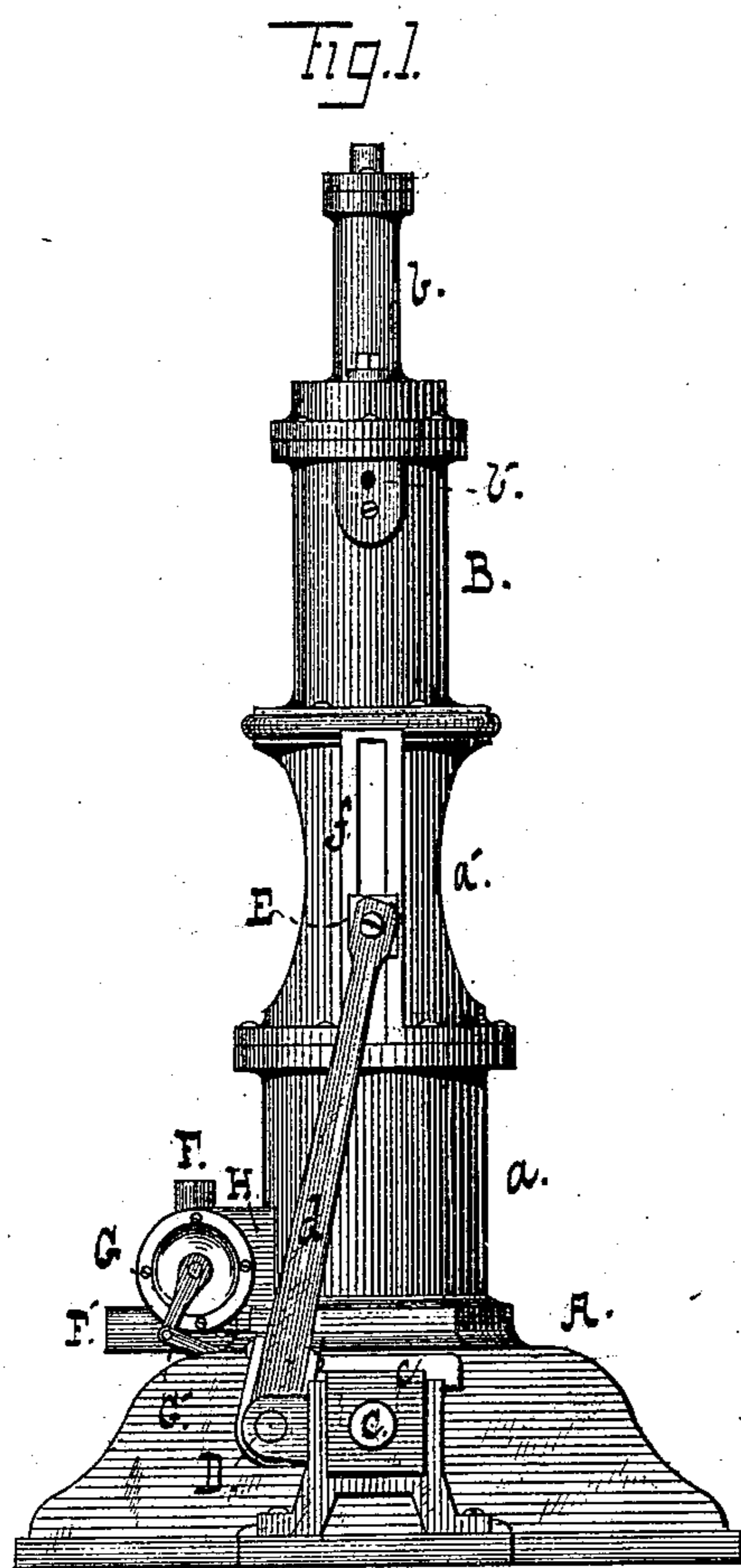


(No Model.)

A. T. BALLANTINE.  
Compressor for Ice Making Apparatus.

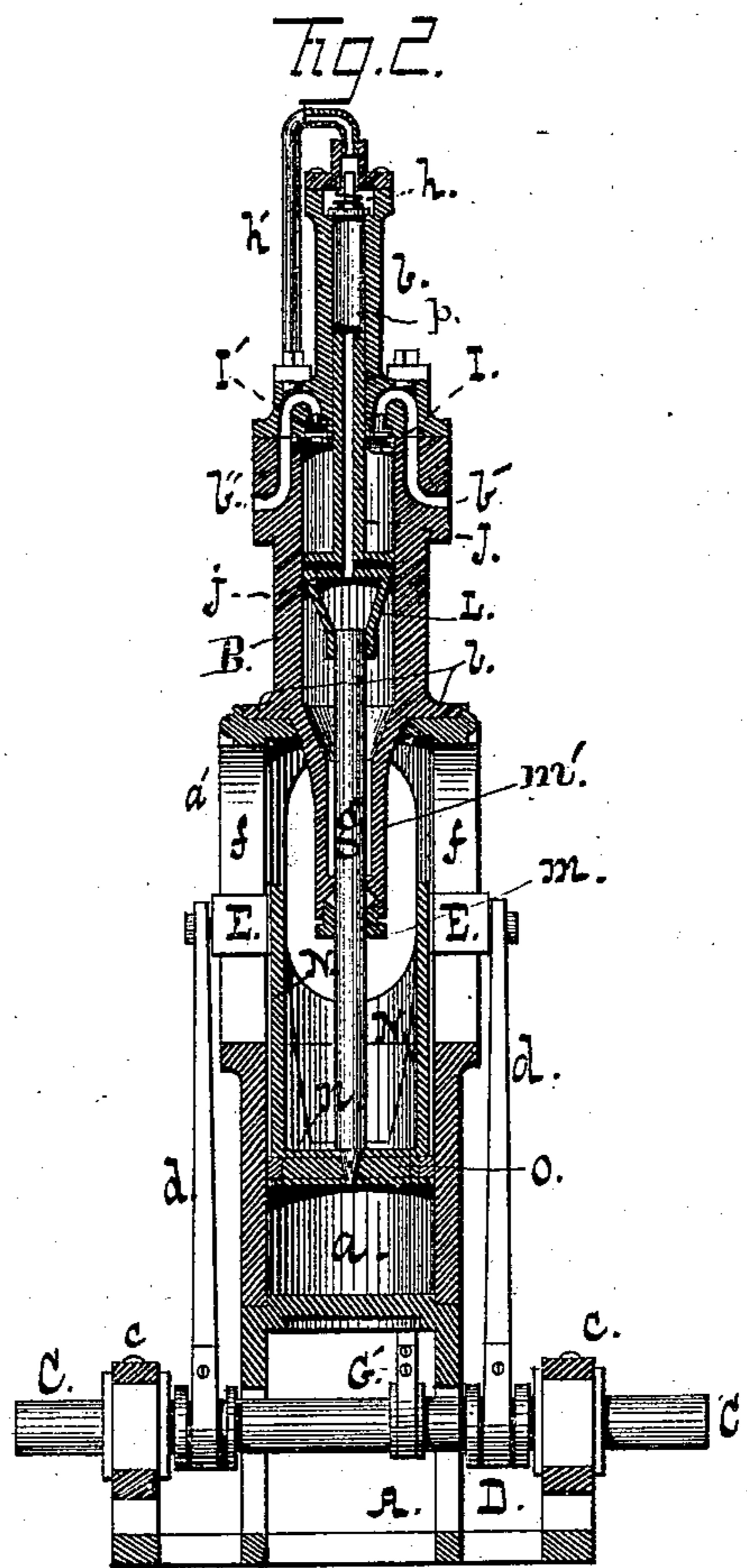
**No. 229,940.**

**Patented July 13, 1880.**



Witnesses:

W. A. Bertram  
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# UNITED STATES PATENT OFFICE.

ALEXANDER T. BALLANTINE, OF PORTLAND, MAINE, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO ROBERT A. RIPLEY, OF SAME PLACE.

## COMPRESSOR FOR ICE-MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 229,940, dated July 13, 1880.

Application filed March 24, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, ALEXANDER T. BALLANTINE, of Portland, Cumberland county, State of Maine, have invented certain new and useful Improvements in Compressors for Ice-Machines; and I hereby declare the same to be fully, clearly, and exactly described as follows, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the device. Fig. 2 is a central vertical sectional view of the same.

My invention has reference to gas-compressors in general, and in particular to that class of the same used to liquefy the gases used in the artificial production of ice. For this purpose ammonia-gas is most commonly used, and my invention is designed to supply a want long felt in the practical production of ice by the so-called "ammonia process," by furnishing a compressor in which the loss of material by leakage is wholly obviated, while lessening the first cost of the machine by simplifying its construction.

Inasmuch as the machine about to be described is adapted for use in the compression of gases generally, and for the reason that its peculiarities of construction are in nowise dependent upon or affected by those of the other parts of the ice-machine with which it is mainly designed to be used, only those parts belonging to the compressor proper are shown in the accompanying drawings and hereinafter described.

In gas-compressors generally and ammonia-compressors in particular it has heretofore been found almost impossible to obviate leakage between the pistons and the walls of the cylinders without making the pistons so tight in the cylinders as to cause a great waste of power by reason of friction.

My invention is mainly directed to obviating this evil by providing for the return of any gas which escapes past the piston into the receiver, and to prevent this leakage as far as may be by maintaining a truly right-line motion of the piston-rod in spite of wear.

In the accompanying drawings, A is the base or frame of the machine, through which passes the shaft C, cranked, as usual, at D, and mounted in suitable bearings *c c*.

A steam-cylinder, *a*, having but a single head, is mounted on the base A, and is provided with a steam-chest, H, having inlet and exhaust pipes F F' and a valve operated by a crank, G, and connecting-rod G', actuated by an eccentric on the main shaft C. A casing, *a'*, whose walls are cylindrical, is mounted on the cylinder *a*, and is slotted laterally to form guides *f f* for the blocks E, that are connected with the cranks D by rods *d*.

O is the piston, whose follower *n* is made integral with the cylindrical piece N, which slides in the cylinder *a'*, and to which the blocks E are secured.

The piston-rod *g* slides through an elongated stuffing-box, *m'*, provided with a gland, *m*, and is connected by means of a yoke, L, to the piston *j*. This latter reciprocates in a cylinder, B, mounted at *l* upon the part *a'*. The piston *j* is centrally perforated and carries a hollow rod, J, which reciprocates in a cylinder, *b*, and carries an upwardly-opening valve, *p*, in its end, as shown. In the top of the latter is a valve, *h*, from which a pipe, *h'*, leads to the receiver for the compressed gas. The inlet and outlet ports *b' b''* are provided with, respectively, downwardly and upwardly opening valves I I', and lead, respectively, from the source of the gas to be compressed and to the receiver.

In operation, as the pistons O and *j* descend, the cylinder B is filled with gas, which enters through the port *b'* and valve I. During the return stroke the gas is forced through the exit-port *b''* and into the receiver. Any gas which during this stroke leaks past the piston *j* is on the downstroke forced to find exit, through the hollow rod or piston J, valves *p h* and pipe *h'*, into the receiver.

By reason of the extended bearing afforded by the cylinder N the lateral pull and push of the connecting-rods *d* produce no lateral strain on the piston *g*, which would speedily result from wear were the rods *d* connected, as usual, to a cross-head. Immunity from looseness due to wear is further insured by the extended bearings on both sides of the piston J afforded by the long stuffing-box *m'* and the cylinder *b*.

The mechanism for effecting the return of any gas which leaks by the piston into the receiver is of paramount importance, as such

leakage has heretofore, in the case of ether and ammonia machines, been the cause of great annoyance and loss, and has completely driven the bisulphide-of-carbon machine out of use by reason of the insufferable odor of that substance. The incoming gas is delivered with sufficient pressure to effect the return stroke of the pistons, and a fly-wheel is only needed to throttle any irregularities of speed. In using the described device, however, as an air-compressor a fly-wheel of suitable size and weight becomes a necessity.

A suitable opening is made in the stuffing-box *m'* for the introduction of the lubricant, the opening being normally closed by a screw-cap or valve.

The lubricant surrounding the piston-rod *g* and occupying the space between it and the internal walls of the elongated stuffing-box *m'* effectually prevents any leakage of gas through the end of the box, forming a liquid seal, which is driven closely down upon the packing by the pressure of any gas that leaks between the piston and cylinder.

What I claim is—

1. The combination, in a gas-compressor, of a piston-rod common to the gas and steam cylinders and a steam-piston whose follower is provided with bearings *N*, located within a continuation of the cylinder and connected at

each side of the cylinder with the crank-shaft, as and for the purpose set forth.

2. The combination, in a gas-compressor, of a cylinder having inlet and outlet ports with a perforated piston provided with a hollow rod located within a continuation of the cylinder and communicating, through the medium of a valved opening, with the receiver, as and for the purpose set forth.

3. The combination, substantially as set forth, of the cylinder *B*, having valved ports *b' b''*, with the piston *j*, tube *J*, yoke *L*, and piston-rod *g*, as described.

4. The combination, with the piston *j*, tube *J*, and cylinder *B*, having ports *b' b''*, of the valved cylinder *b*, having a common delivery with the port *b''*, as set forth.

5. The combination, with the cylinder *a*, having piston *O*, follower *n*, and cylindrical bearing *N*, of the cylinder *B*, having piston *j* and elongated stuffing-box *m'*, as set forth.

6. In combination with the piston-rod *g*, the vertical elongated stuffing-box *m'*, having a stratum of fluid lubricant resting upon the gland, as set forth.

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Witnesses:

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