(No Model.) 2 Sheets—Sheet 1.

T. O. PERRY.

VALVE OPERATING MECHANISM FOR PNEUMATIC PUMPS.

No. 485,884. Patented Nov. 8, 1892.

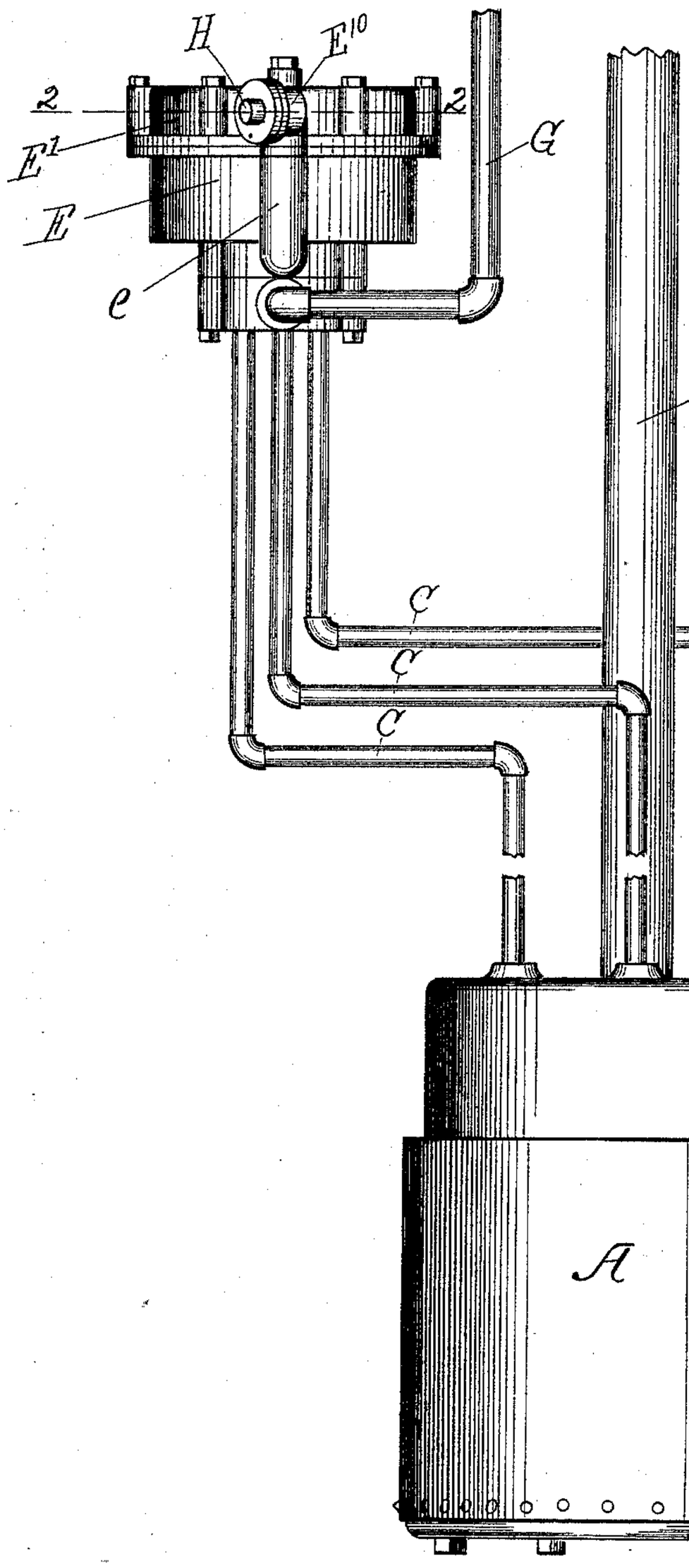

Fig. 1.

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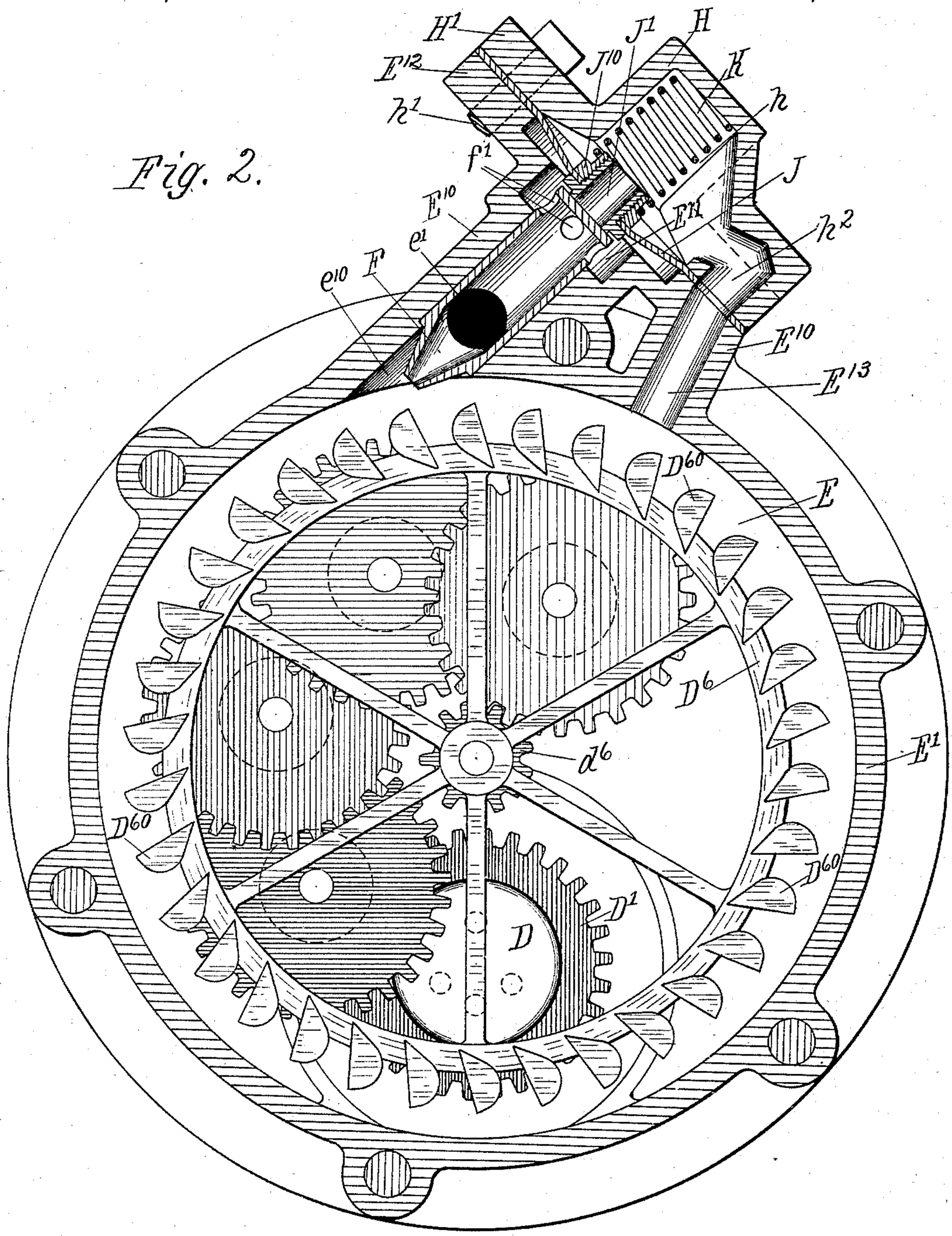
Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS O. PERRY, OF CHICAGO, ILLINOIS.

VALVE-OPERATING MECHANISM FOR PNEUMATIC PUMPS.

SPECIFICATION forming part of Letters Patent No. 485,884, dated November 8, 1892.

Application filed May 27, 1892. Serial No. 434,547. (No model.)

To all whom it may concern:

Be it known that I, THOMAS O. PERRY, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in an Automatically-Regulated Valve-Operating Mechanism for Pneumatic Pumps, which is fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a side elevation of a pneumatic water-elevator and the controlling-valve and its operating mechanism, to which the present invention is applied. Fig. 2 is a horizontal section at the line 2 2 on Fig. 1 upon an enlarged scale.

A is the submerged cylinder containing the water-chambers of the pneumatic pump.

B is the water-discharge pipe therefrom.

C C C are the air-pipes leading to the chambers, respectively, of the cylinder A and controlled by a rotary valve operated by the compressed air, the admission of which to the chambers, respectively, is controlled by said valve. The structure of the cylinder A and of the rotary valve which controls the entrance and escape of air from the water-chambers of the cylinder is fully set forth in my pending application, Serial No. 404,854, filed September 5, 1891, for pneumatic water-elevators. The present invention concerns only the means for regulating the force of the air-jet which operates the valve through the train of mechanism seen in Fig. 2. This mechanism is the same as that which is fully described in my said application Serial No. 404,854, D being the rotary valve having a gear-flange D′, constituting the last wheel of a train of gears, the first of which is a pinion d^6 on the motor-wheel D^6, said motor-wheel being journaled centrally within the cylindrical chamber E and provided with pockets or vanes D^{60} D^{60}, &c., which receive the impact of a jet of compressed air discharged into said chamber E, which may be referred to as the "compressed-air" chamber, through the nozzle F, which is located so as to discharge substantially tangential with respect to the motor-wheel, as seen in the drawings.

G is a pipe leading from any source of compressed air into the chamber E, a suitable passage *e* being formed in the body of the chamber and opening at *e′* into the nozzle F. A boss E^{10} is formed on the body of the chamber E, and, as illustrated and preferred, upon the cap portion E′ thereof, which is pierced by the bore e^{10} in a direction substantially tangential to the wheel D to receive the nozzle F, which is a lining of the bore so made. Concentric with the bore e^{10} at the outer end thereof is the chamber E^{11}. The nozzle F, which is closed at its outer end, projects into this chamber E^{11}, and has lateral apertures *f′ f′*, &c., opening thereinto.

H is the chambered cap, which covers the boss E^{10}, suitable flanges E^{12} and H′, respectively, being formed upon the boss and cap for the purpose of adapting the cap to be bound to the boss by bolts or screws *h′*. The chamber E^{11} in the boss and the chamber *h* in the cap may be regarded as one chamber, which may be distinguished from the principal compressed-air chamber E by the term "second chamber." J is a partition in said chamber, having an aperture through which the partitioned portions of the chamber may communicate. Preferably, it is a yielding diaphragm, bound between the outer face of the boss and the inner face of the cap and separating the the portion E^{11} in the boss from the portion *h* in the cap.

E^{13} is a passage leading radially from the chamber E through the boss E^{10} and registering at the face of the latter with the passage h^2, leading into the chamber *h* in the boss. At the center of the diaphragm J there is secured the valve J′, which is adapted to seat at its inner end upon the head of the nozzle and is axially apertured, so that, except when seated upon the nozzle-head, its aperture constitutes a port of communication between the chamber E^{11} and the chamber *h*.

K is a spiral spring lodged in a suitable seat in the cap H and acting between the cap at the outer end and the valve J′ at the inner end, tending to seat the valve upon the head of the nozzle. As illustrated, the lock-nut J^{10}, which serves to bind the valve J′ to the diaphragm, has the shoulder which affords a seat for the inner end of the spring, as seen in Fig. 2.

Obvious equivalents for the yielding dia-

phragm will occur to any mechanic, and I do not limit myself to this form of yielding partition.

The method of operation of this structure may be understood from inspection of the same, as above described, to be as follows: The compressed air entering through the pipe G into the cavity of the nozzle F will be discharged in a more or less forcible jet from the nozzle onto the wheel D^6, thereby communicating rotary motion to the latter and to the entire train of gearing therefrom to and including the valve D, such rotary motion of the valve D being the ultimate purpose of the mechanism actuated by the motor-wheel and of the direction of the air-jet thereagainst from the nozzle. The rotation of the valve should not exceed a certain low maximun, whatever the tension of the air which is being introduced past it to the pump-chambers; and, furthermore, as the tension of the air increases the resistance to its delivery through a nozzle of a uniform discharge-orifice would be increased and the pressure which it would afford for the ultimate purpose of elevating the water would be to that extent counteracted and the flow of compressed air into the compressed-air chamber retarded without any useful purpose being served by the force thus absorbed. In order, therefore, to prevent this useless absorption of force and to give the apparatus the highest degree of effectiveness under all circumstances, it is necessary to provide for the relief of the pressure of the air being discharged by the nozzle after it passes a given tension and permit such compressed air to enter the compressed-air chamber and have access to the valve and be admitted to the water-chambers without passing through the nozzle. The result is accomplished by the structure shown, for after the tension of air in the nozzle F, and which through the ports f' passes into and occupies the chamber E^{11} and exerts its pressure against the diaphragm J, passes the degree necessary to compress the spring K, the yielding of that spring permitting the diaphragm J to carry the valve J′ off from its seat on the head of the nozzle F. The compressed air obtains relief through the axial aperture in the valve J′ to the opposite side of the diaphragm J—to wit, into the chamber h—whence it passes through the registering-passages h^2 and E^{13} into the chamber E, which it enters through a large orifice, and radial with respect to the wheel D^6, so that it has, practically, no effect upon the wheel or its rotation, which is controlled entirely by the portion of air which passes in a jet from the nozzle.

I do not limit myself to the specific devices herein shown and described for providing and opening the relief-passage from the nozzle to the air-chamber; but the employment of mechanism through which the valve is rotated by means of a jet of the compressed air, which it is the purpose of the valve to admit to the water-chambers, and the providing of an automatic relief for the excessive pressure at the nozzle, which shall, nevertheless, leave such pressure available in the compressed-air chamber and for the purpose of passing to the water-chamber, is the essence of my invention.

I do not herein claim, broadly, in combination with the water-chambers, compressed-air chambers, rotary valve, and the valve-operating motor wheel and train, the relief-port and a controlling valve for the same which is unseated to open the relief-port by the air-pressure in the conduit which leads to the compressed-air chamber from which the motor-wheel-operating jet is discharged, because I have claimed this matter, broadly, in claim 8 of my said application, Serial No. 404,854.

I claim—

1. In combination with the compressed-air chamber and the rotary valve which controls the escape of compressed air therefrom, a motor-wheel within the chamber and mechanism connected therewith adapted to rotate the valve, said motor-wheel being adapted to be actuated by an air-jet, a nozzle through which compressed air is admitted into the chamber, so located as to direct a jet of air upon the motor-wheel to actuate the same, a supplemental passage from the nozzle-cavity into the compressed-air chamber additional to the nozzle-orifice, a valve which seats against the air-pressure experienced within the nozzle-cavity, closing said supplemental passage when seated, and a spring tending to hold it on its seat against the pressure, whereby when the pressure in the nozzle becomes sufficient to overcome the tension of the spring said supplemental passage is opened and relieves the pressure and permits the compressed air to enter the chamber through the supplemental passage, substantially as set forth.

2. In combination with the compressed-air chamber and the rotary valve which controls the escape of air therefrom, the motor-wheel and mechanism connected therewith which rotates the valve, the nozzle through which the compressed air is directed in a jet against the motor-wheel, the supplemental air-passage leading into the compressed-air chamber in a direction non-tangential to the motor-wheel, a valve which controls the supplemental passage, and a spring tending to seat the valve against the pressure in the nozzle-cavity, whereby the excess of pressure therein causes the supplemental passage to be opened and the air therein to be admitted into the chamber in a direction which does not actuate the wheel, substantially as set forth.

3. In combination with the compressed-air chamber, a rotary valve which controls the egress of air therefrom, a motor-wheel and mechanism connected therewith, which rotates the valve, a nozzle by which the compressed air is admitted to the chamber in a jet directed against the motor-wheel, a second chamber with which the nozzle-cavity communicates, a yielding partition in said second chamber,

having an aperture through which the partitioned portions of the chamber may communicate, a seat or stop for the partition on the side thereof toward the communication of said chamber with the nozzle, said seat or stop being adapted to close the aperture when the partition is seated against it, and a spring reacting against the partition to force it to such seat or stop, said second chamber being provided with a passage leading into the compressed-air chamber from the side of the partition opposite the stop, whereby pressure in the nozzle-cavity operating against the partition tends to force the latter against the tension of the spring away from said stop and open a supplemental passage into the compressed-air chamber, substantially as set forth.

4. In combination with the compressed-air chamber, a rotary valve which controls the egress of air therefrom, a motor-wheel and mechanism connected therewith, which rotates the valve-nozzle, by which compressed air is admitted to the chamber by a jet directed against the motor-wheel and tending to operate it, a second chamber with which the nozzle communicates at a point remote from its jet-orifice, a yielding diaphragm pertaining to said chamber, a valve on such diaphragm, having the aperture through which the partitioned portions of the chamber may communicate, a seat for the valve on the side toward the nozzle, adapted to close said aperture when the valve is seated, and a spring reacting against the valve on the other side of the diaphragm to force it to such seat, said second chamber having a passage leading from the side of the diaphragm opposite the nozzle communication into the compressed-air chamber, substantially as set forth.

5. In combination with the compressed-air chamber, a rotary valve which controls the egress of air therefrom, a motor-wheel and mechanism connected therewith, which rotates the valve, a nozzle by which the compressed air is admitted to the chamber in a jet directed against the motor-wheel, a chamber into which the head of the nozzle protrudes and with which it communicates at its head, a diaphragm partitioning said chamber and carrying a valve, such valve having an aperture which leads through it, the head of the nozzle being in position to constitute a stop and seat for said valve at one side of the diaphragm, and a spring reacting against the valve on the other side to force it to such seat, the said second chamber having a passage leading from the side of the diaphragm opposite the nozzle into the compressed-air chamber, substantially as set forth.

In testimony whereof I have set my hand, this 19th day of May, A. D. 1892, at Chicago, Illinois.

THOMAS O. PERRY.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.