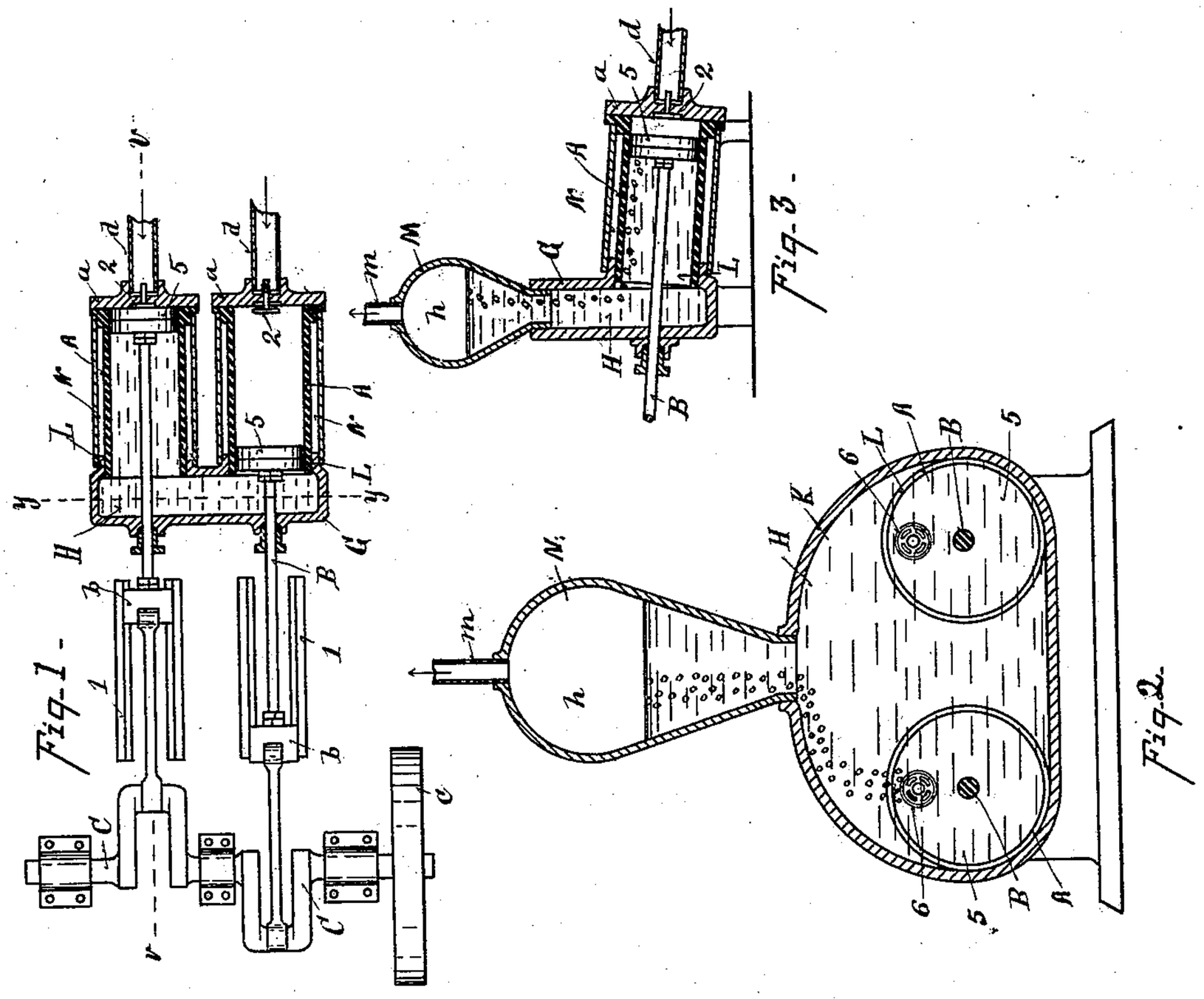
(No Model.)

# S. S. & C. W. MILES.

## COMPRESSION PUMP FOR REFRIGERATING APPARATUS.

No. 507,025. Patented Oct. 17, 1893.

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# UNITED STATES PATENT OFFICE.

STEPHEN S. MILES AND CASPER W. MILES, OF CINCINNATI, OHIO, ASSIGNORS OF ONE-THIRD TO LEMUEL WOOD, OF SAME PLACE.

## COMPRESSION-PUMP FOR REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 507,025, dated October 17, 1893.

Application filed January 27, 1892. Serial No. 419,460. (No model.)

*To all whom it may concern:*

Be it known that we, STEPHEN S. MILES and CASPER W. MILES, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Compression-Pumps for Refrigerating Apparatus, of which the following is a specification.

Our invention relates to ice or refrigerating machines. Its objects are, improved means for compressing the gas, and improved means for condensing the compressed gas, all of which will be fully set forth in the description of the accompanying drawings making a part of this specification, in which—

Figure 1 is a central horizontal section of our compressor. Fig. 2 is a section through the same on line *y*, *y*, Fig. 1. Fig. 3 is a vertical section on line *v*, *v*, Fig. 1.

The compressor preferably consists of single acting piston pumps which are advantageously combined to operate in a battery of two or more pumps in order to distribute the power to the several pumps as desired, and the strain evenly throughout the revolution of the driving shaft.

A represents the pump cylinders; B piston rods; *b* cross heads; 1 cross head guides; C the driving or crank shaft, and *c* the driving pulley.

*d* represents the intake pipes from the refrigerator.

Our compressor is preferably operated in connection with a body of liquid, preferably a heavy hydro-carbon oil, which serves to seal the joints and lubricate the working parts, and is so illustrated; it may, however, be advantageously operated with merely the amount of oil usually supplied to lubricate the working parts of ordinary machinery, as the capillary attraction of the liquid together with the motion of the pump will accomplish its proper distribution.

The manner of construction is as follows: G represents the tank or liquid chamber which is provided with flanged openings L. Into these flanged openings are screwed, or otherwise secured, the forward or open ends of the cylinders A, bringing the open mouths of the cylinders into connection with the tank G, the piston rods passing through and having their stuffing boxes secured to the opposite side of the tank G.

M represents a dome from which the gas passes on to the condensing pipes through outlet pipe *m*.

N represents water jackets surrounding the cylinders, for the purpose of keeping the pump cylinders and liquid of chamber G cool. The intake valves 2 are located in the heads *a* closing one end of the cylinders.

5 represent plungers in which are located exit valves 6. A space *h* is preferably reserved above the liquid in the dome M, which is occupied by a portion of the compressed gas thus keeping the liquid constantly under the elastic pressure of the gas.

The operation of our device is as follows: A limited amount of liquefied gas is allowed to expand in the refrigerator pipes. From the refrigerating pipes it is taken up by the pump at each forward stroke of the piston 5. Upon the return stroke of the piston the gas in the pump is compressed until it reaches a pressure sufficient to open the discharge valve 6 located in the piston head, and rises in bubbles through the liquid of the tank into the space *h*, from whence it passes to the condensing pipes to be cooled and liquefied in passing to the refrigerating coils. Thus, it will be observed that the liquid H retreats before and follows up the piston head in the cylinder at each reciprocation, and materially assists in the return stroke of the piston as it exerts a pressure against the piston head equal to the expansive pressure of the compressed gas in the space *h*. Thus, if the compressed gas in space *h* exerts a pressure of sixty pounds per square inch the piston making the forward stroke has to overcome this pressure but the piston making the return stroke receives at the commencement of its stroke an equal pressure assisting its return stroke, which pressure is gradually counterbalanced by the compression of the gas in the pump until the gas in the pump reaches a pressure sufficient to discharge the gas from the pump into the chamber G.

A single pump might be used allowing the height of the liquid to rise and fall with each stroke of the pump, but we prefer to have two or more pumps operating simultaneously

in the same tank, as they may thus be arranged so as to alternately take up the liquid discharged from the other cylinder and thus maintain a constant height of liquid in the tank; also as the work performed by the driving shaft is confined principally to the forward stroke of the pump and by using two or more pumps the work is evenly distributed over the whole revolution of the shaft, and we are thus enabled to utilize the back pressure exerted on the shaft on the return stroke of one piston to assist in the forward movement of the other, thereby economizing power. Further advantages are obtained by the liquid H, namely, first, it serves to keep the pump from becoming over heated, so that a soft elastic piston packing may be employed; second, the piston stuffing box is packed against a liquid instead of a gas as is usually done which avoids the usual leakage at that point; or, if only a small amount of oil is used enough is supplied to the piston stuffing box by capillary attraction, and the action of the piston to seal it against the escape of gas; third, it serves to automatically lubricate all of the working parts; fourth, it seals all the joints; fifth, by providing the space *h* and tapping it with the discharge pipe we avoid discharging the oil into the system of pipes; sixth, it assists in condensing the gas or removing the heat therefrom as the gas bubbles up through the liquid. For this purpose the tank G, may also if desired, be surrounded by a water jacket.

Having described our invention, what we claim is—

In a refrigerating machine, the combination of the open mouthed pump cylinders A, intake valves 2 located at the closed end of said cylinders, water jacket N inclosing said cylinders, reciprocating plungers 5 exit valves 6 located in the plungers and a liquid lubricant chamber G inclosing the open ends of said cylinders substantially as specified.

In testimony whereof we have hereunto set our hands.

STEPHEN S. MILES.
CASPER W. MILES.

Witnesses:
E. E. WOOD,
GEO. ASHTON.