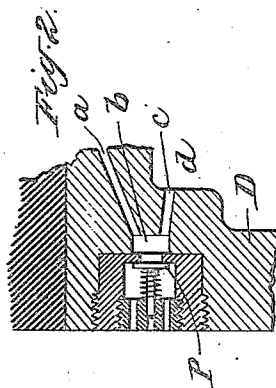
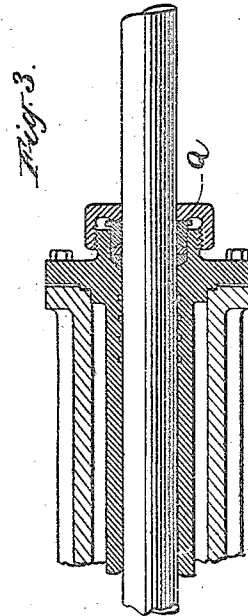
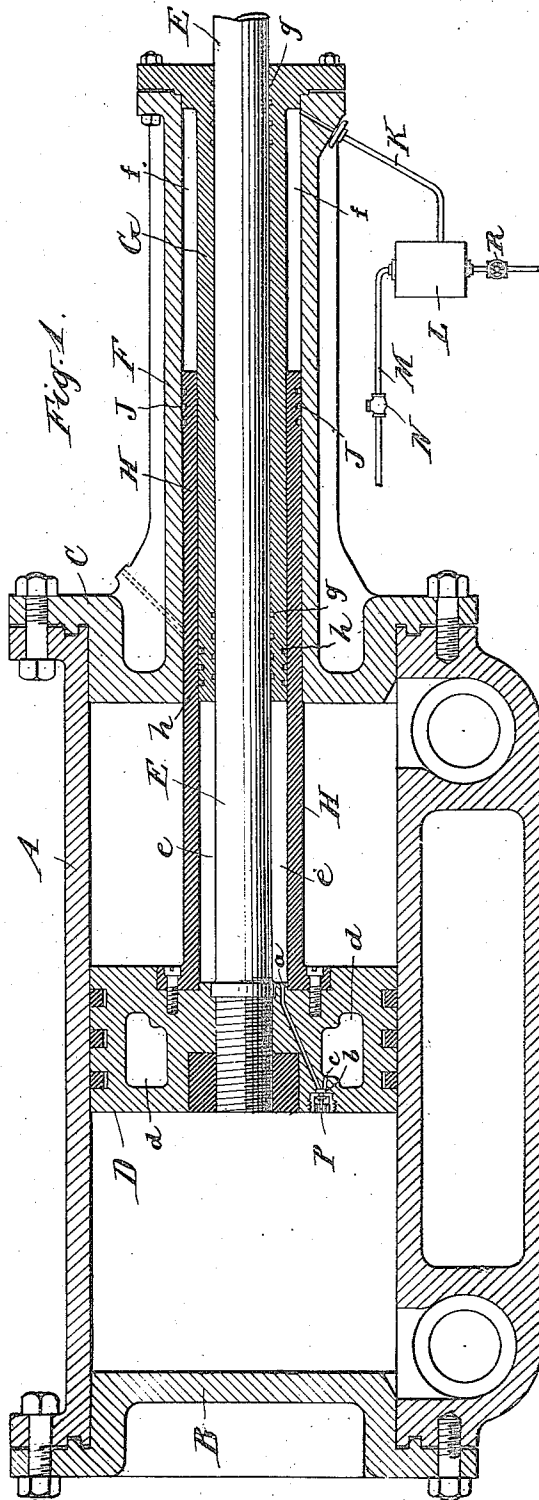


L. BLOCK.
GAS COMPRESSOR.
APPLICATION FILED NOV. 30, 1915.

1,239,869.

Patented Sept. 11, 1917.
3 SHEETS—SHEET 1.

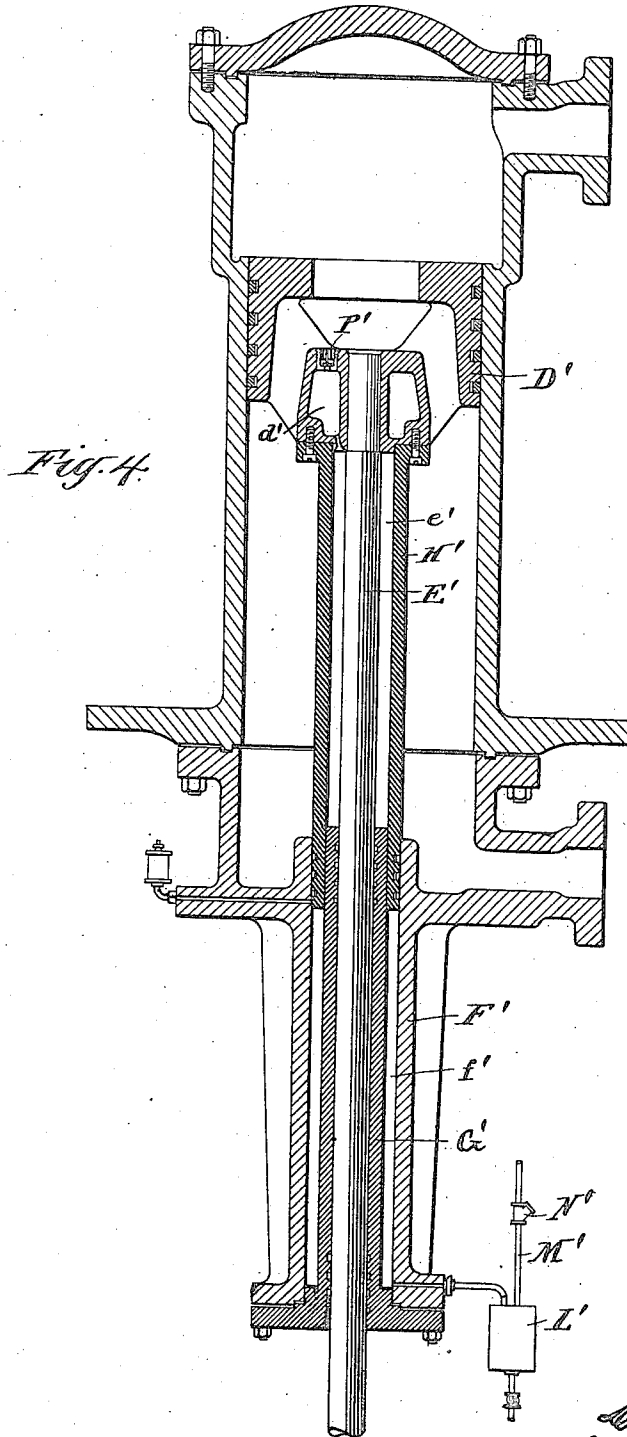


Inventor:
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by his attorney,
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 5.

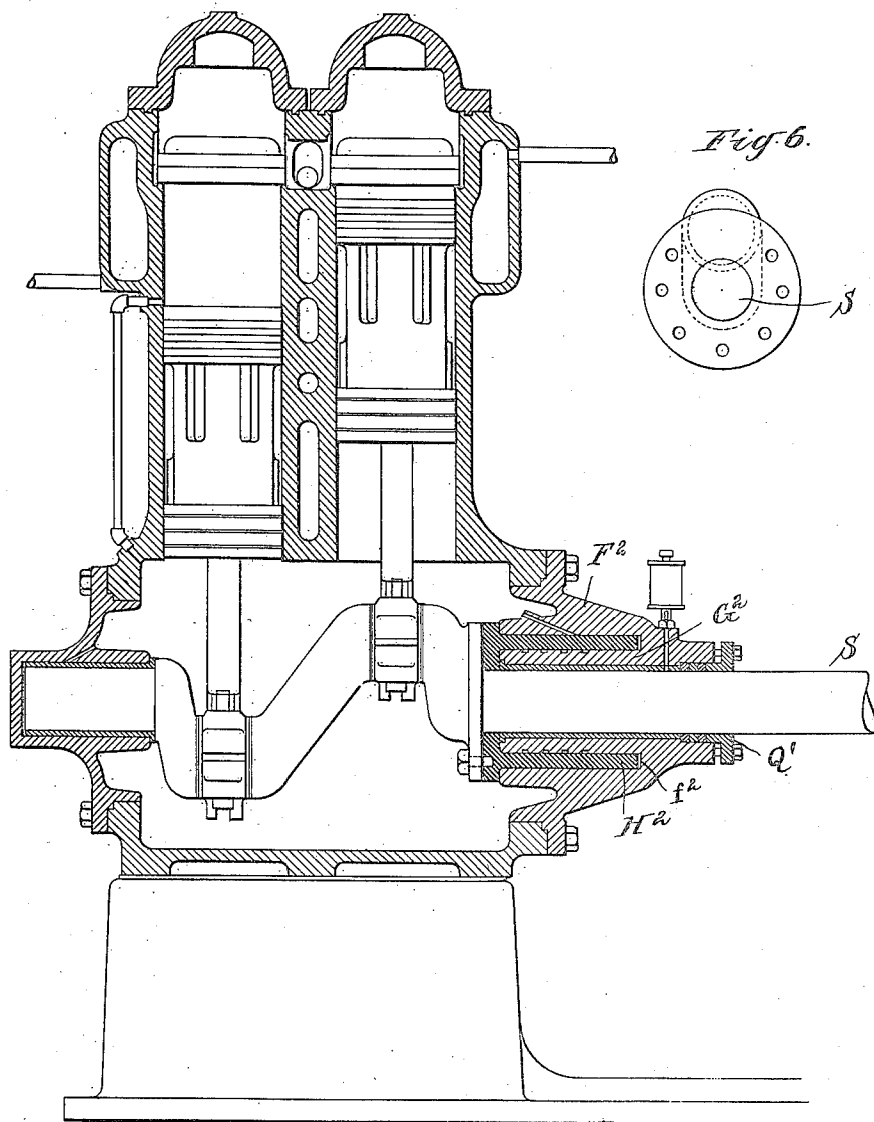
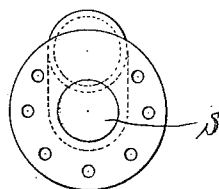


Fig. 6.



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UNITED STATES PATENT OFFICE.

LOUIS BLOCK, OF MAMARONECK, NEW YORK.

GAS-COMPRESSOR.

1,239,869.

Specification of Letters Patent. Patented Sept. 11, 1917.

Application filed November 30, 1915. Serial No. 64,255.

To all whom it may concern:

Be it known that I, LOUIS BLOCK, a citizen of the United States, residing at Mamaroneck, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Gas-Compressors, of which the following is a specification.

The invention relates particularly to gas compressors of refrigerating machines, and especially to means for preventing the escape of gas by leakage around the piston-rod or other moving part of the mechanism. The stuffing-box usually employed for packing such joints is objectionable because of the friction induced when the packing is tightly compressed to seal the joint efficiently, and because of the loss of gas by leakage through the joint if the packing be sufficiently relaxed to permit easy movement. Changes in temperature, wear, and other factors render it extremely difficult to maintain the packing uniformly in the required relation to the moving part.

The object of this invention is to eliminate the stuffing-box and provide means whereby the joint between the cylinder-head and piston-rod, or other moving part, may be effectually sealed against the escape of gas there-through, with a minimum of friction between the fixed and moving parts, and to provide means for receiving and leading to the low-pressure or suction side of the compressor any gas at higher pressure penetrating to such joint.

The invention consists in certain novel features of construction and arrangement by which the above objects are attained, to be hereinafter described and claimed.

The accompanying drawings form a part of this specification and show the invention applied to several types of compressors, only such portions of the latter being illustrated as are necessary to show the relation of the invention thereto.

Figure 1 is a vertical axial section of a double-acting horizontal compressor constructed in accordance with the invention.

Fig. 2 is a section on a larger scale and partly in elevation, showing a detail of Fig. 1.

Fig. 3 is a section corresponding to a portion of Fig. 1 and shows a modification.

Fig. 4 is a vertical axial section showing the invention applied to a single-acting vertical compressor.

Fig. 5 is a vertical central section, partly in elevation showing a pair of compressors of the single-acting inclosed type to which the invention is applied in a modified form.

Fig. 6 is an end view of the shaft in Fig. 5. Similar letters of reference indicate like parts in all the figures.

Referring to Figs. 1 and 2, A is the compressor cylinder having a rear head B and front head C, containing a piston D arranged to be reciprocated in the cylinder as usual by a piston-rod E, and equipped with suction and delivery valves and other usual essentials, not shown.

On the cylinder head C is a tubular extension F flanged exteriorly at the outer end to receive a corresponding flange on a tubular piston-guide G extending inwardly, fitted to and snugly inclosing the piston-rod E with liberty for the latter to reciprocate therein, and itself inclosed by the extension F but with an annular space *f* between these parts.

In the annular space *f* thus provided between the extension F and guide G is received a sleeve H mounted axially on the piston, surrounding the piston-rod but separated therefrom, as shown, and reciprocating with the piston.

Gas received in the front end of the cylinder through the suction-valve, not shown, fills the space outside the sleeve H and is compressed as usual by the forward movement of the piston but is held away from the piston-rod and the joint between the latter and the guide B by the intervening sleeve. The sleeve is provided with exterior packing-rings J serving to pack the joint between the sleeve H and extension F, and any gas escaping through such joint is received in the space *f* which is connected by a pipe K to a receiver L in communication with the suction-side of the compressor through a pipe M controlled by a checkvalve N. At the bottom of the receiver is a blow-off cock R.

The receiver L contains gas normally at the pressure in the suction-side of the system and provides a chamber to which gas in the space *f* may be driven and again withdrawn by the reciprocations of the sleeve H without creating excessive changes in pressure, and insures against the formation of a vacuum in the space *f*. If the accumulation of gas in the chamber L becomes sufficient to be compressed by the forward reciproca-

tion of the sleeve H to a pressure greater than that of the suction-side, the checkvalve N lifts and the excess escapes to the suction-side, thus maintaining the pressure in the receiver L and space f at approximately that of such suction-side.

As the pressure in the space f is normally that of the suction-side of the system, the leakage of gas from such space through the long close annular joint between the sleeve H and guide G, packed by the rings h , will be very small and is received in the annular space e surrounding the piston-rod E. This space is alternately increased and diminished by the reciprocations of the piston, and is in communication through the passages a , b and c with a chamber d cored in the piston, containing gas at the low pressure of the suction-side and serving the same function as the receiver L above described, in preventing the formation of a vacuum in the space e and in affording a compartment or recess into which any gas in the space e may be driven at each forward movement of the piston.

A self-closing valve P located in the passage b is subject to the varying pressures of gas in the rear end of the cylinder, alternating from suction pressure at one end of the stroke to the high pressure of delivery at the other; when the pressure in the space e and chamber d exceeds that of the suction-side, the valve P lifts and permits such excess to escape to the cylinder during the suction stroke of the piston, at which time the gas in the space e is being forced into the chamber d by the approach of the piston to the end of the guide G.

Thus the pressure in the space e is held at approximately that of the suction-side, and gas under delivery pressure is never in direct contact with the piston-rod nor admitted to the joint between the piston-rod and guide G. The latter is provided at each end with oil grooves g aiding to prevent leakage through such joint.

As a safeguard, to be used when the compressor is idle, the flanged head of the guide G may carry a stuffingbox, as at Q in Fig. 3. When thus equipped the gland should be completely relaxed while the compressor is running, and tightened only when the compressor is stopped to guard against slow leakage during the idle period.

In the single-acting vertical compressor partially shown in Fig. 4, the hollow hub or boss of the piston D^1 provides a chamber d^1 into which leakage from the space e^1 between the piston-rod E^1 and sleeve H^1 may flow and escape through the valve P^1 to the suction chamber of the compressor, and the leakage to the space f^1 between the guide G^1 and extension F^1 flows to the receiver L^1 and through the pipe M^1 past the checkvalve N^1 to the suction-side. The action is

similar to that above described, and this form may if preferred be equipped with a stuffingbox as a precautionary measure to be employed when the compressor is idle.

The cubic contents of the chambers d and d^1 preferably should exceed the capacity of the spaces e and e^1 , and the receivers L and L^1 preferably should exceed in capacity the cubic contents of the spaces f and f^1 , so that if the extensions F and F^1 , guides E and E^1 , and sleeves H and H^1 are so proportioned as to practically fill such spaces at each reciprocation of the pistons D and D^1 the gas in such spaces may be driven into the chambers and receivers without an excessive increase of pressure, and again flow to the spaces on the return stroke to avoid a vacuum therein.

In the inclosed type of compressor partially illustrated in Fig. 5 the bearing for the shaft S is lengthened to form an extension F^2 and guide G^2 , shown as cast integrally, and provided with an annular recess f^2 receiving a sleeve H^2 secured to and revolving with the shaft and performing the same function as the sleeves H and H^1 above described. A stuffingbox Q^1 may be provided to guard against leakage when the compressor is not running.

In all the forms shown the joint between the fixed parts and the moving member, whether the latter be a piston-rod as in Figs. 1 and 4 or a shaft as in Fig. 5, can never be subjected to any pressure higher than the low pressure of the suction side of the system.

I claim:—

1. In a compressor of the character set forth, the combination of a movable member actuating a compressor piston, a fixed guide inclosing such member, and means inclosing such member and guide and moving with such member in gas tight contact with said guide for excluding gas from the joint between said guide and member.

2. In a compressor of the character set forth, the combination of a movable member actuating a compressor piston, a fixed guide inclosing such member, a fixed extension inclosing said guide and separated therefrom, and a sleeve carried by such movable member and received in the space between said guide and extension in gas tight contact with said guide.

3. In a compressor, the combination of a piston, a piston-rod thereon, a sleeve on said piston inclosing said piston-rod and separated therefrom, and means coacting with said sleeve for isolating said piston-rod from contact with the gas in the compressor.

4. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a fixed guide for the latter within said extension, a piston, a piston-rod thereon, and a sleeve on said piston moving with the lat-

ter and inclosing said piston-rod and received between said extension and guide and matching to and received in said extension.

5 5. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and separated from said extension, and a sleeve
10 on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide.

15 6. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and separated from said extension, and a sleeve
20 on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, and a passage leading from such space to the suction-side of the
25 compressor.

7. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
30 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, a receiver, a pipe leading
35 from such space to said receiver.

8. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
40 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, a receiver, a pipe leading
45 from such space to said receiver, a delivery pipe leading from said receiver to the suction-side of said compressor, and a check-valve in said delivery pipe.
50

9. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
55 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to recip-

rocate in the annular space between said extension and guide, and a passage leading
60 from the space between said piston-rod and sleeve to the opposite face of said piston.

10. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
65 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, said piston having a
70 chamber therein and a passage leading from the space between said piston-rod and sleeve to said chamber.
75

11. In a compressor, the combination of a cylinder head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
80 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, said piston having a
85 chamber therein and a passage leading from the space between said piston-rod and sleeve to said chamber, and a delivery passage from the latter to the opposite face of the piston, and a self-closing valve in said delivery pas-
90 sage.

12. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
95 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, and packing rings on said
100 sleeve between the latter and said extension.

13. In a compressor, the combination of a cylinder-head, a tubular extension thereon, a piston, a piston-rod thereon extending axially of said extension, a tubular guide inclosing said piston-rod and carried by and
105 separated from said extension, a sleeve on said piston inclosing said piston-rod and separated therefrom, and arranged to reciprocate in the annular space between said extension and guide, and packing rings on said
110 guide between the latter and said sleeve.

In testimony that I claim the invention above set forth I affix my signature.

LOUIS BLOCK.