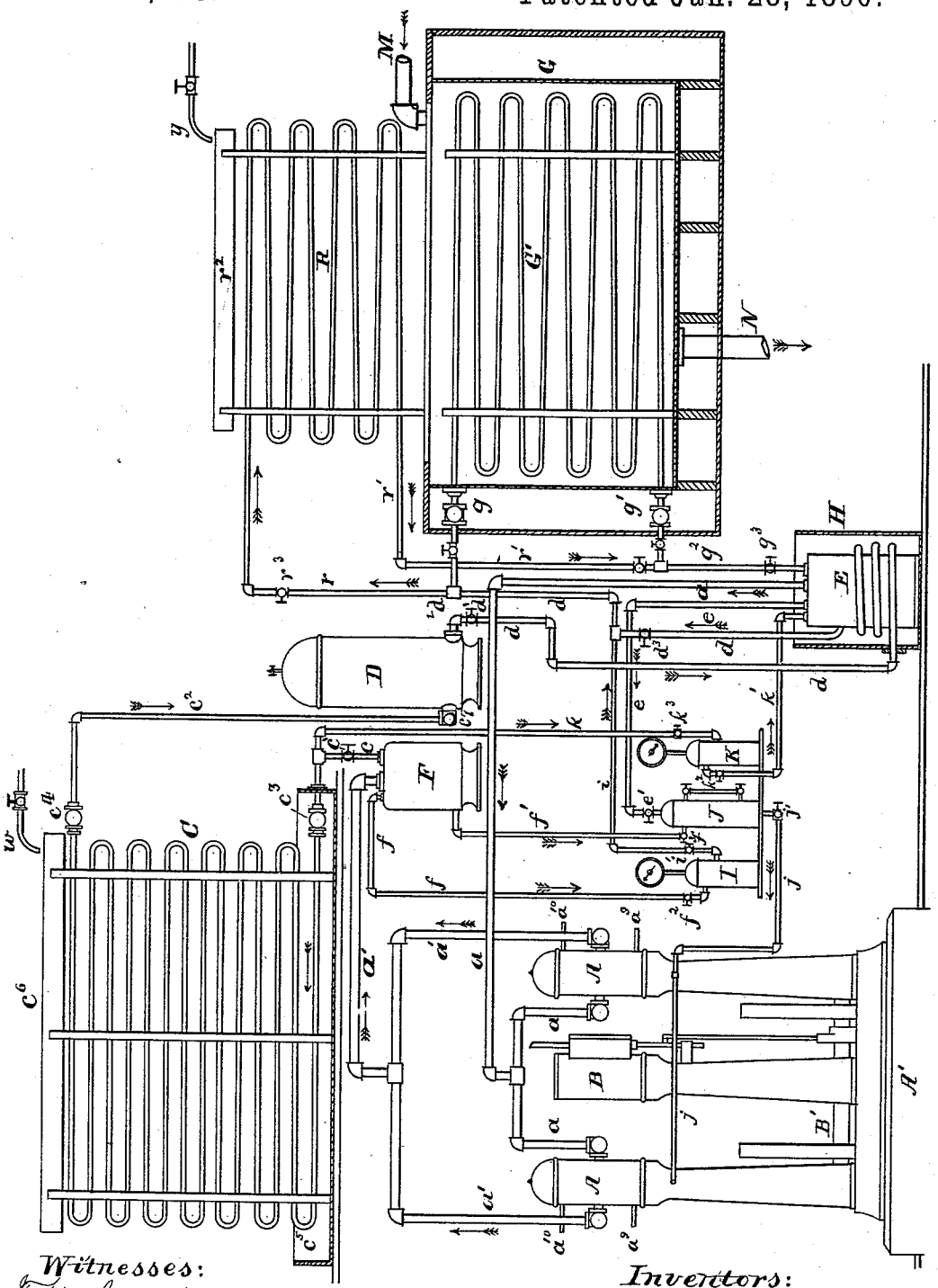
(No Model.)

# J. L. CLARK, C. H. CULVER & J. H. STRATTON.

## REFRIGERATING MACHINE.

No. 420,188. Patented Jan. 28, 1890.

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# UNITED STATES PATENT OFFICE.

JOSHUA L. CLARK, OF PITTSBURG, PENNSYLVANIA, AND CHARLES H. CULVER AND JAMES H. STRATTON, OF AKRON, OHIO.

## REFRIGERATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 420,188, dated January 28, 1890.

Application filed December 27, 1888. Serial No. 294,743. (No model.)

*To all whom it may concern:*

Be it known that we, JOSHUA L. CLARK, CHARLES H. CULVER, and JAMES H. STRATTON, citizens of the United States, residing, respectively, the first at Pittsburg, in the county of Allegheny and State of Pennsylvania, and the others at Akron, in the county of Summit and State of Ohio, have invented a certain new and useful Refrigerating-Machine, of which the following is a specification.

Our invention has relation to improvements in that class of refrigerating-machines in which the low temperature is secured by expanding through suitable machinery a volatile liquid, as anhydrous ammonia, into a gas.

The objects of our invention are to provide a more perfect and complete apparatus for securing the desired effect than those now employed to utilize on different parts of the apparatus to cool the volatile liquid the low temperature now wasted, to provide devices for transferring and storing the ammonia-ether in the condenser or the brine-tank coil in case of accident to one, or when it is desired to make repairs upon either, and to provide an auxiliary brine-cooling device.

Our invention consists in the construction and arrangement of the parts hereinafter described, and specifically pointed out in the claims, reference being had to the accompanying drawings, forming part of this specification.

In the accompanying drawing, in which similar letters of reference indicate like parts, the figure is a diagram of our improved refrigerating-machine, showing the location and arrangement of the various parts and their pipe-connections.

The apparatus shown in the figure represents what is known as the "indirect system," in which the cold is communicated, primarily, to a brine which is circulated through the chambers to be cooled, but is equally applicable to the direct system, in which the expansion-coils themselves enter the cooling-chamber.

In our invention there are certain features common in other refrigerating-machines of this class, which, except in the matter of form, construction, and pipe-connections, do not differ materially from other machines of the same class. These are a compression-pump operated by an engine or other motor, an oil-trap intermediate the pump and the condenser, a condensing-coil where the condensed vapor is cooled and liquefied, a storage-tank for the volatile liquid, a tank and expansion-coil where the brine is cooled, and a trap to receive the vapor and liquid from the expansion-coil.

In the accompanying drawing, A A are the compression-pumps mounted on a base A′ and operated by an engine B.

F is the oil-trap; C, the condenser; D, the ammonia-storage tank; G, the brine-tank inclosing the coil G′, and E the brine-tank trap.

The compression-pump may be of any desired form of construction, but is preferably of the form indicated in the accompanying drawing, a detailed description of which is, however, omitted here, as its construction and arrangement are reserved from this application to constitute the subject of a separate application. The vapor is drawn into the pumps through the suction-pipes $a$ and discharged through the pipes $a'$, in each of which near the cylinder are globe-valves, (not lettered,) so that either may be shut off. The compressed vapor passes through the pipe $a'$ primarily to the oil-trap F, which consists of a closed cylindrical vessel provided with exit-pipes $c\,f\,f'$ and the induction-pipe $a'$. From the trap F the ammonia passes through the pipe $c$ into the condenser C, where it is cooled, and thence through the pipe $c''$ into the ammonia-storage tank D.

The condenser C consists of a series of coils of pipe connected at opposite ends with headers $c^3$ $c^4$ and resting in and above a tank $c^5$, and having above them a perforated trough $c^6$, from which cold water, delivered by a pipe $w$, is sprayed over them. From the tank D the ammonia passes through the pipe $d$, provided with the cock $d'$, into the expansion-coils G′ of the brine-tank G. This coil is constructed similarly to the condenser-coil C, the coils being connected at opposite ends

with headers $g$ $g'$, and in it the ammonia expands into a vapor or gas, which in turn passes by the pipe $g''$ to the trap E, whence it is drawn back to the pumps A by the pipe $a$. Thus far, except in the details of construction hereinbefore mentioned and hereinafter claimed, our machine does not differ materially from other machines heretofore made.

When the brine returned is unusually hot, as from a "bandelot," we employ an auxiliary coil R above the brine-tank G, into which the ammonia passes from the pipe $d$ through a T-joint $d''$ and pipe $r$, and is returned through the pipe $r'$ into the pipe $g^2$ and trap E. Above the coil R is a perforated trough $r''$, into which the hot brine is conveyed by a tube Y, and from which it flows in a spray over the coil R into the tank G.

The trap E in machines of this class is rendered cold by the gas returning from the expansion-coil G', and is constantly coated with frost and exposed to the air. To utilize this cold, which is otherwise lost, we place this trap in a tank H, filled with brine, into which the pipe $d$ enters and is coiled about the trap E, by which arrangement the ammonia contained in it is additionally cooled. For the purpose of storing the ammonia in either the condenser-coils or the brine-tank coils when the other shall need repairs, or for any other purpose, we use two traps I K, each provided with a gage, the former to indicate the pressure in the trap F and the latter the pressure in the trap E. The trap I is connected with the trap F by a pipe $f$, having a valve $f''$, and with the pipe $d$ by a pipe $i$, in which is a valve $i'$. The trap K is connected with the pipe $c$ and with the trap E by the pipes $k$ $k'$, respectively, the former being provided with a valve $k^3$ and the latter with a valve $k''$, by which they may be closed.

When the machine is in operation, the valves $i'$ $k^3$ are closed, so that the traps I K are connected only with the traps F E, respectively. When it is desired to remove the ammonia from the condenser C and store it in the brine-tank coil, we close the valves $c'$, $c^7$, $g$, $r^3$, and $e'$ and open the valves $i'$ and $k^3$. By this arrangement the ammonia is drawn from the condenser C through the pipe $k$, trap K, pipe $k'$, trap E, and pipe $a$ to the pumps A, and thence delivered through the pipe $a'$, trap F, pipe $f$, trap I, pipes $i$ and $d$ into the coil G'.

If at any time repairs are needed on the brine-tank coil G', it is freed from the ammonia by closing the valve $d'$ and afterward the valve $g^3$, when the ammonia has been drawn out, by which arrangement the ammonia is stored in the condenser C and tank D.

We claim as our invention—

1. The combination, in a refrigerating-machine, with a trap intermediate of and connected with the expansion-coils and the compression-pump to receive the refrigerating-gas in its passage from the former to the latter, of a tank to contain non-congealable liquid surrounding said trap, and a pipe connecting the storage-tank and expansion-coil to convey volatile liquid from the former to the latter, having a portion located in said tank, substantially as shown and described, and for the purpose specified.

2. In a refrigerating apparatus of the kind specified, the combination, with the compression-pump, condenser, and refrigerating-coil, of two auxiliary traps, one connected with the conveyer between the compression-pump and condenser and with the pipe to convey volatile liquid to the refrigerating-coil, and the other connected with the conveyer to return the refrigerating-gas to the pump, and with the condenser, said connections being provided with valves by which they may be closed, substantially as shown and described, and for the purpose specified.

In testimony that we claim the above we hereunto set our hands.

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