

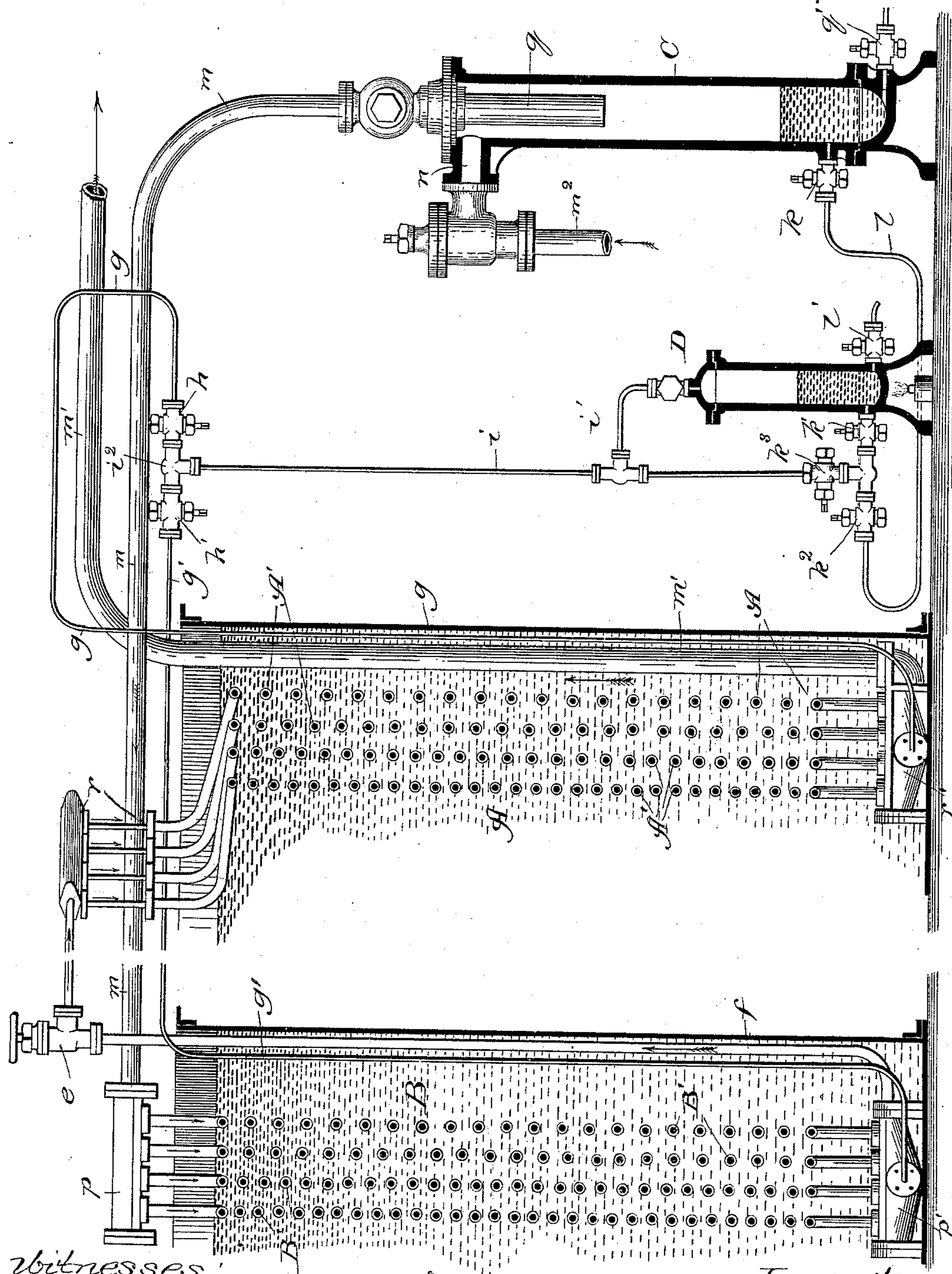
(No Model.)

F. W. WOLF.

OIL EXTRACTING AND GAS SAVING APPARATUS FOR ICE OR
REFRIGERATING MACHINES.

No. 405,451.

Patented June 18, 1889.



Witnesses:
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UNITED STATES PATENT OFFICE.

FREDERICK W. WOLF, OF CHICAGO, ILLINOIS.

OIL-EXTRACTING AND GAS-SAVING APPARATUS FOR ICE OR REFRIGERATING MACHINES.

SPECIFICATION forming part of Letters Patent No. 405,451, dated June 18, 1889.

Application filed December 2, 1887. Serial No. 256,767. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. WOLF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Oil-Extracting and Gas-Saving Apparatus for Ice or Refrigerating Machines, of which the following is a specification.

My invention relates to an improvement in the class of ice or refrigerating machines in which the expansive quality of a gas is utilized to abstract the heat from a surrounding object and produce cold. The class of machines referred to commonly comprise, broadly stated, as essential parts, a refrigerator in the form of a tank containing one or more metal coils, surrounded with the object to be cooled—such as brine—when the cooling effect is to be produced by forcing the brine or other cooling agent through coils in the apartments or inclosures the temperature of which is to be affected, or not so surrounded when the cold is produced by the expansion of the gas itself through the coils in the apartments or inclosures; a condenser, also in the form of a tank, containing one or more coils to correspond with the number in the refrigerator, with which they are connected at corresponding ends and subjected to the cooling effect of running water, and a gas compressor or pump communicating with the refrigerator and condenser at the coils thereof from the ends of the latter opposite those already referred to as being connected together.

The operation of the machine produces a continuous circulation of the gas, which is allowed to expand through the refrigerator, and is then forced by the action of the pump into the condenser, where it is deprived of the latent heat, of the heat of compression, and of that absorbed by its expansion in the refrigerator, into which it is again introduced to produce the effect of its expansive property.

The gas employed, whatever it may be, (I use anhydrous ammonia) is more or less expensive, and it is therefore desirable to save it, since the expense of running the machine is reduced to the extent of the saving afforded by preventing the waste of gas. One, and perhaps the most usual, source of waste

against which it is desirable to provide precautionary means is the lubricant, which, in its access to various parts of the machine, becomes mixed with the gas, so that when the lubricant is accumulated or collected—as, of course, it should be after having performed its function of lubrication—in a suitable extraneous receptacle properly communicating for the purpose with the machine, it may be drawn off at intervals, between which the gas with which it is impregnated may free itself and be allowed to re-enter the course of circulation. The lubricant itself is also frequently a source of trouble, since by its contact with expanding gas a refrigerating effect is produced upon the oil sufficient at least to stiffen it to an extent which impedes its flow, whereby it accumulates or collects at points and produces obstruction and impairs conductivity. In the particular machine manufactured by me (the so-called “Linde” machine, for which Reissued Letters Patent No. 10,522 were granted on the 16th day of September, 1884, and for use with which, particularly, I have invented the improvement forming the subject of the present application) this tendency to obstruction by the lubricating-oil is less than ordinary, since means are provided in the construction of the machine to confine the lubricating medium to the stuffing-boxes of the compressor, the gas being relied upon for lubricating other parts; but, notwithstanding every possible precaution to the contrary, some oil will enter the compressor-pump, rendering necessary means for separating from it, when accumulated in the receptacle provided to receive the waste oil, and saving the gas with which it becomes impregnated.

My invention has for its principal objects the provision of an oil-extracting mechanism of a construction and having a relation to the machine which will permit the oil to be taken at will from any part of the machine at which it collects, and drawn off, and which shall permit the saving of gas mixed with the lubricant.

To this end my invention consists in the general construction of my improved apparatus, and it also consists in details of construction and combinations of parts.

The accompanying drawing presents a broken and partly-sectional diagrammatic

view of an ice or refrigerating machine in which the compressor is omitted, and provided with my improvement.

A is the refrigerator, containing metal coils A', all of which terminate at opposite ends, respectively, in manifolds or "headers" r and r' .

B is the condenser, containing coils B', terminating at opposite ends, respectively, in manifolds or headers p and p' .

C is an oil-trap having a discharge-cock q' , and from the upper end of which extends downward an interior pipe q . The pipe q extends across a lateral inlet-opening n near the top of the oil-trap, through which the latter communicates controllably, as shown, with the compressor, (not shown,) an arrow indicating the direction of pressure to be from the compressor to the trap. A pipe or conduit m affords communication, controllable through the medium of suitable valve mechanism, between the oil-trap C from its upper end and the manifold p of the condenser, and a similar pipe or conduit m' , forming the induction-pipe, leads from the manifold r' of the refrigerator to the compressor, the course of flow being indicated by arrows, and the eduction-pipe m^2 leads from the compressor to the trap C at the inlet n .

D is an oil-extractor provided near its lower end with a lateral discharge-cock l' , and communicating from near its base, through a pipe l , with the oil-trap C, adjacent to which it is provided with a cock k , and having two cocks k' and k^2 near the oil-extractor D. From the pipe l , between the cocks k' and k^2 , extends a pipe, i , provided with a cock k^3 , and communicating controllably, through a branch pipe i' , with the oil-extractor at the top of the latter. The upper end of the pipe i enters a T i^2 , (as at the opposite end of the pipe i), having cocks h and h' , respectively, at its opposite extremities, from the former of which leads a pipe g to the manifold r' , and from the latter a pipe g' to the manifold p' , and the last-named manifold has communication, through a pipe f , with the manifold r , adjacent to which is a regulating-valve e , to regulate the flow of liquid ammonia from the condenser into the refrigerator.

The manifolds p' and r' are of peculiar construction as to their bases, which are synclinal, and the pipes f and g communicate with those manifolds at the lowest parts of the latter.

The operation is as follows: The compressor operates in the usual way for the ordinary purpose—namely, of circulating the gas (ammonia) from the refrigerator by way of the pipes m' m^2 , oil-trap C, and pipe m through the condenser, wherein it is liquefied and at a certain pressure—say one hundred and fifty pounds—and thence by way of the pipe f through the refrigerator, wherein it expands and is sucked through the pipe m' , as aforesaid. Whatever lubricating-oil may be circulated with the gas enters with the latter

the oil-trap C and trickles down the inner surface of the oil-trap and the outer surface of the pipe q , against which the flow entering by way of the passage n is directed, the gas, or the larger part of it, disengaging itself from the oil and passing upward through the pipes q and m into the condenser through the manifold p , while the oil drops by its own gravity into the oil-trap C, whence it may, if desired, be drawn off at intervals through the cock q' . That portion of the lubricating-oil which does not make the circuit will tend to lodge at the lowest points—namely, in the manifolds p' and r' , from the former of which it may, on opening the cock h' and the cocks k' and k^3 , or, instead of the last named, that in the branch pipe i' , be forced by the pressure in the condenser into the oil-extractor D, and from the latter of which it may be caused to enter the oil-extractor on opening the cock h and the necessary one or ones to admit it into the oil-extractor, the pressure in the refrigerator-coils being raised for the purpose by opening the regulating-valve e sufficiently far. At intervals, during which the oil and gas will have separated, owing to the specific gravity of the former and volatile nature of the latter, the oil may be drawn off at the cock l' and discarded as having performed its function, and the gas admitted through the branch pipe i' , and pipes i and g into the refrigerator at the manifold r' .

It is not usual nor advisable to draw the oil from the trap C directly through the cock q' , since thereby gas mechanically confined in the oil may be lost. The better plan is to allow the contents of the trap C (at proper intervals, during which the greater portion of the gas mixed with the oil when first introduced will have separated itself and may have been released through the pipe m) to pass by way of the pipe l into the extractor D, after which the cock k in the pipe l is closed and the extractor D left wholly cut off from the machine for a sufficient time to allow the mixed oil and gas therein to separate, the oil settling toward the bottom and the gas rising to the top. When this separation has taken place, the cock in the pipe i' and the cock h are opened, allowing the gas to re-enter the circuit by way of the manifold r' , for which purpose a vacuum is preferably first formed in the refrigerator, (by closing the regulating-valve e and then stopping the machine or not, as desired.) When the flow of gas toward the manifold r' has ceased, the cocks last named are shut, and the separated waste oil in the oil-extractor D is drawn off by way of cock l' . The separation of the oil and gas in the oil-extractor may be accelerated by applying heat to the latter either by means of a spirit-lamp, as indicated in the drawing, or by a steam-pipe, or any other suitable means.

From the foregoing description it will be seen that the oil-extractor D is made the objective point of all oil which accumulates in any portion of the machine, and affords a

convenient agent for separating from it any gas which it may carry and returning the separated gas to the circuit, while permitting the oil to be drawn off into the open air and used over again, if desired.

In the Linde machine referred to, in which no oil enters the compressor except such as is unavoidably carried in from the stuffing-box by the mechanical action of the piston-rod, I find it advisable to draw off the oil from the trap C by way of the extractor D about once in twenty-four hours, though the intervals may be increased or diminished in length, depending upon the rapidity of accumulation in the trap C, which is easily ascertained. When the mingled oil and gas from the trap C has been allowed to enter the oil-extractor, (which is, as will be understood, entirely shut off from the machine while the separation is taking place within it) from half an hour to an hour should be allowed for the separation before the cocks are opened to permit the return of gas to the circuit. The outlet-cocks for the gas should, of course, be closed before the oil is drawn out of the extractor D at *l'*.

In machines other than the Linde the particular mode of use will readily suggest itself to persons skilled in the use of such machines.

As will be seen by my improved apparatus, the gas may escape through the same channels by way of which the mixture of oil and gas are introduced.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an ice or refrigerating machine having an oil-trap C, communicating with the compressor and condenser, a gas-saving and oil-extracting apparatus D, controllably communicating directly with the oil-trap C and the condenser and refrigerator, and provided with a suitable cock through which to withdraw out of the machine the accumulated oil, substantially as described.

2. In an ice or refrigerating machine, the combination, with the compressor, of an oil-trap C, communicating with the discharge end of the compressor, a condenser B, commu-

nicating with the oil-trap, a refrigerator A, communicating with the condenser and with the suction end of the compressor, and a gas-saving and oil-extracting apparatus D, communicating directly and controllably with the oil-trap C and with the condenser and refrigerator, near the lower ends thereof, and provided with a suitable cock through which to withdraw out of the machine the accumulated oil, substantially as described.

3. In an ice or refrigerating machine, the combination, with the compressor, of an oil-trap C, communicating with the discharge end of the compressor, a condenser B, communicating with the oil-trap and provided at its lower end with a synclinal manifold *p'*, a refrigerator A, communicating with the condenser and with the suction end of the compressor, and provided at its lower end with a synclinal manifold *r'*, and a gas-saving and oil-extracting apparatus D, communicating directly and controllably with the oil-trap C and with the manifolds *p'* and *r'*, and provided with a suitable cock through which to withdraw out of the machine the accumulated oil, substantially as described.

4. In an ice or refrigerating machine, the combination, with the compressor, of an oil-trap C, communicating with the discharge end of the compressor, a condenser B, communicating with the oil-trap, a refrigerator A, communicating with the condenser and with the suction end of the compressor, a gas-saving and oil-extracting apparatus D, having a discharge-outlet *l'*, pipes *g* and *g'*, leading, respectively, from the lower ends of the refrigerator and condenser, a pipe *i*, communicating at one end, controllably, with the pipes *g* and *g'* and toward its opposite end with the device D, and a pipe *l*, affording communication between the oil-trap C and device D, near their bases, substantially as described.

FREDERICK W. WOLF.

In presence of—

J. W. DRYENFORTH,
CHAS. E. GAYLORD.