the trip-pin 13 being in the

lower position, forcing the ball downward in the inlet-valve, and the outlet from the dome is closed. As the float D is raised on its tube 23 by the water flowing into the dome through the inlet-valve the compression of air in the dome will insure the auxiliary float F remaining in its initial position until the upper float D has been carried up to an engagement with the relief or bonnet valve G at the top of the air-vent tube 11, uncovering the top of the said air-vent tube and relieving the pressure of air in the dome B, as has been stated, the air passing down and out through the air-vent tube to a certain extent, and at such time the upper float D will raise the guide-tube 23, and thus carry the auxiliary float F upward. The inlet-valve will then be closed, and the outlet 22 will be opened, permitting the water to readily leave the dome B. As the water leaves the dome the two floats D and F serve as weights, acting together to close the outlet 22 and to open the inlet-valve by carrying the valve-lever E to its normal position, which is shown in Fig. 1.

It will be observed that in the first position of the auxiliary float F it assists the valve-lever E in rising, so as to uncover the outlet-opening 22, and in the second position it serves as a weight to bring the valve-lever to its normal position, closing the outlet-valve 22 and opening the inlet-valve. It will also be observed that in restoring the valve-lever E to its normal position it is controlled by the combined weight of both of the floats D and F, as the float D in its lower position will exert its weight on the movable guide-tube 23, which guide-tube in its turn is pivoted to the valve-lever E, and the said valve-lever in its turn is attached to the auxiliary float F.

At the upper portion of the neck 13 of the dome a valve-casing 40 is secured, and this casing is provided at its upper end with a plug 40^a, held in place by a suitable gland 41, and this plug is provided with a vertical opening 42 extending through it and communicating with a conical recess 44 in the bottom of the said plug, as is shown in Fig. 1. Above the opening 42 in the said plug 40^a a split valve 43 is secured. This valve and its casing is a delivery-valve and is adapted to permit the air compressed in the dome B to be forced out through the said split section 43 into a tube 43^a, connected usually with a hose 43^b and with any receptacle adapted to receive the compressed air; but in the event an accident should happen to the working part of the said device and the water in the dome B should have a tendency to overflow into the compressed-air-delivery pipe 43^a such a disposition of the water is prevented by locating what I term an "overflow-valve" 45 in the casing 40, having a suitable support 46. The upper end of this valve 45 is more or less conical, so that when an overflow of water occurs in the said dome the water will raise the valve 45 and seat it in the recess 44, thus preventing the water from leaving the dome until it can be properly discharged. I desire it, however, to be understood that the construction of the bonnet-valve G and the construction of the delivery-valve located above the bonnet-valve form no portion of the present invention, having been fully described and shown in the patent upon which this construction is an improvement.

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

1. In hydraulic air-compressors, a base having an inlet-valve and an outlet-valve, a dome secured to the base, a valve-lever pivoted within the dome, arranged to control the inlet-valve and the outlet-valve, closing one and opening the other, a vent-tube fixed within the dome, having communication with the dome and with the outside atmosphere, a tube mounted for movement on the fixed vent-tube, a bonnet-valve having side openings and adapted to normally close the inner end of the vent-tube, the said bonnet-valve having sliding movement relative to the vent-tube, a flange on the upper end of the sliding tube and loosely located within the bonnet-valve, a float having sliding movement on the said movable tube, the said float being adapted to operate on said bonnet-valve and to raise the said movable tube, a connection between the said movable tube and the valve-lever, and an auxiliary float connected with the said valve-lever, being located below the first-named float, which auxiliary float tends to assist the valve-lever in its upward movement, the two floats being buoyant while immersed in water and acting as weights as the water leaves the dome.

2. In hydraulic air-compressors, a base having an inlet-valve and an outlet-valve, means for supplying water to the inlet-valve, a dome secured to the base, an air-vent tube stationarily located at the central portion of the base within the dome, the said air-vent tube being open at the top and having communication with the atmosphere at its bottom, a guide-tube having sliding movement on the vent-tube, the guide-tube being provided with a flange at its upper end, a bonnet-valve mounted to slide upon the vent-tube and to normally close its upper end, the said bonnet-valve being provided with side openings and with a bottom flange adapted in one position of the valve to engage with the flange on the said guide-tube, a valve-lever pivoted above the base within the said dome, a pivotal connection between the said valve-lever and the said guide-tube, the valve-lever being adapted for alternately opening and closing the inlet and outlet for the dome, a float attached to the valve-lever and located above the same, an upper float independent of the lower float and having limited movement on the said guide-tube, and adapted in its upper position to open

the bonnet-valve and to operate the valve-lever assisted by the lower float.

3. In hydraulic air-compressors, a base having an inlet-valve and an outlet-valve, means for supplying water to the inlet-valve, a dome secured to the base, an air-vent tube stationarily located at the central portion of the base within the dome, a guide-tube having sliding movement on the air-vent tube, being provided with a flange at its upper end, the said air-vent tube being open at its top and open at its bottom, the bottom opening communicating with the outside atmosphere, a bonnet-valve mounted to slide on the upper end portion of the vent-tube, the said valve having side openings and a flange at its bottom adapted to occupy a position below the flange on the guide-tube and to engage with such flange to lift the guide-tube at one position of the valve, a valve-lever pivoted above the base within the dome, being adapted for alternately opening and closing the inlets and outlets for the dome, the said valve-lever being pivoted to the said guide-tube, a float attached to the valve-lever, an upper float independent of the lower float and mounted to slide on the guide-tube and engage with and have lifting action on the bonnet-valve, the said bonnet-valve when lifted being first unseated from the vent-tube, then acting to raise the guide-tube assisted by the lower float, a delivery-valve located above the bonnet-valve, and a check-valve located at the supply end of the supply-tube connected with the inlet-valve.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM G. COX.

Witnesses:
J. FRED. ACKER,
JNO. M. RITTER.