

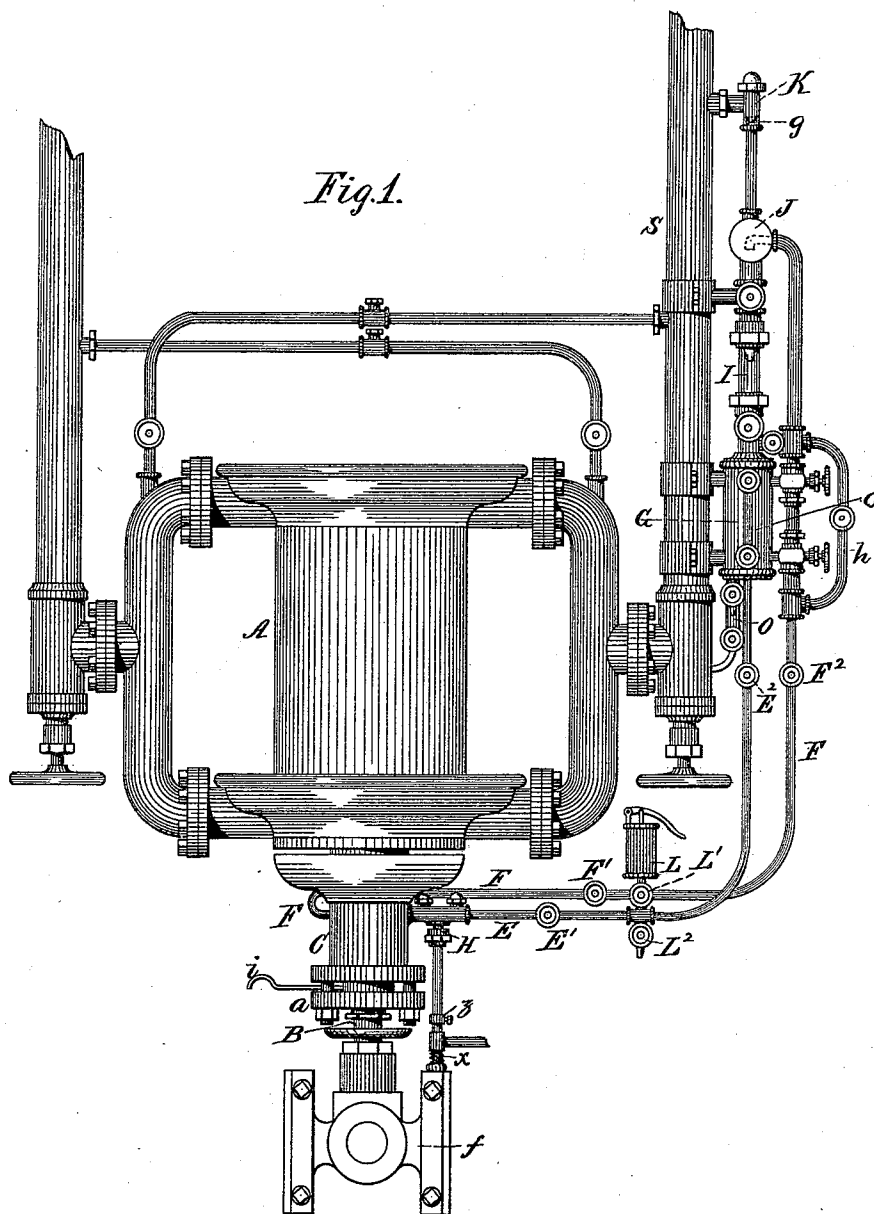
(No Model.)

2 Sheets—Sheet 1.

W. S. BREWER.
GAS COMPRESSION PUMP.

No. 448,874.

Patented Mar. 24, 1891.



Witnesses:
W. C. Jirdin, ston.
Ella Hosea.

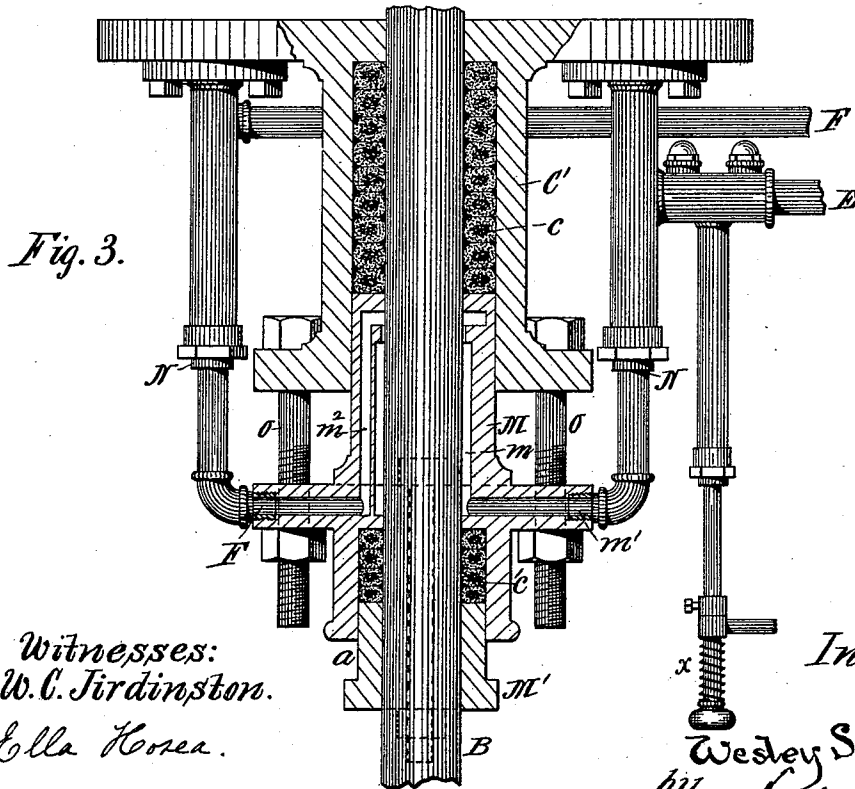
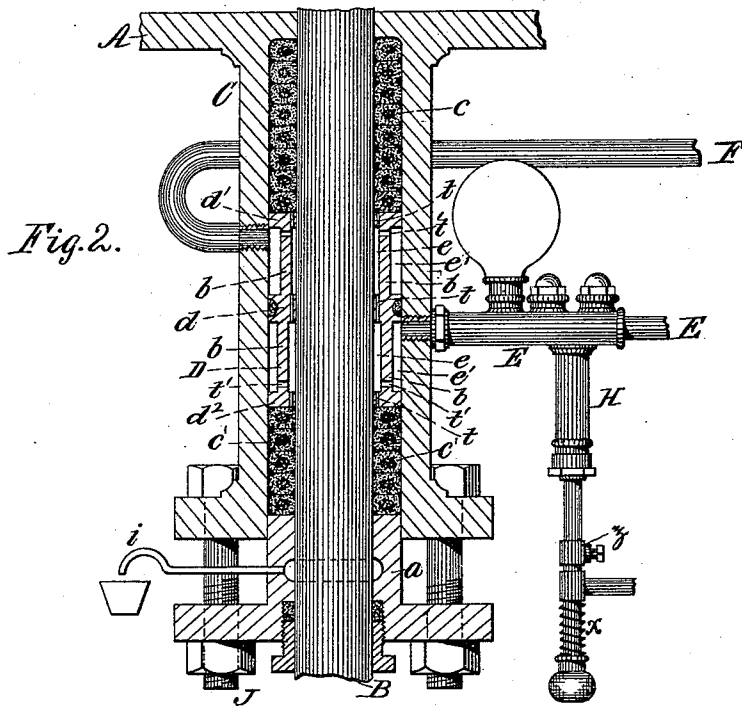
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UNITED STATES PATENT OFFICE.

WESLEY S. BREWER, OF CINCINNATI, OHIO.

GAS-COMPRESSION PUMP.

SPECIFICATION forming part of Letters Patent No. 448,874, dated March 24, 1891.

Application filed April 6, 1889. Serial No. 306,188. (No model.)

To all whom it may concern:

Be it known that I, WESLEY S. BREWER, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Gas-Compression Pumps, of which the following is a specification.

My invention relates to that class of refrigerating or ice-making machines employing compression-pumps for the condensation of a liquefiable gas or vapor; and its object is to provide a method of and apparatus for properly lubricating the piston-rod of the pump and at the same time preventing the escape of gas through the packing. In most compression-pumps of this class this is beset with more or less difficulty, owing to the tenuity of the gases employed and to the great pressure against which the pump is necessarily operated, and, besides the waste and loss of gas and the consequently increased expense of maintaining the required pressure in the tanks, the escape of acid-gases in the pump-room is a cause of annoyance. In the effort to check these evils by setting up the packing-glands great friction and wear and injury of parts ensue, with only temporary relief.

My invention is designed to remedy this condition, and does so by forced feed of oil to and around the piston-rod and to the packing, whereby the oil has the quadruple function of lubricating the rod, sealing the packing against the passage of gas from the stuffing-box, trapping the gas-bubbles that may pass out of the pump-cylinder into the stuffing-box with the piston, and returning the gas to the suction end of the pump.

My invention also embraces a construction of apparatus in which these functions are satisfactorily performed and the packing kept loose to avoid undue friction and wear, and whereby, also, the precise condition and working of the system is at the same time rendered visible to the attendant, so that the proper adjustment of the parts may be at all times maintained.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical elevation of the device complete in its preferred form as applied to the new machines; Fig. 2, a sectional

detail view of the stuffing-box, gland, and oil-sleeve; and Fig. 3, a sectional view of a construction embodying my invention as applied to the existing stuffing-boxes of machines in use.

Referring now to the drawings, A designates the pump-cylinder, B the piston-rod, and C the stuffing-box. Within the stuffing-box are placed a few coils of the usual hemp or rubber packing *c* next to the cylinder and a few coils *c'* of the same next to the gland *a*, with the interval between occupied by an oil-carrier D. The oil-carrier consists of three annular flanges *d d' d''*, fitting the rod and stuffing-box closely, separated by cylindrical partitions *b*, having between each end flange and the central one two annular oil-chambers *e e'*, each inner one *e* surrounding the piston-rod B and each outer one *e'* bounded exteriorly by the wall of the stuffing-box. Near the bottom of the lower partition and near the top of the upper one are oil-holes *t'*, forming the sole communication between each two outer and inner annular chambers, and a series of similar oil-holes *t* through each of the flanges concentrically around the piston-rod forms the sole communication between the upper and lower inner oil-chambers and between the said inner chambers and the packing-cavities of the stuffing-box above and below the oil-sleeve. The central flange *d* is packed exteriorly as a piston in the stuffing-box, and in lieu of a series of concentric perforations the central flange may be bored a trifle larger for the passage of oil. An oil-supply pipe E from the pump H enters the stuffing-box at the lower outer oil-chamber, and an oil-exit pipe F leaves the stuffing-box opposite the upper outer oil-chamber. It will thus be seen that oil forced into the sleeve by the pump H and pipe E passes first into the lower outer annular chamber *e'*, thence through the lower set of radial holes *t'*, through the lower partition *b*, to the lower inner chamber *e*, around the piston-rod, where part passes down to saturate the packing *c'* below. The oil passes thence upward through the concentric apertures *t* of the central flange *d* into the upper inner annular chamber *e* around the piston-rod and saturates the upper packing *c*, and from the chamber *e* outward through the ra-

dial holes t' of the upper partition b into the upper outer chamber e' , and thence outward through the exit-pipe F . Assuming a means, presently to be described, for maintaining a forced circulation, the oil, as will be seen, is constantly passing in an ascending current through the inner chambers e of the oil-sleeve D adjacent to the piston-rod, and it will be obvious that any bubbles of gas which may be brought down through the upper packing by the piston-rod in its downward stroke will tend to separate from the rod in the upper inner chamber and be carried by the ascending flow of oil outward into the exit-pipe F . It will also be obvious that the forced saturation of the packing with oil and the abundant lubrication of the rod by oil contact within the sleeve will assist the packing to prevent escape of gas without excessive compression of the packing itself by the gland, thus avoiding undue friction.

The outer connections and attachments are as follows, Fig. 1: The supply-pipe E extends to a small pump II , having the usual check-valves and having its plunger arranged in the path of some part of the cross-head f , which, when near the upper limit of its stroke, strikes and forces in the plunger against the resiliency of a spring z , by which it is held outward. The supply-pipe E extends thence to the oil-reservoir G , located above adjacent to the suction-pipe of the pump. Above and communicating with the reservoir is a "sight-feed" chamber I , above which is a separating-chamber J , from which the oil passes downward and gas passes upward. The gas passes upward through an uplifting check-valve g in a chamber K , communicating with the suction-pipe S of the pump. This valve is weighted or governed by spring-pressure against the normal suction of the pump and has a minute hole through it to equalize the pressure in the reservoir. The exit-pipe F is carried upward adjacent to the reservoir G , where a glass gage P is arranged as part of its path, having the usual valved connections and terminates in a downward-discharging bend in the sight-feed chamber and separator J , whence, as before stated, the gas passes upward and the oil downward. A pipe h connects the pipe F around the glass gage P for temporary use in case of breakage. Thus in the operation of the machine the quantity of gas passing through with the oil can be seen at P , while the quantity of oil being circulated may be determined at the sight-feed chamber I , and both may be regulated by attention to the packing or changing the stroke of the oil-pump II by resetting the limiting-collar z upon the plunger. I may also groove the interior of the gland a and pipe the same outwardly with a goose-neck i to catch any overflow, and in such case it is desirable to attach an additional small stuffing-box j at the outer entrance of the gland around the piston-rod B .

The supply-pipe E and return-pipe F are

furnished with closing-valves, as shown at E' E^2 and $F' F^2$, respectively.

To recapitulate, the operation of the force-pump H by the main cross-head f keeps the cavity in the oil-sleeve D filled with oil and seals by saturating the lower section of packing, so as to render a leakage of gas through it impossible. Any gas escaping down with the piston-rod through the upper section of packing is trapped in and by the column of oil ascending in contact with the piston in the sleeve and escapes with the oil back through the exit-pipe F and is finally trapped and separated at the chamber J , whence the gas passes back into the suction-pipe of the pump and the oil flows down into the reservoir G to be used again. The valve g is loaded to require two or three pounds pressure in excess of the tank-pressure to raise it, and the small hole through it, while serving to permit the gradual escape of gas into the suction-pipe, is too small to permit fluctuations of pressure in the oil-reservoir under the strokes of the main pump. The glass gages show at all times the relative quantity of gas and oil passing, and it is part of the advantage derivable from the present invention that the packing around the piston-rod may be loose enough to permit escape of gas with the piston into the oil-sleeve, as described, without detriment, since there is no external leakage.

I also attach to the apparatus a small hand pump L , attached to the pipe E , used for filling the reservoir G , and provided with valves $L' L^2$. Should the oil in the reservoir become dirty, it may be drawn off at the valve L^2 for filtering, and while the reservoir is disused the pump L may be employed for temporarily charging the stuffing-box.

The foregoing description and illustration refer to a vertical compression-pump; but the improvement may with equal advantage be applied to one operating horizontally. The only change required is that the holes in the oil-sleeve D , communicating between the chamber, should be arranged at the upper side instead of concentrically in relation to the piston.

In Fig. 3 I have exhibited a modification adapting the principle of the invention to an existing machine, the differences being those of construction merely and designed to utilize the ordinary stuffing-box attached to the pump. I combine the functions of the oil-sleeve and gland into one structure M , which is substantially a gland in relation to the stuffing-box C' and held by the usual retaining-bolts o . Within it and surrounding the piston-rod B , I form the annular oil-chamber m , entered by a passage m' below, supplied by the supply-pipe E , and communicating above with separate exit-passage m^2 , leading down to a connection with the return-pipe F . The packing c surrounds the piston above the gland, as in the former case, above the sleeve.

The outer mouth of the gland M is itself enlarged into a stuffing-box containing the lower section of packing c' and is fitted with an independent gland M'. All other parts and connections are the same as hereinbefore described. This construction, as will be seen, embodies the same general principles as the oil-sleeve before described and is adapted to a shorter stuffing-box, such as are generally found in existing machines. It is somewhat more economical of construction, but involves disconnecting pipes when packing is to be replaced or the provision of slip-joint N in the pipes F and F'.

The arrangement of the reservoir shown in the drawings enables me also to attach a sight-feed oiling device O, by which oil in regulated quantities may be introduced to the suction-pipe of the pump to lubricate the piston and interior working parts, which is very necessary to the perfect operation of such compression-pumps.

I may add, in conclusion, that by the use of my improvement a higher piston speed, and consequently greater capacity of the pump, is assured by the perfect lubrication and avoidance of friction by easy adjustment of packing.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. The method of lubricating the pistons of gas-compression pumps and recovering the gas escaping through the piston-rod orifice, consisting in maintaining a continuous independent and positively-forced flow of oil upward around the piston-rod within an open chamber of the stuffing-box, trapping the escaping gas therein, and carrying the said gas outward with and by means of said flow of oil, substantially as set forth.

2. The method of lubricating the piston-rods of gas-compression pumps and preventing the escape of gas through the stuffing-box, consisting in providing and maintaining a continuous independent and positively-forced flow of oil upward around the piston-rod within the stuffing-box from and to an external reservoir, thereby lubricating the piston-rod in its packing, and "trapping" the escaping gas therein by means of said oil and carrying the same outward, and finally separating the gas and oil in the return-passage to the oil-reservoir and returning the gas to the suction side of the pump, substantially as set forth.

3. In a gas-compression pump, the combination, with its stuffing-box and piston-rod, of

an annular oil-chamber surrounding the piston-rod within the stuffing-box, a supply and an exit pipe connecting said chamber, respectively, at the lower and upper parts with an oil-reservoir, an oil-reservoir so connected, an oil force-pump in the line of the supply-connection, and an oil-separator in the exit or return connection arranged to maintain a continuous positive flow of oil through said stuffing-box chamber, substantially as set forth.

4. In a gas-compression pump, in combination with its stuffing-box and piston-rod, a sleeve adapted to surround the rod within the stuffing-box, constructed with two annular concentric chambers, the outer one bounded outside by the stuffing-box and the inner one by the piston-rod, both chambers divided horizontally by a partition fitting the stuffing-box closely and shutting off communication between the two divisions of the outer chamber except through the inner chambers, substantially as set forth.

5. In a gas-compression pump, in combination with the stuffing-box and contained oil-sleeve, the oil-reservoir, supply and return pipes connecting said oil-sleeve medially with said reservoir, the oil-pump in the line of said supply-pipe, the sight-feed chamber in the line of the return-pipe, and the gas-separating chamber having a valved connection with the sight-feed chamber and communicating with the suction side of the pump, substantially as set forth.

6. In a gas-compression pump, the combination, with the oil-chamber within the stuffing-box, the independent oil-reservoir, the supply-pipe and its pump, and the return-pipe and its separator, of the gas-conduit provided with the perforated check-valve and extending from the gas-separator to the suction-pipe, substantially as set forth.

7. In a lubricating and gas-trapping apparatus of the character described, the combination of the oil-chamber, pipes E F, pump H, valves E' F', auxiliary hand-pump, valves E² F², oil-reservoir, gas-separator, sight-feed oil-passage, and sight-feed gas-passage, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WESLEY S. BREWER.

Witnesses:

L. M. HOSEA,
ELLA HOSEA.