No. 711,689. Patented Oct. 21, 1902.

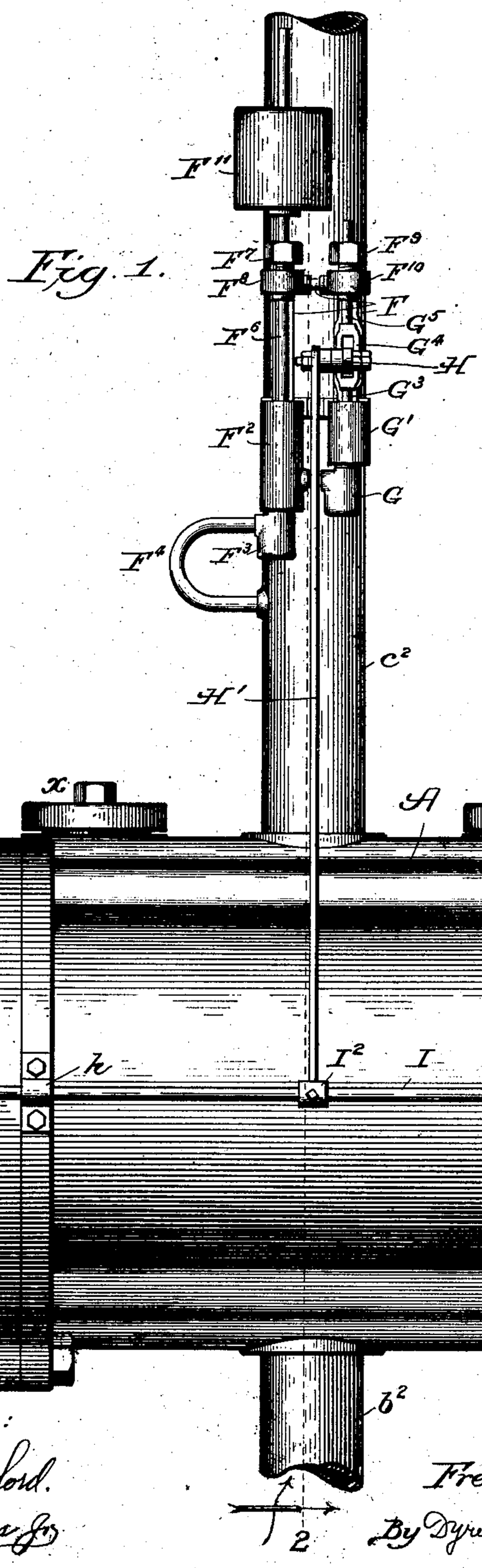
F. WITTENMEIER.

COMPRESSOR.

(Application filed Feb. 15, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Chas. E. Gaylord.
John Enders Jr.

Inventor:
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Att'ys.

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Fig. 2.

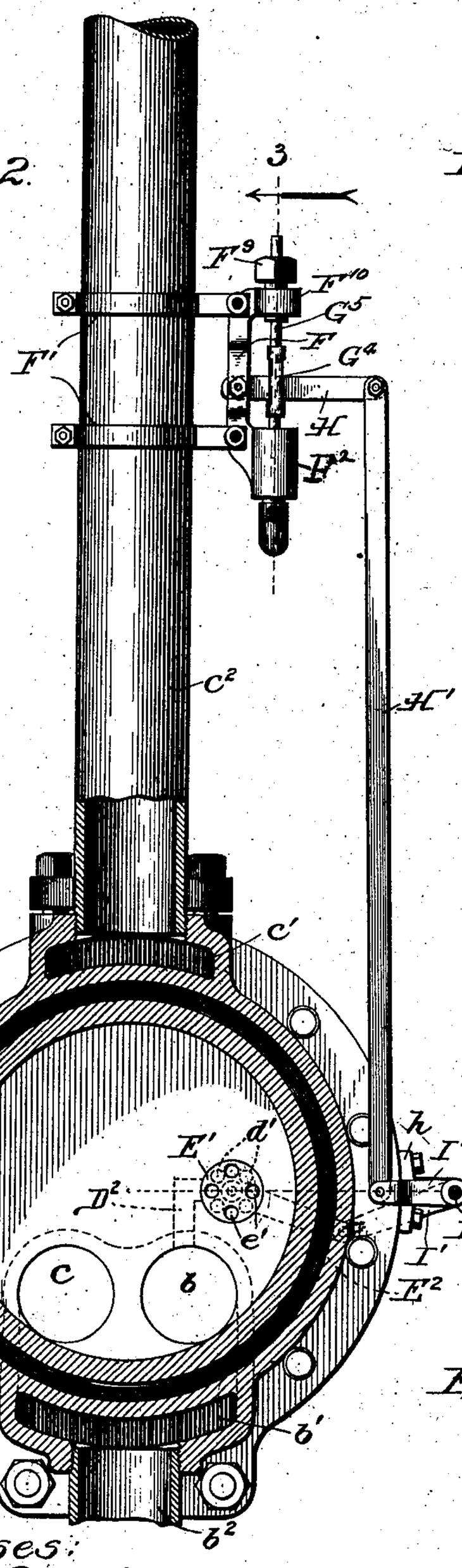

Fig. 3.

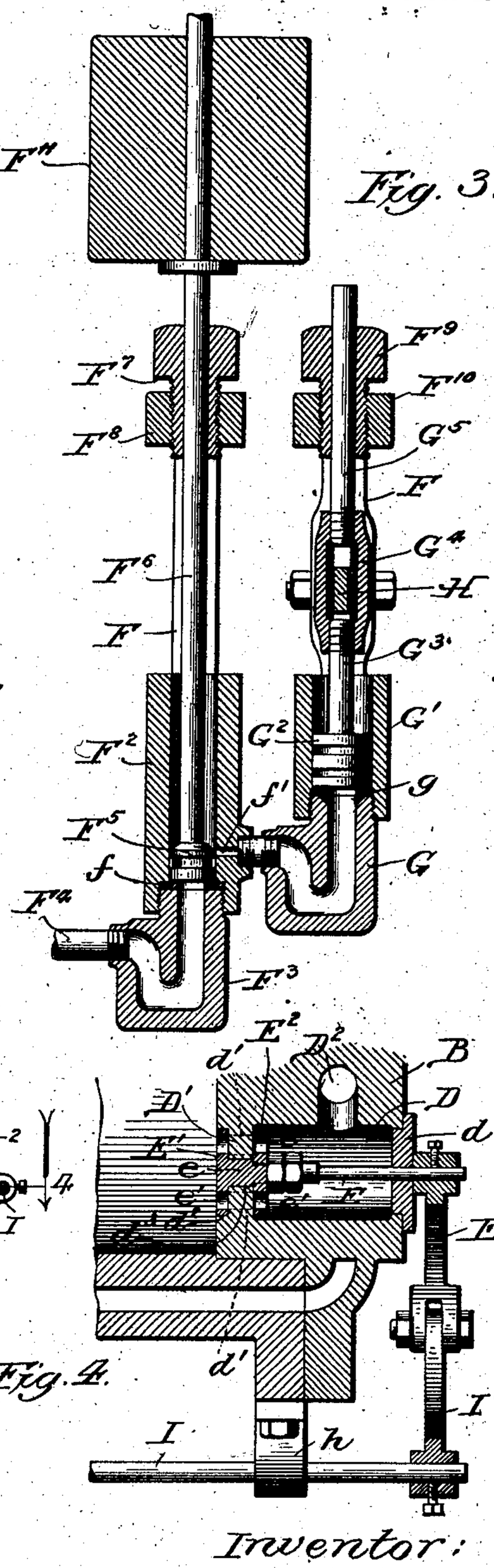

Fig. 4.

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UNITED STATES PATENT OFFICE.

FREDERICK WITTENMEIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO KROESCHELL BROTHERS ICE MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 711,689, dated October 21, 1902.

Application filed February 15, 1902. Serial No. 94,283. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK WITTENMEIER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Compressors, of which the following is a specification.

My invention relates more especially to improved and automatically-operating means for loading the compressor-piston or starting the operation of compression when the supply generated by the compressor falls below a certain predetermined limit and for unloading the compressor-piston or stopping the operation of compression when said limit is exceeded.

My object is to provide improved and quickly-acting mechanism movable under variations in pressure of the compressed fluid for automatically loading and unloading the compressor-piston without interfering with the reciprocation thereof.

In carrying out my invention I provide a suitably-disposed valved opening or by-pass and operating mechanism for the valve actuated to open it whenever the compressed fluid exceeds a predetermined pressure and close it whenever the pressure falls below said limit.

In the drawings, Figure 1 is a broken side elevation of so much of a double-acting compressor as is necessary to illustrate my improvements and their operation; Fig. 2, a section taken on line 2 in Fig. 1; and Figs. 3 and 4, enlarged broken sections taken, respectively, on lines 3 and 4 in Fig. 2 viewed in the direction of the arrows.

A is the cylinder of a double-acting compressor, which may be constructed with a water-jacket *a*. In the cylinder-heads B, at each end of the cylinder, are valved inlet or suction ports *b c*. The ports *b c* communicate through a cored passage with a suction-chamber *b'*, which receives the air or gas to be compressed from an inlet-pipe b^2. The discharge-valves at the valve-caps *x* are not shown in detail, but they communicate with a compression-chamber *c'*, having a discharge-pipe c^2. The induction and eduction valves may be of any suitable construction, and the chambers *b' c'* communicate with the respective ports at opposite ends of the cylinder. In the cylinder is the usual piston upon a piston-rod C, and the piston reciprocates between the opposite cylinder-heads without material clearance.

In each cylinder-head B, preferably in the position shown, is a cylindrical chamber D, closed at its outer end by a suitable cap *d*. Adjacent to the inner surface of the cylinder-head the chamber D is provided with a wall or diaphragm D', having a series of openings or ports *d'*, which may be four in number, as shown, and equidistant apart. The chamber D in each cylinder-head communicates through a cored passage D^2 with the adjacent cored suction-passage. The chambers D and passages D^2 form supplemental openings or by-passes through the cylinder ends. At the inner side of the wall D' is a round shallow recess d^2, and the wall is provided with a central opening d^3. Extending through the cap *d* and center of the chamber D is a rotary valve-stem E, provided with an enlarged or shouldered part *e*, fitting through the opening d^3. Integral with this stem E, in the recess d^2, is a disk valve E', which moves upon the inner surface of the wall D'. Rigidly secured to the stem E and sliding against the outer surface of the wall D' is a rotary disk valve E^2. The valves E' E^2 have corresponding openings *e'*, which in one movement of the valve-stem E register with the openings *d'* in the wall.

On the discharge-pipe c^2 is a bracket F, secured in place by means of the collars F'. Integral with or suitably supported by the bracket F is a cylinder or chamber F^2, open at its upper end and provided at its lower end with a coupling F^3, which communicates, through a pipe F^4, with the interior of the discharge-pipe c^2. Between the coupling F^3 and the chamber F^2 is a gasket *f*, forming a valve-seat. Extending through the wall of the cylinder F^2 is a port *f'*, communicating with a coupling G, surmounted by a cylinder G', which is open at its upper end. Between the coupling G and cylinder G' is a gasket *g*, forming a cushion.

In the cylinder F^2 and fitting upon the seat *f* is a piston-valve F^5 on a vertical stem F^6,

sliding through a guide F^7 on an arm F^8 of the bracket F. On the upper end of the stem F^6 is a weight F^{11}.

In the cylinder G', seating upon the cushion *g*, is a movable diaphragm or piston-valve G^2 on a vertical stem G^3. On the upper end of the stem G^3 is a slotted coupling G^4, and on the upper side thereof is a stem extension G^5, movable through a guide F^9 in an arm F^{10} of the bracket F.

Fulcrumed at its end upon the bracket F is a lever H, passing through the slot of the coupling G^4.

Mounted in bearings *h* on the side of the compressor-cylinder A is a horizontal rock-shaft I, provided beyond each of the cylinder-heads with an arm I'. On each stem E, just beyond the respective cap *d*, is an arm E^2, pivotally connected at its free end with the adjacent arm I'. At the center of the rock-shaft I is an arm I^2, and pivotally fastened at its opposite ends, respectively, to the lever H and arm I^2 is a rod H'.

Presuming, for example, that the area of the opening at the seat *f* is one-quarter of a square inch and that it is desired to maintain a pressure on the discharge side of the compressor equal to one hundred pounds to the square inch, a weight F^{11} of twenty-five pounds would be provided. Normally the valves E' E^2 are in a position wherein they close the ports *d'* of the by-passes through D D^2. When these valves are closed, the piston upon the stem B in its reciprocation will draw fluid through the ports *b c* and discharge the same as it is compressed to the discharge-pipe c^2. When the pressure in the discharge-pipe exceeds the predetermined limit of, say, one hundred pounds, it exerts a pressure against the valve F^5 exceeding the resistance of the weight F^{11}, whereby the latter, with the stem F^6 and the valve, is raised in the cylinder F^2 until the valve uncovers the port *f'*. This causes a sudden rush of the compressed fluid through the pipe F^4, coupling F^3, and port *f'* to the coupling G, against the under side of the piston G^2, sufficient to raise the latter, its stem, and coupling G^4 to swing the lever H upward on its fulcrum and through the connection H' I^2 rock the shaft I. This rocking of the shaft causes it through the connections I' E^2 to turn the valve-stems *e* at each end of the cylinder A and rotate the valves E' E^2 until the ports *e'* thereon register with and open the ports *d'* of the by-passes. Immediately that the by-passes are opened the fluid discharged by the piston will pass through the by-passes to the suction-chamber *b'* against practically no resistance, and practically all load will be taken from the piston. When the demand upon the compression side of the machine lowers the pressure in the discharge-pipe c^2 to somewhat below the predetermined limit—say one hundred pounds—the weight F^{11} overcomes the resistance of the pressure against the lower end of the valve F^5 and drops, closing said valve. This relieves the pressure against the under side of the valve G^2, permitting it and its stem and the lever H to descend and rock the shaft I to close the by-pass valves E' E^2, when the compressor-piston will be immediately loaded in the sense of its discharging through the eduction-valves against the back pressure in the pipe c^2 and resume work. When the piston F^5 falls to its seat *f*, it uncovers or partly uncovers the port *f'*, whereby the pressure previously held by the coupling G quickly escapes.

It will be noticed that the area of the lower surface of the valve F^5 exposed to pressure from the discharge-pipe c^2 increases instantly that it leaves its seat, so that as soon as the fluid-pressure rises above the point at which it will start the valve F^5 upward an increased area is exposed to said pressure, causing the valve to be elevated very quickly. The in-rush of fluid against the under side of the valve G^2 acts very quickly to raise the latter and close the by-pass valves. These features of my construction are important, because the piston F^5 has no mechanism to operate which might, by sticking, interfere with its free movement, and the valve G^2 is relieved from the influence of the fluid-pressure at all times during the working of the compressor-piston and produces a sudden quick opening and closing of the by-passes under the desired conditions.

If desired, a spring may be substituted for the weight on the stem F^6 and the mechanism otherwise variously modified without departing from the spirit of my invention as defined by the claim.

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

In a compressor, means for unloading the compressor-piston when the pressure-supply pumped by said piston is excessive, comprising a supplemental opening in the cylinder end, a valve at said opening and means for opening said valve comprising a chamber G', a passage extending from the compression side of the compressor to said chamber, a movable diaphragm in said chamber operatively connected with said supplemental-opening valve, a weighted passage opening and closing valve F^5, and lever mechanism connected with said diaphragm and supplemental-opening valve, all constructed to operate substantially as set forth.

FREDERICK WITTENMEIER.

In presence of—
ALBERT D. BACCI,
L. HEISLAR.