(No Model.) 2 Sheets—Sheet 1.

A. T. BALLANTINE.

VALVE FOR COMPRESSORS FOR ICE MAKING APPARATUS.

No. 317,963. Patented May 19, 1885.

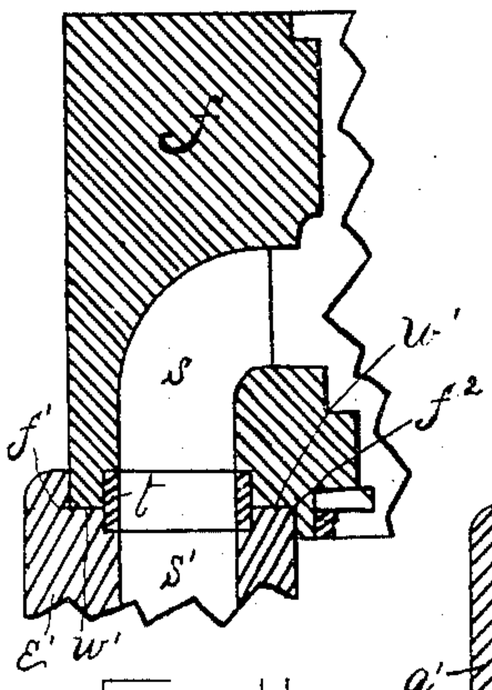

Fig. 4.

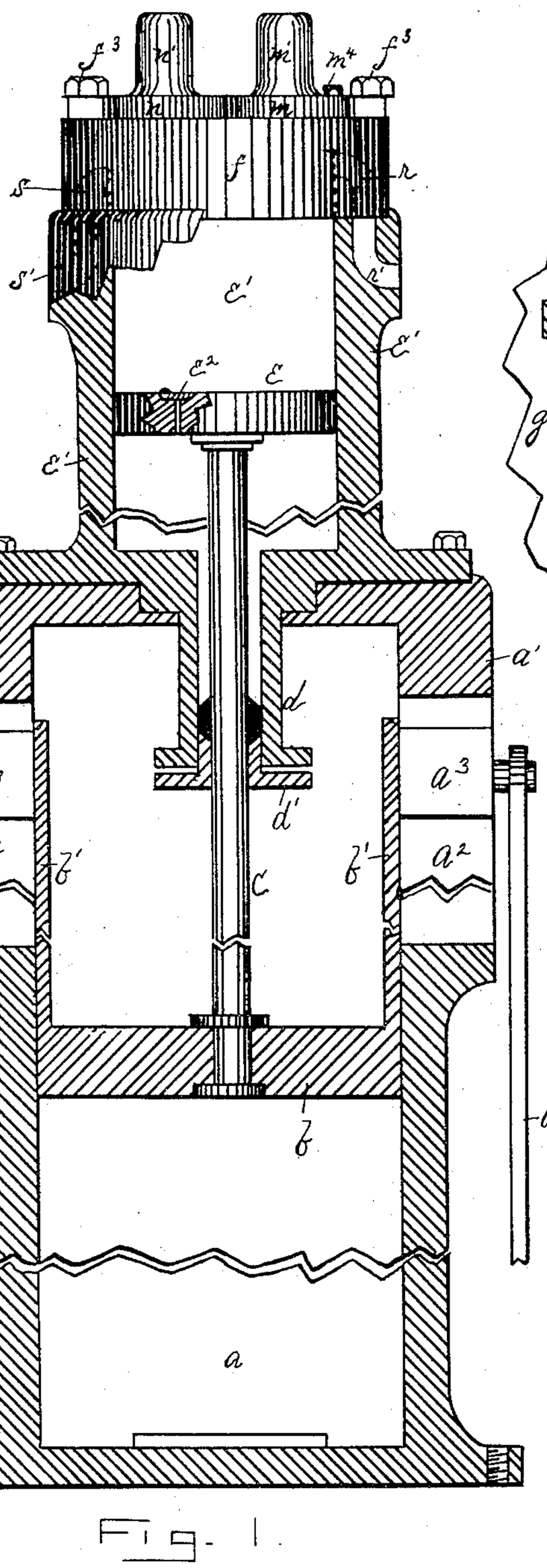

Fig. 1.

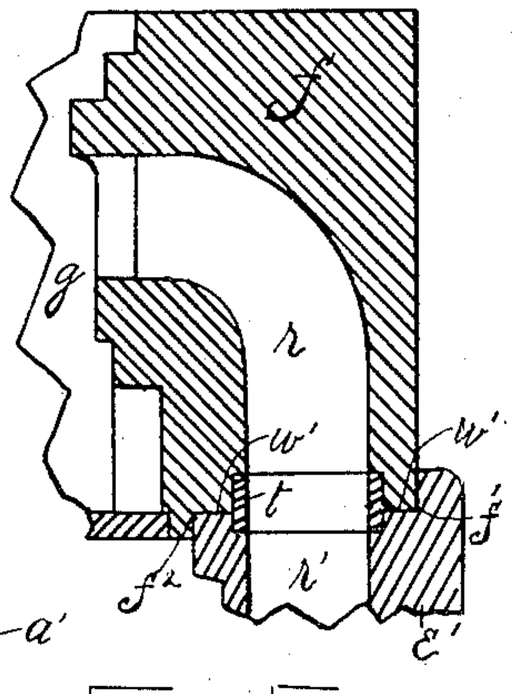

Fig. 5.

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(No Model.) 2 Sheets—Sheet 2.

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VALVE FOR COMPRESSORS FOR ICE MAKING APPARATUS.

No. 317,963. Patented May 19, 1885.

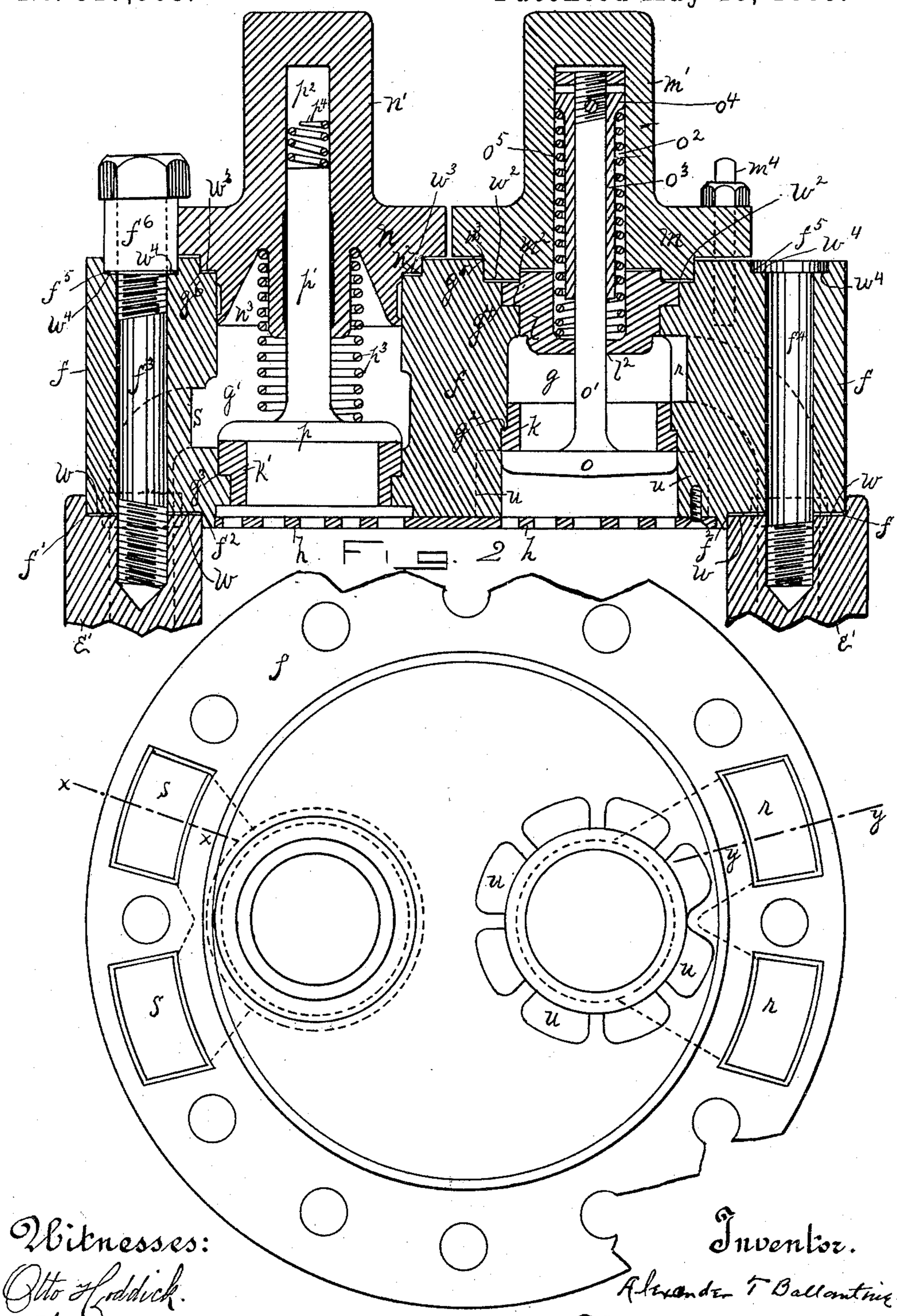

FIG. 2.

FIG. 3.

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UNITED STATES PATENT OFFICE.

ALEXANDER T. BALLANTINE, OF GENEVA, OHIO, ASSIGNOR TO ELLA B. BALLANTINE, OF SAME PLACE.

VALVE FOR COMPRESSORS FOR ICE-MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 317,963, dated May 19, 1885.

Application filed June 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER T. BALLANTINE, a citizen of the United States, residing at Geneva, in the county of Ashtabula and State of Ohio, have invented certain new and useful Improvements in Valves for Compressors for Ice-Making 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates, particularly, to certain improvements in the compressor for which Letters Patent No. 229,940 were issued to me on the 13th of July, 1880; and it consists in an improved construction of the inlet and outlet ports and the downwardly and upwardly opening valves of the gas-cylinder, which forms a part of such compressor, all as will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a central vertical section of the compressor. Fig. 2 is a similar section of the upper portion of the compressor, containing the inlet and outlet ports and valves of the gas-cylinder. Fig. 3 is an under side plan view of Fig. 2 with the gas-cylinder and perforated diaphragm removed. Fig. 4 is a partial section of the outlet-port, taken in the line *x x* of Fig. 3; and Fig. 5 is a similar section of the inlet-port, taken in the line *y y* of Fig. 3.

Referring to the drawings, *a* is the steam-cylinder, having but a single head. A casing, *a'*, whose walls are cylindrical, is mounted on the cylinder *a*, and is slotted laterally to form guides a^2 a^2 for the blocks a^3 a^3, that are connected to the operating-shaft (not shown) by the rods a^4 a^4.

b is the piston, whose follower *b'* is made integral with the piston *b*. This follower *b'* is cylindrical in form and has the blocks a^3 a^3 secured to its upper end. The piston-rod *c* slides through an elongated stuffing-box, *d*, provided with a gland, *d'*, and is connected to the piston *e*, which reciprocates in a cylinder, *e'*, mounted upon the part *a'*.

The parts just described are substantially the same as in the patent hereinbefore mentioned, my improvements, which I will now proceed to particularly describe, being located at the top of the cylinder *e'*.

Referring more particularly to Fig. 2, *f* is a cylindrical cap, which is seated in a shouldered recess, *f'*, in the top of cylinder *e'*. This cap *f* is provided with the interior circular shoulder, f^2, which fits within the cylinder *e'*, and the cap is secured to cylinder by a series of bolts, f^3, which pass down through the circular openings f^4, provided with the shoulders f^5, which receive the shouldered portions f^6 of the bolts f^3.

g and *g'* are two vertical passages in the cylindrical cap *f*, which open downwardly into the cylinder *e'*; and *h* is a diaphragm secured across the bottom of the cylindrical cap *f* and within the cylinder *e'*, and perforated at the bottom of the passages *g* and *g'*.

g^2 is a shoulder in the passage *g*, against which is secured the shouldered collar *k*; and g^3 is a similar shoulder in the passage *g'*, against which is secured a shouldered collar, *k'*. The upper end of passage *g* is shouldered at g^4, adapting it to receive the cap *l*, provided with the annular flange *l'*, which rests upon the shoulder g^4. Over this cap *l* is placed another cap, *m*, provided with the hollow extension *m'*. The base of this cap *m* is provided with an interior shoulder, m^2, which rests upon the top of the annular flange l^2 of cap *l* on an exterior shoulder, m^3, which rests upon a similar shoulder, g^5, in the top of the opening *g*. The cap *m* is secured in position by a series of bolts, m^4.

n is another cap, provided with a hollow extension, *n'*. This cap *n* is provided with an annular shoulder, n^2, which rests upon a corresponding shoulder, g^6, around the top of passage *g'*.

o is the inlet-valve in the passage *g*, located below the collar *k*, and having a follower, *o'*, extending upwardly through a close filling passage, l^2, in the cap *l*, and into the enlarged

chamber o^2, formed in the caps l and m. A collar, o^3, with an annular flange, o^4, is rigidly secured to the follower o' within the chamber o^2, and surrounding this collar is the spiral spring o^5.

p is the outlet-valve, located within the passage g', above the collar k', and having a follower, p', extending upwardly within the chamber p^2 in the cap n.

Surrounding the follower p' and extending upwardly within an annular recess, n^3, in the bottom of the cap n, is a spiral spring, p^3, whose upper end rests against the top of the recess n^3, and whose lower end rests against the upper face of the valve p. Above the follower p' and within the chamber p^2 is the short spiral spring p^4.

Leading from the passage g are the ports r r, (shown in dotted lines in Figs. 1 and 2, and in full lines in Figs. 3 and 5,) preferably two in number, which pass downwardly to the bottom of the cap f, where it rests upon the cylindrical extension a', and there meet the passages r' r' (see Fig. 1) in the wall of the cylinder e'. Similar passages, s s and s' s', lead from the passage g'. At the junctions of these passages, which form the inlet and outlet ports, shoulders are formed in the contacting portions of the cap f and cylinder E', adapted for the reception of the collars t, which lie partly within the cap f and partly within the cylinder E'.

At the base of the passage g, and surrounding such passage, are a series of side chambers, (shown in dotted lines in Fig. 2 and in full lines in Fig. 3,) extending from the collar k to the diaphragm h.

The operation of the mechanism just described in detail is as follows: As the pistons b and e descend, the valve o is drawn down against the action of the coiled spring o^5, and the ammonia or other gas is drawn into the cylinder e' from the source of supply, through the inlet-port r r', passage g, and passages u, the elongated collar o^3 preventing the valve o from striking the perforated diaphragm h, and the coiled spring returning the valve o to its normal position, against the collar k, on the completion of the downward stroke of the piston e. As the piston e ascends, the gas in the cylinder e' is forced up against the valve p, which rises against the action of the coiled spring p^3, permitting the gas to pass through the passage g' and outlet-port s s' to the receiver. The loose spring p^4, above the follower p', prevents any jarring between the valve p and its follower p' and the cap n; and the coiled spring p^3 returns the valve p to its normal position, against the collar k', at the completion of the upward stroke of the piston e. The piston e is provided with the automatic valve e^2, which allows any of the gas which may have escaped under the piston during the upstroke to be returned above the piston as it descends.

To provide against the escape of any of the gas through the joints where the caps f, m, and n are joined together and to the cylinder e', the following arrangement of packing is made: Before the cap is placed upon the part a' a layer of soft metallic packing—such as lead—is placed between the parts f and e' at the points w, and when the parts are secured united by the bolts f^3. This packing is held in position by the shoulders f' and f^2, which prevent the packing from spreading, thereby insuring a perfectly-tight joint. Lead packing is similarly placed where the passages r and s join the passages r' and s' to form the inlet and outlet ports, the packing being prevented from spreading by the collars t t and the shoulders f' and f^2. This packing is similarly arranged at the points w^2 w^2 and w^3 w^3, where the caps m and n are secured to the cap f, and at the points w^4 w^4 in the shouldered recesses f^5, where the fastening-bolts f^3 are secured. In this manner all points where the escape of gas is possible are provided with effectual means for its prevention.

I claim—

1. In a gas-compressor for ice-making apparatus, the combination, with the gas-cylinder e' and piston e, perforated diaphragm h, passages g and u, and inlet-ports r r', and passage g', and outlet-ports s s', of the spring-pressed valves o and p, substantially as shown and described.

2. In a gas-compressor for ice-making apparatus, in combination with the inlet-ports r r' and the passage g, provided with the collar k and side passages, u, the valve o, its follower o', and the collar o^3 and spring surrounding such follower, both located within the chamber o^2, substantially as shown and described.

3. In a gas-compressor for ice-making apparatus, in combination with the outlet-ports s s' and the passage g', provided with the collar k', the valve p, its follower p', and the coiled spring p^3, located between the valve o and the cap n, substantially as shown and described.

4. In a gas-compressor for ice-making apparatus, in combination with the outlet-ports s s' and the passage g', provided with the collar k', the valve p, its follower p', the coiled spring p^3, located between the valve o and cap n, and the loose spring p^4 in the chamber p^2, substantially as shown and described.

5. In a gas-compressor for ice-making apparatus, the combination, with the cap f, containing the passages g, g', r, and s, the caps m and n, having the hollow extensions m' and n', and the hollow cap l, of the spring-pressed valves o o' and p p', substantially as shown and described.

6. In a gas-compressor for ice-making apparatus, as a means of preventing the escape of gas, the caps f, m, n, and l, containing the valves and ports, and shouldered, as shown,

and having a suitable packing placed at the shouldered points w, w^2, w^3, and w^4, substantially as shown and described.

7. In a gas-compressor for ice-making apparatus, the cap f, provided with the passages r and s, and cylinder e, provided with the passages r' and s', shouldered at their joining edges, as shown, combined with the collars $t\,t$, and provided with a suitable packing at the points w', as and for the purpose stated.

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

ALEXANDER T. BALLANTINE.

Witnesses:
J. FRED. BOHN,
OTTO HODDICK.