(No Model.)

L. BLOCK.

REFRIGERATING MACHINE.

No. 487,706. Patented Dec. 13, 1892.

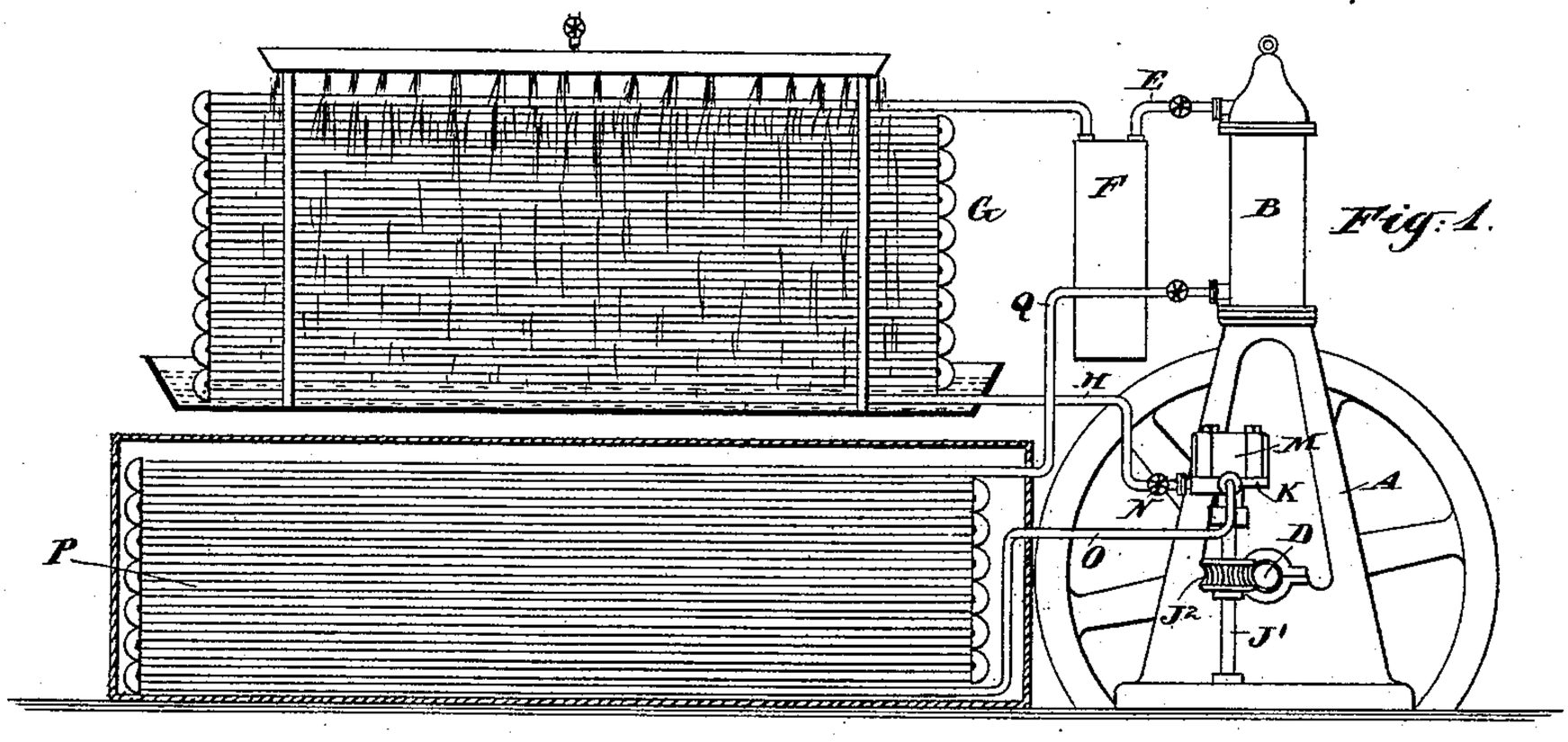


Fig: 1.

Fig: 2.

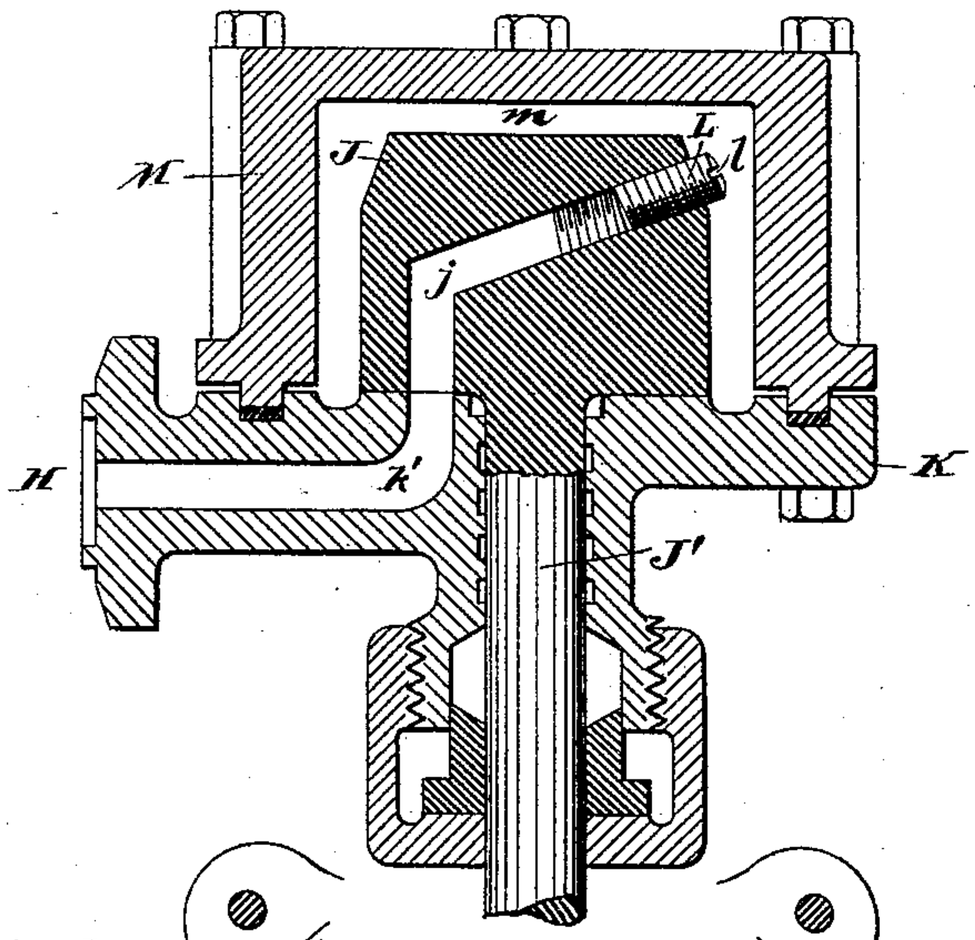


Fig: 4.

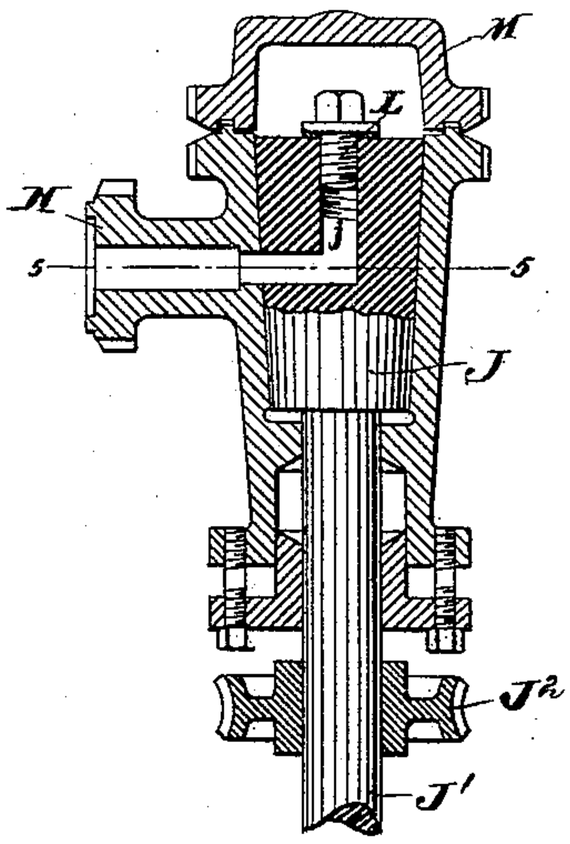


Fig: 3.

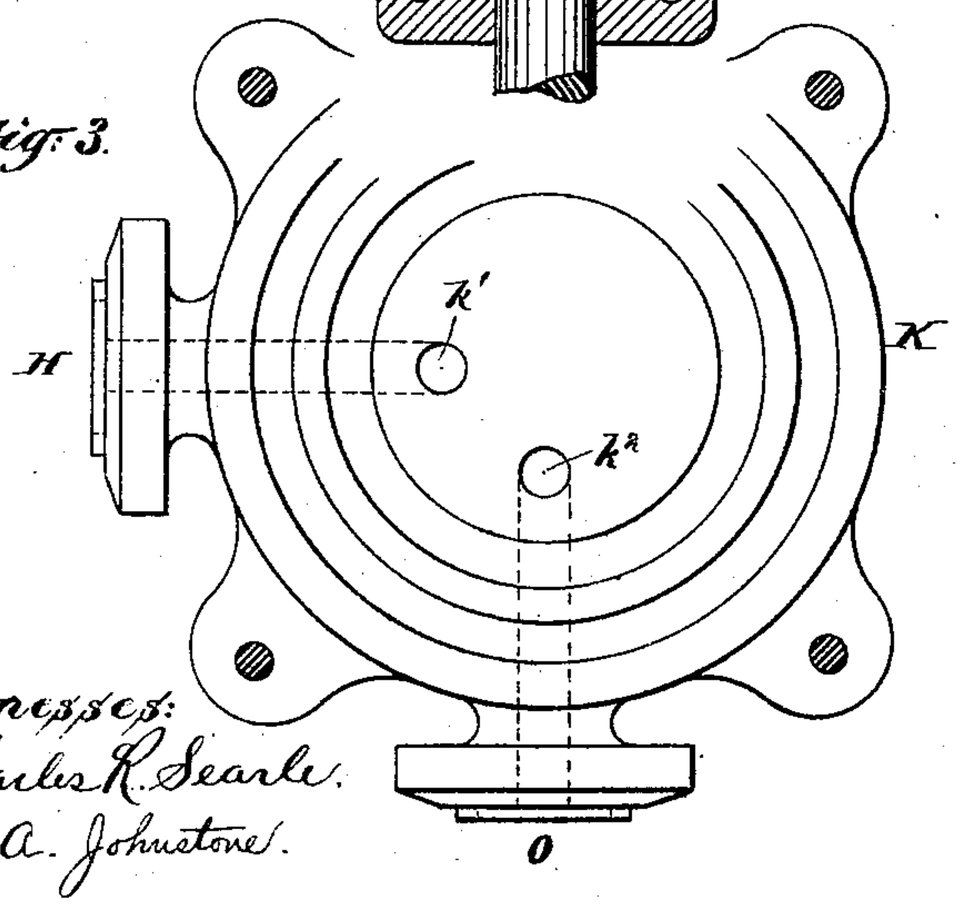
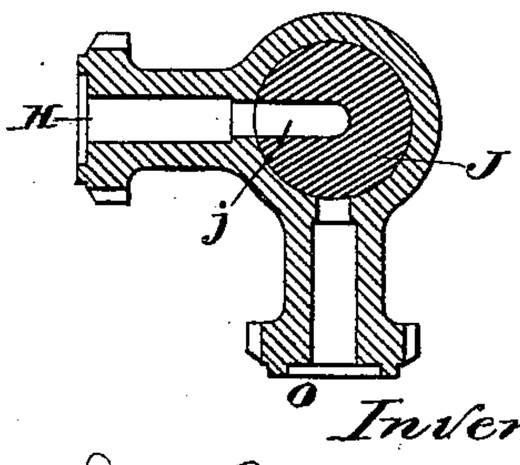


Fig: 5.



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UNITED STATES PATENT OFFICE.

LOUIS BLOCK, OF NEW YORK, N. Y.

REFRIGERATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 487,706, dated December 13, 1892.

Application filed July 11, 1892. Serial No. 439,594. (No model.)

To all whom it may concern:

Be it known that I, LOUIS BLOCK, a citizen of the United States, residing in the city and county of New York, in the State of New York, have invented a certain new and useful Improvement in Refrigerating Apparatus, of which the following is a specification.

The improvement relates to the provisions for transferring the refrigerating medium from the condenser-coils to the expansion-coils. I use ammonia or analogous volatile liquid as the refrigerating medium, reducing it to the liquid form by cooling under pressure and transferring it from the condenser-coils into the expansion or evaporating coils by alternately filling and emptying a cavity in a moving valve. I provide for holding the valve to its seat by the pressure of the fluid itself and cause the pressure to be automatically adjusted. I provide for varying the capacity of the cavity as may be required from time to time.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a general side elevation of the entire apparatus, and Fig. 2 is a vertical section of a portion on a larger scale. Fig. 3 is a plan view corresponding to Fig. 2 with the cover and valve removed. Figs. 4 and 5 show a modification. Fig. 4 is a vertical section, and Fig. 5 a horizontal section on the line 5 5 in Fig. 4.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

B is an upright compressor, which may be of any ordinary or suitable form, mounted on a framing A and operated by a cranked shaft D, which is steadied by a fly-wheel and rotated by means of a steam-engine or other suitable power. (Not shown.) The ammonia is delivered in the gaseous form through the pipe E and separator F into the condenser-coils G, where it is subjected to a shower of cold water which lowers its temperature, and it is delivered therefrom at intervals in measured quantities into the pipe O, connected with the evaporating-coils P, in which it develops the cold, and is ultimately delivered therefrom through a pipe Q into the compressor B to be compressed and again passed around.

My improvement operates by means of a valve J, having an operating-shaft J′ and a worm-wheel J^2, the latter being operated by a worm on the main shaft D. The valve J has a cavity *j*. The fixed base K, with which the valve makes a tight and easy contact, is provided with two passages k' k^2, to which the cavity *j* in the valve J is alternately presented. The passage k' connects with the pipe H, bringing liquid ammonia at a high pressure from the condenser. The passage k^2 connects with the pipe O, leading to the evaporating-coils P, in which a low pressure obtains. When the cavity *j* is presented to the passage k', the cavity is filled with liquid ammonia. When by the rotation of the valve J, due to the engagement of the worm on the main shaft D with the worm-wheel J^2, the cavity *j* is carried away from the passage k', the cavity remains filled with the liquid ammonia. When by the continued rotation of the valve J this cavity *j* is presented to the passage k^2, the liquid ammonia in the cavity *j* is at once liberated and is allowed to flow through the pipe O into the evaporating-coils P. The ammonia performs such movement with great promptness, due partly to the action of gravity, but more to the tendency of the liquid ammonia to assume a gaseous form the instant it is relieved from pressure. So soon as the cavity *j* comes into communication with the passage k^2, the ammonia in the cavity *j* is relieved from pressure and a portion of it assumes a vaporous or gaseous form. Its expansion drives out the ammonia, which still remains in the liquid condition, transferring into the pipe O, and thus into the evaporating-coils P, all except a thin vapor of ammonia, which remains, filling the cavity *j*. The cavity *j* in the valve J extends upward in an inclined direction through the valve. Its upper portion is screw-threaded and receives a screw L, the outer end of which is scored across, as indicated at *l*, adapted to receive a screw-driver, by which the screw may be operated to turn it in one direction or the other. Turning it in one direction forces in the screw and diminishes the capacity of the cavity *j*. Turning it in the opposite direction partially withdraws the screw and increases

such cavity. The measure of ammonia transferred at each presentation of the cavity *j* alternately to the two passages *k' k²* may be very greatly reduced by turning the screw inward to its fullest extent, or it may be considerably increased by turning such screw in the opposite direction, so as to partially withdraw it from the cavity. When the screw is thus set farther inward, the quantity of ammonia transferred at each revolution of the valve J from the pipe H to the pipe O, and consequently from the condenser G to the evaporator P, is reduced. When the screw is adjusted outward, the quantity thus transferred at each revolution is increased. The lower face of the valve J fits nicely on the adjacent surface of the base K when the valve is pressed gently down upon the latter; but the shaft J' is capable of a slight end movement, so that the valve J may rise a little above its seat on the base K when required.

M is a strong cover, which matches tightly on the base K and forms a chamber *m*, which covers the valve J. On first starting the machine the chamber *m* only contains air at ordinary pressure. The liquid ammonia at the pressure of, say, one hundred and fifty pounds per square inch, received through the passage *k'*, lifts the valve slightly from its seat on the base K, and the chamber *m* is filled with ammonia. The pressure thus increased in the chamber forces the valve to its seat on the base K and it operates tightly thereafter. Whenever through leakage or other cause the pressure in the chamber *m* becomes insufficient and the valve J rises a little, more ammonia will escape from the high-pressure passage *k'* and add to the pressure in the chamber *m*, and thus again force the valve to its seat.

When it is desired to reduce the quantity of ammonia transferred at each revolution of the valve J, the cock N is closed, the cover removed, and the screw L turned inward to the required amount and the parts again replaced. If it be desired to increase the amount of ammonia transferred at each revolution, the screw is thus turned outward.

Modifications may be made in the details without departing from the principle or sacrificing the advantages of the invention. I prefer to make the bearing-surface of the valve plane and the adjacent surface of the base K correspondingly plane; but either surface can be made conical or domed, the other being correspondingly formed to make a tight and easy engagement therewith.

Figs. 4 and 5 show a modification in which the bearing-surface is very greatly coned—made almost cylindrical. These figures show, also, a modification by providing the screw corresponding to L as formed with a large collar having a nicely-finished under face, which when the screw is forced home makes a gas-tight contact with the adjacent surface of the valve. In order to make available the tightness of such contact, when a change in the capacity of the cavity *j* is required, it is necessary to remove the screw previously introduced and insert another longer or shorter one having a corresponding collar.

The form of the invention shown in Figs. 4 and 5 may be worked with the shaft arranged horizontally, so that the view in Fig. 4 would be a plan view instead of a vertical section. The screw L, having a collar, as shown, and requiring to be exchanged bodily in order to vary the capacity of the cavity, may be used with the form of the valve shown in the principal Figs. 1, 2, and 3, if desired.

I claim as my invention—

1. As a means for introducing liquefied refrigerant in measured quantities into the evaporating-coils of a refrigerating apparatus, the valve J, having a cavity *j*, in combination with a base K, having two widely-separated ports *k' k²*, and means, as the shaft J' and worm-wheel J², for moving the said valve so that the cavity *j* is presented alternately to each of the said ports, and with a cover M, inclosing the said valve loosely in a gas-tight chamber *m*, the valve being adapted to lift from its seat when subjected to an excess of pressure from below, so as to allow gas to flow into the chamber and induce a pressure therein, holding the valve gently to its seat, all arranged for joint operation, substantially as herein specified.

2. As a means for introducing liquefied refrigerant in measured quantities into the evaporating-coils of a refrigerating apparatus, the valve J, having a cavity *j*, in combination with a base K, having two widely-separated ports *k' k²*, and means, as the shaft J' and worm-wheel J², for moving the said valve so that the cavity is presented alternately to each of the said ports, and with a device, as the screw L, for varying the capacity of the cavity as may be required, all substantially as and for the purposes herein specified.

3. As a means for introducing liquefied refrigerant in measured quantities into the evaporating-coils of a refrigerating apparatus, the valve J, arranged to rise a little from its seat and having a cavity *j*, in combination with the screw L, adapted to vary the capacity of such cavity, and with the inclosing casing M, leaving a chamber *m*, in which the gas is by the rise of the valve allowed to accumulate to a sufficient pressure to afterward hold the valve to its seat, all arranged for joint operation, substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

LOUIS BLOCK.

Witnesses:
H. A. JOHNSTONE,
M. F. BOYLE.