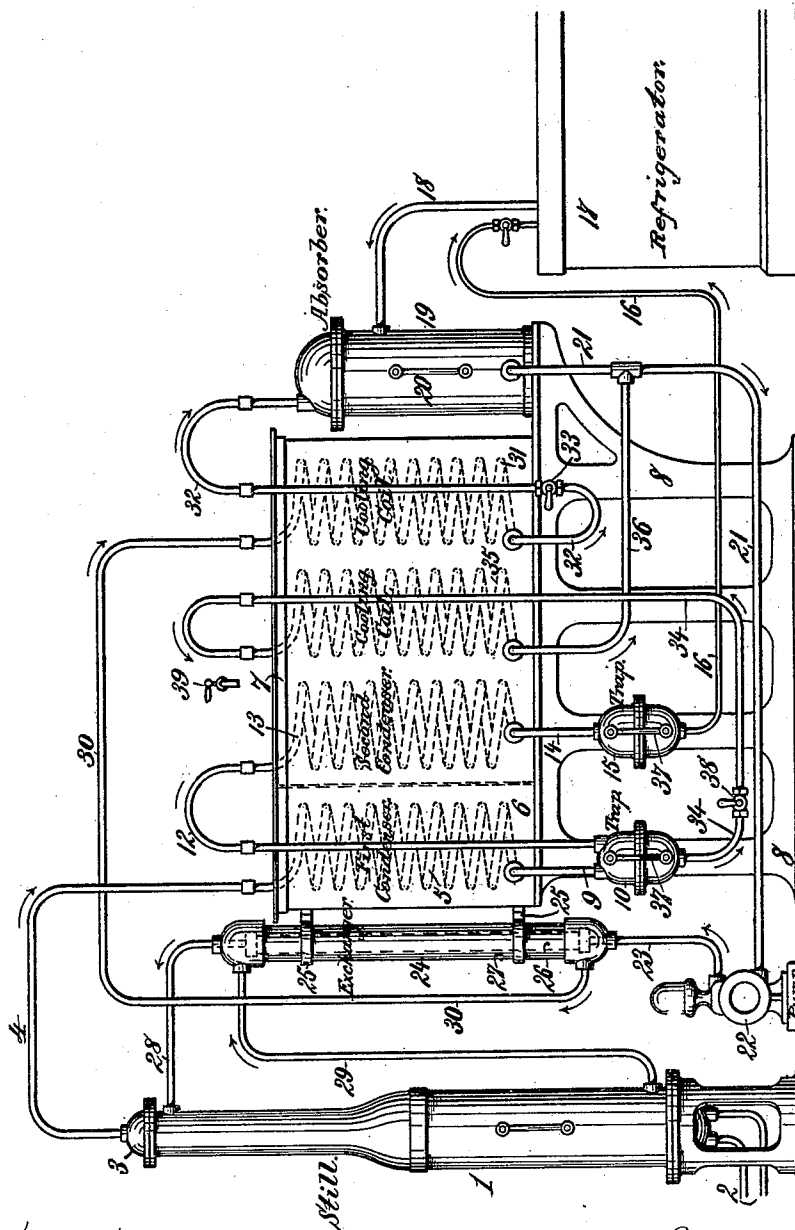


(No Model.)

B. THOENS & A. GERDES.
ICE MACHINE.

No. 463,958.

Patented Nov. 24, 1891.



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UNITED STATES PATENT OFFICE.

BURCHARD THOENS AND AUGUST GERDES, OF NEW ORLEANS, LOUISIANA.

ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 463,958, dated November 24, 1891.

Application filed April 18, 1891. Serial No. 389,494. (No model.)

To all whom it may concern:

Be it known that we, BURCHARD THOENS and AUGUST GERDES, subjects of the Emperor of Germany, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented new and useful Improvements in Ice-Machines, of which the following is a specification.

Our invention relates to and consists in certain novel and useful improvements in the construction and organization of absorption ice-machines. It is the purpose of said invention to provide means whereby the steam and gas may be separated in such manner as to yield pure anhydrous or nearly anhydrous ammonia-gas for use in the refrigerating apparatus to produce a rapid and extreme reduction of temperature.

Our invention consists to this end in a novel arrangement whereby a continuous circulation is secured from the retort to a condenser, where the steam is separated at a temperature which effects its condensation without liquefying any material portion of the gas, the circulation from this point being by two distinct passages, one for the ammonia-gas, through a liquefying-coil to the refrigerator or freezing-chamber and thence to an absorber, and the other for the condensed steam, through a cooling-coil and thence to the absorption-chamber or to the suction-pipe from said chamber to the pump and through an exchanger to the retort, the heated fluid from the latter, which remains after the gas and a certain quantity of steam has been separated, being driven through the exchanger and through a separate cooling-coil to the absorption-chamber, where it meets the gas coming from the refrigerator, the heated fluid from the retort and the cold fluid and gas from the absorber meeting in the exchanger and equalizing their temperatures, the former parting with a portion of its heat and the latter undergoing a corresponding increase in temperature.

In the absorption ice-machines used prior to our invention a serious defect has been found to exist from the imperfect separation of the steam and the ammonia-gas, whereby a quantity of water of condensation constantly passes through the condensing or liquefying chamber into the refrigerator, es-

pecially in warm weather, when a higher pressure must be maintained in the retort and condensing-chamber. Inasmuch as this can be only effected by applying more heat to the fluid in the retort, by which a greater evaporation of water is caused, the defect is largely increased and the capacity of the machine is reduced nearly one-half. To remove this objection and increase the capacity of ice-machines of this type and to render the operation more rapid and economical are the essential objects of our invention; and to enable those skilled in the art to understand and use the same we will describe in detail the construction, arrangement, and operation of a machine embodying our invention, reference being made to the accompanying drawing, in which the figure is an elevation of an ice-machine, showing one form in which our invention is carried into operation.

In the said drawing, the reference-numeral 1 indicates the retort of an ice-machine of any preferred form, the heat being maintained therein by steam-coils, of which the terminals 2 only are shown. From the upper extremity or dome 3 of the retort a pipe 4 is carried to the upper terminal of a coil 5, which is arranged in a separate chamber 6 of a tank or compartment 7. This tank is mounted upon a supporting-frame 8. From the lower terminal of the coil 5 a pipe 9 descends to a vessel 10 beneath, (preferably constructed like any of the more approved forms of steam-trap.) From the top of this vessel a pipe 12 passes upward, outside the tank 7, its upper portion being curved to unite with the upper terminal of a coil 13, arranged within the main chamber of the tank 7, the lower terminal of said coil being connected to a pipe 14, which descends to and enters the top of a vessel 15, which is usually of the same construction as the vessel 10, and arranged at about the same level, each being bolted to a sustaining-bracket upon one of the uprights of the supporting-frame 8. From the lower portion of the vessel 15 a pipe 16 is carried horizontally, or substantially so, beyond the end of the supporting-frame and into a refrigerator or freezing-tank 17, where it is arranged in any well-known manner. From the coils or other arrangement of pipe in the refrigerator 17 the

return-pipe 18, rising out of the same, enters an absorber 19. The interior construction of this chamber is not shown, as it need not essentially differ from the forms now in use and well known by those familiar with this type of ice-machine. As shown in the drawings, the absorber 19 consists, substantially, of a cylindrical vessel of suitable dimensions mounted upon the end of the supporting-frame 8. It is usually supplied with a gage-tube 20, by which the volume of fluid therein can be ascertained at any moment. From the lower portion of the absorber 19 a pipe 21 is carried to a pump 22. From said pump a pipe 23 leads to the lower end of a long vertical cylindrical vessel 24, supported by brackets 25, which project from the end wall of the tank 7, adjacent to the retort 1. This vessel is termed the "exchanger," and within the interior thereof is arranged a second separate vessel 26, extending nearly from end to end of the exchanger and concentric with it, an annular passage-way or space 27 being formed between its exterior and the inner face of the exchanger 24. To the lower end of the interior vessel 26 the pipe 23, which is packed through the lower end of the exchanger, is connected. From its upper end a pipe 28, packed through the top of the exchanger is carried to and into the upper end of the retort 1. From the lower part of the retort a pipe 29 rises to and enters the upper part of the exchanger 24, its open end having communication with the annular space or passage 27. From the lower end of the said exchanger a pipe 30, also communicating with said space, rises and is carried above the tank or compartment 7 to the end adjacent to the absorber, where it is connected to the upper terminal of a coil 31, arranged in the main chamber of the tank. From the lower terminal of this coil a pipe 32, having a cock 33, rises above the tank exterior thereto and enters the top or dome of the absorber 19. From the bottom of the vessel or steam-trap 10 a pipe 34 extends horizontally beneath the vessel 15 and then upward above the tank, its end being connected to the upper terminal of a coil 35, arranged in the main chamber of the tank 7 between the coils 13 and 31. From the lower terminal of said coil a pipe 36 is carried to the descending portion of the pipe 21, to which it is connected by a T-joint. A gage-tube 37 is usually attached to each of the vessels 10 and 15 to show the volume of fluid therein, and a cock 38 may be placed in the pipe 34; but this will not be so essential when the vessel 10 is in the form of a steam-trap, as the fluid discharge from the latter will be controlled automatically.

The operation of the mechanism described is as follows: The water holding the ammonia-gas in solution being introduced to the retort and heated, the gas is driven off and at the same time a certain quantity of steam is formed which mingles with the gas and passes with it from the retort. Passing from the

latter through the pipe 4 the ammonia-gas and steam enter the coil of pipe 5, lying in the separate chamber 6 of the tank 7. This coil is maintained at such temperature by a surrounding body of water that condensation of the steam is produced without liquefying the gas, the required temperature in the coil being preserved either by admitting only a limited flow of cool water to the chamber 6, or by allowing an overflow from the main chamber of the tank 7, or both, as circumstances may require. From the coil 5 the water of condensation flows downward through the pipe 9 to the vessel or steam-trap 10, while the gas, freed from admixture with steam, passes through the pipe 12 to the coil 13, lying in the main chamber of the tank 7, where it is cooled to liquefaction, this portion of the tank being supplied with cold water from any convenient source through a tube and faucet 39. From the coil 13 the liquefied gas passes through the pipe 14 to the vessel 15, where its volume is indicated by the gage-glass, and thence it passes through the pipe 16 to the refrigerator 17. From the refrigerator the ammonia, again converted to gas, flows through the return-pipe 18 to the absorber 19. Here it meets the fluid with which it was originally combined in the retort, which has passed from the bottom of the retort through the pipe 29, and, flowing through the annular passage 27 of the exchanger 24, has been deprived of a portion of its heat by contact with the interior vessel 26, through which the cold fluid from the absorber, drawn through the pipe 21, is driven by the pump, the fluid traversing the interior vessel being at the same time correspondingly raised in temperature. The condensed steam accumulating in the vessel or trap 10 in the meantime flows through the pipe 34 to the coil 35, where it is cooled to such a point that it will retain the ammonia gas it contains without driving off any portion thereof, and from said coil 35 it passes through the pipe 36 to the pipe 21, and thence to the pump, or, if preferred, to the absorber, where it mingles with the fluid delivered to the latter by the pipe 32.

By the construction and arrangement described we effect a practically complete separation of the ammonia-gas and steam, whereby the former enters the freezing-tank in an anhydrous state, or very nearly so. We provide, also, a compact, simple, and continuously-operating machine having more rapid evaporation in the refrigerator, and thereby affording a lower temperature and doing more rapid work.

We are aware that condensers have been constructed in which it was intended that the water of condensation should be returned to the retort by gravity; but in these machines the gas, having to pass through many feet of pipe and bends, has less pressure in the condenser than in the retort, and the water could not therefore return.

What we claim is—

1. An ice-machine having two condensers maintained at different temperatures, a vessel or trap connected by a pipe to the fluid-outlet of the first condenser, an absorber, and
5 a pump to which the fluid from the absorber and the water from the vessel or trap are drawn through a single suction-pipe, substantially as described.

2. An ice-machine having two condensers
10 maintained at different temperatures, a vessel or trap connected by a pipe to the fluid-outlet of the first condenser, a cooling-coil connected by a pipe to the fluid-outlet of said vessel or trap, an absorber, and a pump con-
15 nected to the fluid-outlet of the absorber by a suction-pipe which conveys the water of condensation from the cooling-coil and the re-united water and gas from the absorber, substantially as described.

20 3. In an ice-machine, the combination, with

a condenser maintained at a temperature low enough to condense steam, but too high to liquefy the ammonia-gas, of a vessel or trap connected to the outlet of said condenser to receive the condense-water, a cooling-coil con- 25 nected to the fluid-outlet of said vessel or trap, a second condenser maintained at a lower temperature to liquefy ammonia-gas, and connected by a pipe with the gas-outlet of said vessel or trap, an absorber, and a pump with 30 which the cooling-coil and absorber communicate, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

BURCHARD THOENS.
AUGUST GERDES.

Witnesses:

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