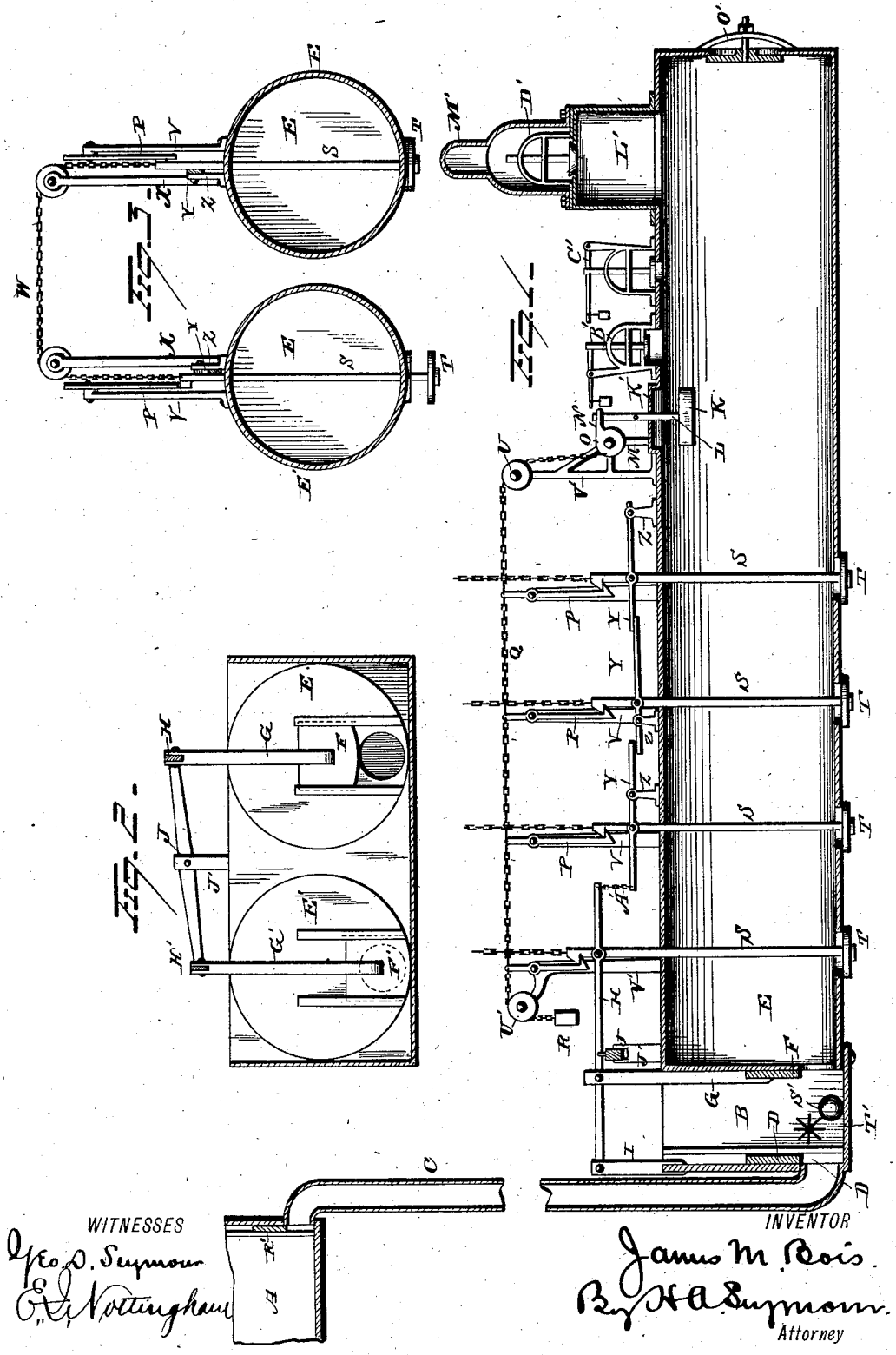
(No Model.) 2 Sheets—Sheet 1.

J. M. BOIS.

HYDRAULIC AIR COMPRESSING APPARATUS.

No. 259,799. Patented June 20, 1882.



WITNESSES

Geo. D. Seymour

E. C. Nottingham

INVENTOR

James M. Bois.

By H. A. Seymour.

Attorney

(No Model.) 2 Sheets—Sheet 2.

J. M. BOIS.

HYDRAULIC AIR COMPRESSING APPARATUS.

No. 259,799. Patented June 20, 1882.

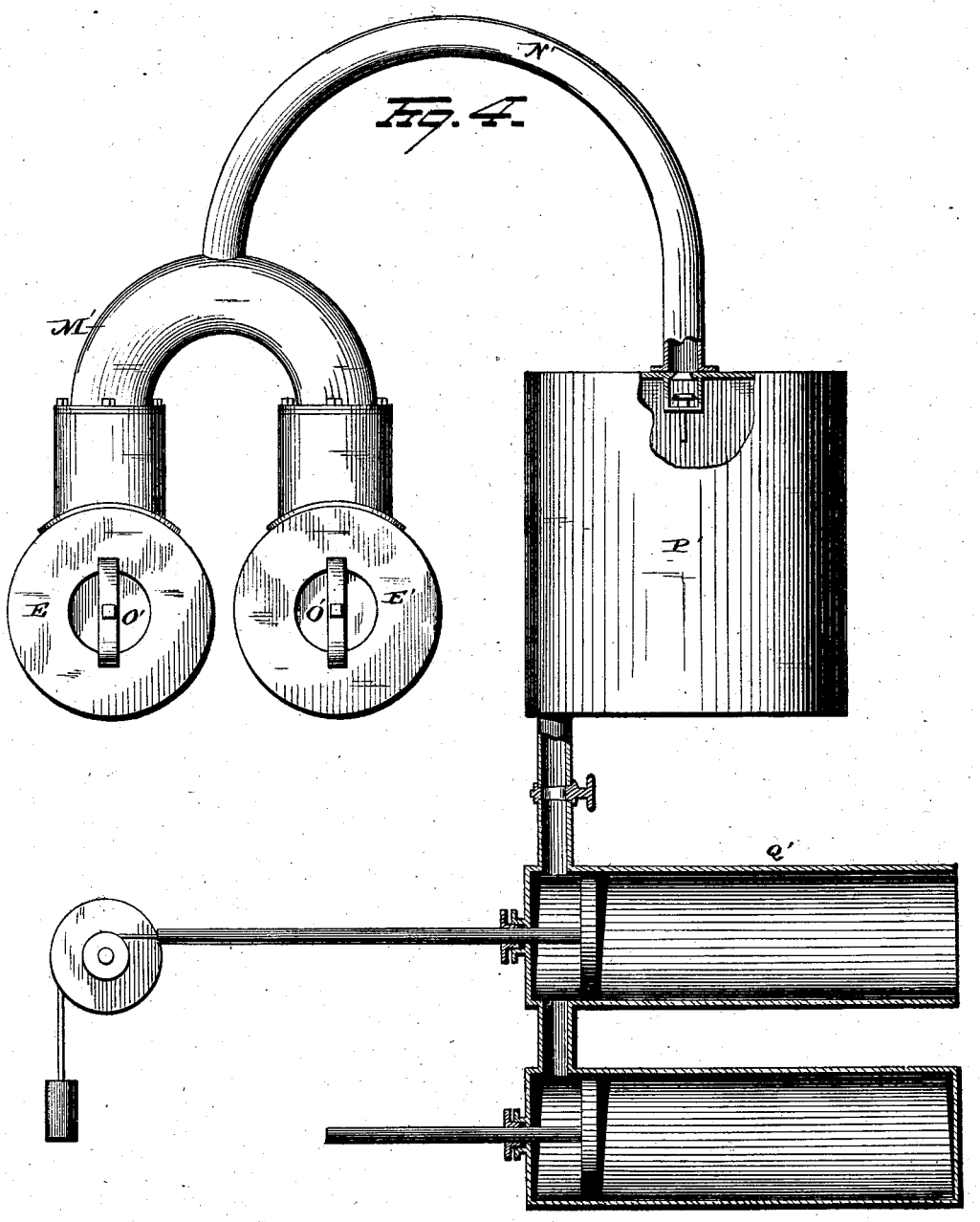


Fig. 4.

WITNESSES

Geo. O Seymour

C. L. Nottingham

INVENTOR

James M. Bois.

By H. A. Seymour

Attorney

UNITED STATES PATENT OFFICE.

JAMES M. BOIS, OF EAST AURORA, NEW YORK.

HYDRAULIC AIR-COMPRESSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 259,799, dated June 20, 1882.

Application filed February 14, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. BOIS, of East Aurora, in the county of Erie and State of New York, have invented certain new and useful Improvements in Hydraulic Air-Compressing Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to an improvement in hydraulic compressing apparatus, the object being to utilize a head of water to compress air in a continuous and automatic manner, and to store the air so compressed for all the uses which it may be made to subserve.

With this object in view my invention consists in certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a view in vertical horizontal section through one of the two air-compressing cylinders, which, together with their valves and lever systems, constitute my improved apparatus. Fig. 2 is a view of the said cylinders, taken through the gates which establish communication between them and the secondary water-reservoir. Fig. 3 is a view of the cylinders, taken through one of the water-discharge-valve systems; and Fig. 4 is a view in end elevation of my apparatus, showing also the storage-reservoir and my improved pneumatic equalizer, for obtaining from a pulsating column of compressed air a steady and uniform pressure.

A represents a reservoir or any other desired source of water-supply. It is connected with a secondary reservoir, B, by means of a pipe, C, the inflow of water from the primary reservoir A to the said reservoir B being regulated by means of the gate D, which is adapted to be operated independently of the apparatus by any approved form of gate-opening device. Communication is established between the reservoir B and two air-compressing cylinders, E and E′, located side by side, through gates F and F′, provided with upwardly-extending gate-stems G and G′, attached to gate-lever H and H′, pivoted to standards I, and joined one to the other by an oscillating beam, J, fulcrumed midway of its length to a standard, J′, located between the cylinders. The gates aforesaid are automatically operated to alternately fill the cylinders from the reservoir B, and of their action in fulfilling this function more hereinafter.

Floats K, located in the cylinders and suspended from their upper walls, are adapted to rise and fall with the inflow and outflow of water into and from them, and to operate, by virtue of the reciprocating motion thus acquired, a system of levers which control the action of the discharge-valves.

Inasmuch as the requirements of the invention demand that the system of levers above referred to be operated only toward the termination of the flow of water into the cylinders, the floats are located very near their upper walls, the same being recessed, as at K′, to receive the floats when the water is at its highest elevation.

With reference now to the construction, arrangement, and operation of the said system of levers, the floats K are provided with spindles L, having pins M projecting from them, which engage as the floats rise with the arms N of the operating-levers O, the motion of the said levers O being imparted to the catch-levers P by means of chains Q or other equivalent connecting devices to which the upper arms of the said catch-levers are attached, the said levers being pivoted to standards V. Weights R depending from the free ends of the chains fulfill the function of restoring the catch-levers to their normal positions of readiness to engage with the upper extremities of the stems S of the discharge-valves T after the said stems have been disengaged from the levers by the action of the floats K and the operating-levers O. The said chains are preferably arranged to run over pulleys U, journaled in the upper ends of the standards V′; but other devices for guiding the chains may be resorted to, if desired. The valve-stems S of one cylinder are connected with the stems of the corresponding valves of the other cylinders by chains W, which run in pulleys journaled in the upper ends of standards X, secured to the upper faces of the cylinders, as shown. The object in connecting the valve-stems in this manner is to render the valves mutually assistant in being opened and closed. One or

more independent levers, Y, pivoted to the standards Z and to the valve stems S, have such relative disposition to each other that as the valve-stems descend by reason of their release from the catch-levers P and the pressure of the water in the cylinders upon the valves T, attached to said stems, they will, through the chains A′, depress one of the gate-levers; and inasmuch as the said gate-levers are connected with the stems of the gates and with the oscillating beam, as aforesaid, the depression of one lever will effect the closing of one gate, the elevation of the other lever, the opening of the other gate, the elevation of the valve-stems, and the closing of the valves located in the cylinder in which the gate is opened, and the restoration of the levers Y connected with the elevated gate-lever to positions of readiness to receive the proper impulse from the valve-stems to which they are attached when the same are released from their catch-levers.

The number of levers Y employed will depend chiefly upon the pressure of water opposing the opening and closing of the gates, every additional valve-stem brought into the lever system by one of the levers Y giving additional power.

In fulfilling the functions above recited the gate-levers are assisted by one or more of the discharge-valves T, the stems of which are pivoted to them, as shown in the drawings.

Air-valves B′, located in the upper portions of the cylinders, are designed to admit atmospheric air into them, while safety-valves C′, adapted to be set to any predetermined pressure of compressed air, are designed to relieve the cylinders if the pressure to which they are set is exceeded. The cylinders are also furnished with domes D′, provided with valves L′, arranged to automatically open and permit the passage of the compressed air into the pipes M′ leading from the domes to the pipes N′, and to close again to prevent the return of any of the compressed air to the cylinders when the water which displaced and compressed it is discharged.

The domes should be sufficiently capacious to prevent the suction of the air as it is forced through the valves L′ from carrying any water through them.

Man-holes O′, located in the exposed heads of the cylinder, are designed to render their interiors accessible for the regulation of the valves, floats, and gates.

The said pipe N′ leads to the storage-reservoir P′, from which the compressed air is conducted to the pneumatic equalizer Q′, designed to supply to any air-motor a volume of compressed air under an unvarying pressure.

When it is desired to withdraw the water entirely from the apparatus the gate R′, located in the primary reservoir, is closed, and a plug, S′, is withdrawn from an orifice in the secondary reservoir.

If desired, a wheel, T′, may be located in the said secondary reservoir and the head of water in the pipe C thus utilized.

Having thus described my invention in detail, I will now set forth its method of operation:

Assuming the gate G to be open, the relative positions of the valves and levers of the two cylinders will be as follows: In the cylinder E the discharge-valves T will be closed, the valve-stems S will be engaged with the catch-levers P, and the levers Y will be in position to be acted upon by the descent of the said valve-stems, while in the cylinder E′ the gate G′ will be closed, the valves T will be opened, the valve-stems S will be disengaged from the catch-levers P, and the levers Y will be depressed. Under the conditions above recited water admitted into the reservoir B will flow into the cylinder E, and by its first compression of the column of air therein close the air-valves B′. As the water rises in the cylinder it will displace and compress the air therein and force it through the valve L′ of the dome D′ into the pipes leading to the reservoir P. When the water attains a sufficient elevation, which occurs when the cylinder is almost full, the float K will be engaged and raised by the continued inflow of water, until, when the cylinder is completely filled, it will be forced into the recess K′. Meanwhile, however, the pin M of the float-spindle L has been engaged with the arm of the operating-lever O, which latter is connected through the medium of the chain Q with the catch-lever P. As the float enters the recess the movement of the actuating-lever is completed and the catch-levers are disengaged from the valve-stems S. The weight of the water in the cylinder will immediately open the valves T and depress the stems S, which will, through the action of the levers Y, depress the gate-lever H, close the gate F, elevate the gate-lever H′, open the gate F′, close the valves T of the cylinder E′, engage the valve-stems S of the said valves with their catch-levers P, and also elevate the lever Y, attached to the said valve-stems. Water will now flow in and fill the cylinder E′, compress the air therein, and force it into the reservoir P and elevate the float K, which will release the catch-levers P from the valve-stems with which they are engaged. The presence of the water in the cylinder will now open the valves T, the valve-stems will descend and operate the levers Y, the gate-lever H′ will be depressed, the gate F′ closed, the gate-lever H elevated, the gate F opened, the valves T of the cylinder E will be closed, and the levers Y again elevated. Water will now flow into and fill the cylinder E, and the operation above described will be indefinitely repeated. The valves T are further rendered mutually assistant in being opened and closed by the chains W, which connect their valve-stems.

It is apparent from the foregoing description that the action of the two cylinders in compressing air will be alternate, one cylinder being filled with water while the other is being emptied. It is also apparent that the actua-

tion of the lever and valve systems of the two cylinders depends chiefly upon the motive force due to the water as it is discharged from the cylinders.

In view of those changes, often rendered necessary by the oscillation of the ordinary practical conditions, I would have it understood that I do not limit myself to the exact construction shown and described, but that I hold myself at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. In a hydraulic air-compressing apparatus, the combination, with two cylinders, of gates located between the cylinders and a water-supply, connection between said gates, floats located within the cylinders and arranged to actuate a system of levers to release the discharge-valves, and systems of levers actuated by the discharge-valves and arranged to close the gate of one cylinder and open the gate and close the discharge-valves of the other cylinder.

2. In a hydraulic air-compressing apparatus, the combination, with two cylinders, of gates located between the cylinders and a water-supply, connection between said gates, floats located within the cylinders and arranged to actuate a system of catch-levers, discharge-valves provided with stems adapted to engage with said catch-levers, and systems of levers actuated by the discharge-valves and arranged to close the gate of one cylinder and open the gate and close the discharge-valves of the other cylinder.

3. In a hydraulic air-compressing apparatus, the combination, with two cylinders, of gates located between the cylinders and a water-supply, connection between said gates, floats located within the cylinders and arranged to actuate a system of levers to release the discharge-valves, and a system of levers pivoted to the stems of the said discharge-valves and arranged to close the gate of one cylinder and open the gate and close the discharge-valves of the other cylinder, substantially as set forth.

4. In a hydraulic air-compressing apparatus, the combination, with two cylinders, of gates located between the cylinders and a water-supply, gate-levers to which the gates are attached, connection between said gate-levers, floats arranged to actuate a system of levers to release the discharge-valves, and a system of levers connecting the stems of the discharge-valves with the free ends of the gate-levers.

5. In a hydraulic air-compressing apparatus, the combination, with two cylinders, of gates located between the cylinders and a water-supply, discharge-valves provided with valve-stems, and connections between the stems of the corresponding valves of the two cylinders.

6. In a hydraulic air-compressing apparatus, the combination, with a primary reservoir and a secondary reservoir located below it, of two cylinders, gates located between them and the secondary reservoir, and connection between said gates, of floats located within the cylinders and arranged to actuate a system of levers to release the discharge-valves, and systems of levers actuated by the discharge-valves and arranged to close in one impulse the gate of one cylinder and to open the gate and close the discharge-valves of the other cylinder.

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

JAMES M. BOIS.

Witnesses:
HERMAN MORAN,
F. O. M. CLEARY.