

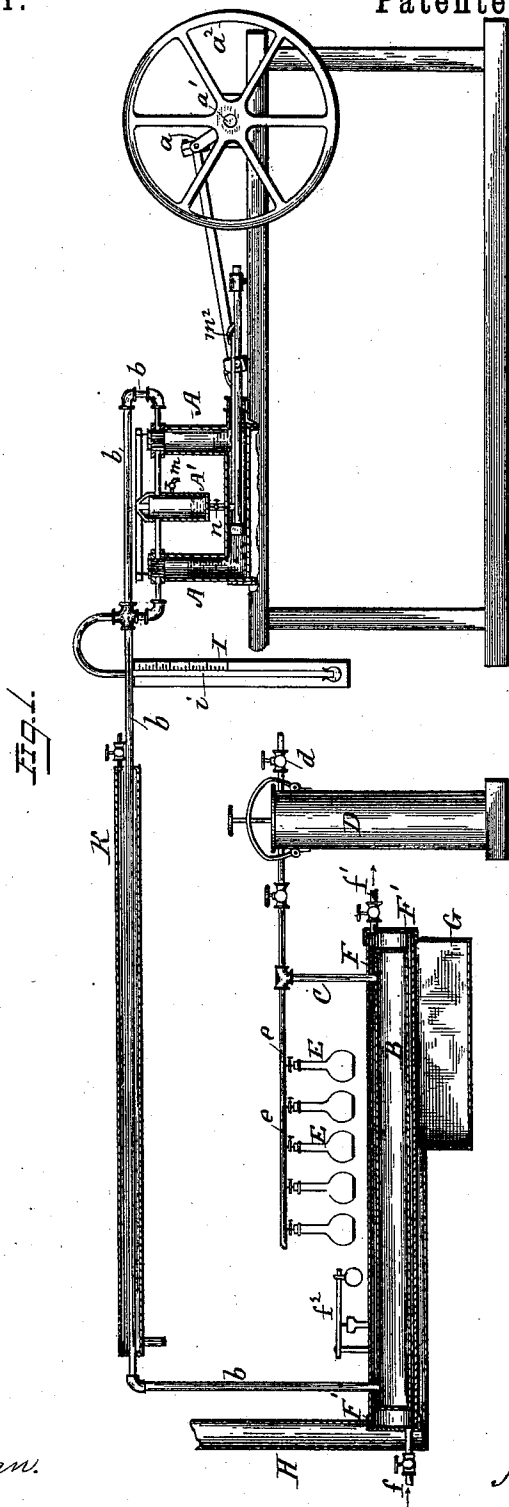
(No Model.)

2 Sheets—Sheet 1.

A. CONACHER.
REFRIGERATING MACHINE.

No. 352,041.

Patented Nov. 2, 1886.



Witnesses:

E. C. Mordeman.

W. B. Masson.

Inventor

Alexander Conacher

by E. E. Masson
atty.

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UNITED STATES PATENT OFFICE.

ALEXANDER CONACHER, OF AUGUSTA, GEORGIA.

REFRIGERATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 352,041, dated November 2, 1886.

Application filed April 23, 1886. Serial No. 199,918. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER CONACHER, a citizen of Great Britain, residing at Augusta, in the county of Richmond, State of Georgia, have invented certain new and useful Improvements in Refrigerating-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to a machine for producing artificial ice or cold air by means of sulphuric acid or other analogous liquid having great affinity for water or its vapor, and its objects are to improve the construction and operation of the machine; and to these ends it consists in certain novel features, which will be hereinafter described, and then specifically pointed out in the claims.

In the drawings, Figure 1 represents a side view of a refrigerating-machine constructed in accordance with my invention, with some of the parts in longitudinal vertical section. Fig. 2 is a longitudinal vertical section of the pump. Fig. 3 is a horizontal section of the pump. Fig. 4 is a side view of the tripping-rod.

The apparatus consists of a double-acting pump, A, substantially as shown in patents granted to me February 1, 1881, No. 237,251, and No. 317,629, granted to me May 12, 1885. The piston of this pump A is operated by the crank *a* upon the shaft *a'*, carrying the fly-wheel *a''*. Into the body of the pump there is introduced through the trap-cylinder A' a charge of mercury, of petroleum-oil, or of any other liquid that will not throw off any material amount of vapor under a vacuum at ordinary atmospheric temperature. The suction-pipes of the pump are connected by means of pipes *b b* with a large horizontal iron pipe or cylinder, B, that is lined with lead and charged about two-thirds full with sulphuric acid of 60° density. A pipe, C, leads from the top of the cylinder B into the upper end of a sheet-iron tank, D, and a branch of said pipe has a series of spouts entering the neck of a series of water-bottles or carafes, E, and communication with either one or all of which is effected by means of cocks *e* upon the above-stated spouts, or upon the pipes connecting them with cylinder B. This cylinder B is inclosed in an iron cylinder, F, of sufficient diameter and length to inclose the

cylinder B and leave space for water to surround the last-named cylinder, and said cylinder has caps F' secured on both ends, and the latter are provided with pipes *f* and *f'*, controlled by cocks, through which water is conducted in or removed from the cylinder F. The top of this cylinder is also provided with a steam safety-valve, *f''*, to regulate the temperature of the water therein. A furnace, G, preferably of sheet-iron, extends the whole length of the pipe F, and is provided with a smoke-pipe, H, at the rear end. The side walls of this furnace extend along the side of the pipe F and inclose fully two-thirds of its surface, leaving only the third on top uncovered. Connected by means of a rubber or other pipe to the section-pipe *b* of the pump is a glass tube, *i*, secured vertically to a board, I.

The lower end of the tube *i* stands in a bottle of mercury, and upon the board are marked the inches above the mercury in the bottle, from 25 to 30 and subdivision, to indicate the vacuum made in the apparatus. The suction-pipe *b* is inclosed the most of its length in a pipe, K, through which water is made to circulate to cool its contents.

The apparatus can be made to operate intermittently as follows: The valve *d*, controlling the inlet-pipes leading to the tank D, and the valves *e* to the bottles E, being closed, the pump is started and a vacuum is produced in the pipes *b*, B, C, and tank D. When a high vacuum is produced, as will be indicated by the mercury-gage, the inlet-valve *d* upon the pipe leading from a reservoir of water to the tank D is partially opened, the water flows in under the influence of the vacuum, and its vapor being rapidly absorbed by the sulphuric acid in the cylinder B the water rapidly freezes in the tank D. In like manner, if the water-bottles E are partially filled with water and attached to the pipe C, as shown, and their connecting-valves opened, the water contained therein will be quickly congealed. During this operation water is introduced and made to circulate into the space between the cylinders B and F by means of the inlet-pipe *f*, and is discharged by the outlet-pipe *f'*, so as to keep the sulphuric acid cool. When the acid has absorbed so much of the watery vapor that it requires to be reconcentrated, the valves on

the water-pipes ff' , connecting with the cylinder F, are closed after about one-fourth of the water contained in said cylinder has been drained off. Fire is then started in the furnace G under said cylinder, and when the safety-valve f^2 , or any other pressure-indicator on top of the cylinder, shows a pressure of about fifty pounds of steam per square inch, the pump A is operated, and under the vacuum formed thereby and the temperature due to the above-stated pressure of steam the watery vapor becomes separated from the acid and passes through the pipe b . During this part of the operation water is allowed to flow through the sleeve k , surrounding the pipe b , and nearly all the distilled vapor or steam is condensed before reaching the pump. The condensed steam discharging into the trap-cylinder A^2 of the pump can be drawn off by petcock m , and the quantity drawn off measured or ascertained, and when it is found that as much water has been drawn off as was absorbed by the acid in the freezing process it is known that the acid is again concentrated sufficiently for again commencing the freezing operation.

If the liquid employed in the pump is mercury, the condensed steam discharged into the trap-cylinder is drawn off by the petcock m on the side of said cylinder. If petroleum or other liquid lighter than water is used, the condensed steam is drained from the lower end of the trap-cylinder by means of a pipe inside of trap-cylinder attached to petcock m , the lower end of pipe reaching to near the bottom of trap-cylinder. In the latter case the upper end of the pipe n , forming the communication between the trap-cylinder and the pump, is lengthened inside of said cylinder, so as to rise above the water in the bottom of that vessel, and a return-bend can be attached on said upper end, so as to prevent water from being drawn into the pump.

The suction-valves P in the top of the cylinders A of the pump are opened at the beginning of each stroke by being pressed down by the rods p , operated by the walking-beam M, carrying a pendent lever, M' , to which motion is conveyed by means of the horizontal rod M^2 , through the trippers m^2 , pivoted to said rod and pressed down by the spring m^3 , so that a pin, n^2 , attached to the cross-head N^2 of the piston-rod N, pushes them and the rod M^2 a certain distance (in practice about three-fourths of an inch) at the beginning of each stroke, and until the trippers pass over the stationary blocks q , which elevate their outer end above the cross-head pin and stop the motion of the rod M^2 , the trippers remaining elevated in that position until the cross-head pin reaches the end of its stroke and begins to move back, when a similar motion is imparted in the opposite direction, the rod M^2 being

retained parallel with the piston-rod by the guide Q. By thus opening the suction-valves the air in the vessels to be exhausted is rarefied to the same degree as the air inside the pump, and thus a higher vacuum is attained than if the valves were opened only by the difference in pressure on each side of these valves. When mercury or a liquid heavier than water is used in the pump, the apparatus shown in Patent No. 237,251 may be used; but for lighter liquids the pump shown in Patent No. 317,629 may preferably be used. The walking-beam is supported on bearings A^3 , secured to the trap-cylinder A' . The ends of the walking-beam have slots to receive the pins that support the vertical rods p , and enable the latter to maintain a perpendicular position at any part of the stroke, and while operating on the stems of the valves P. The rods p pass through stuffing-boxes r , on top of which are oil-cups R, which are kept supplied with oil to prevent air being drawn into the pump.

Having now fully described my invention, I claim—

1. The combination of a pump having two vertical cylinders, and between them a trap-cylinder connected therewith, and a lead-lined cylinder having inlet and outlet pipes, with a pipe uniting the latter cylinder to the pump, substantially as and for the purpose described.

2. The combination of a pump, a lead-lined cylinder connected by a pipe with said pump, a water-holding jacket for said pipe, and a water-holding jacket for the lead-lined cylinder, with a furnace under the latter jacket, substantially as and for the purpose described.

3. The combination of a pump, a lead-lined cylinder connected by a pipe with said pump, a water-holding cylinder inclosing the lead-lined cylinder, and a furnace under said water-cylinder, with a pipe leading from the top of the lead-lined cylinder, and a tank or water-holding vessel, substantially as described.

4. The combination of the two vertical cylinders A of a pump and the spring-valves in the top thereof with the walking-beam M and its pendent rods, substantially as described.

5. The combination of the two vertical cylinders A of a pump and the spring-valves in the top thereof with the walking-beam M, having the pendent rod M' in its center, the rod M^2 , parallel with the piston-rod, trippers m^2 , pivoted to the rod M^2 , and the piston-rod carrying the pin n^2 , substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER CONACHER.

Witnesses:

OWEN L. WILLIAMS,
NATHAN BARNES.