

(No Model.)

F. K. SOWERS, G. L. VAIL & L. M. PETITDIDIER.  
APPARATUS FOR DEAERATING WATER.

No. 598,470.

Patented Feb. 1, 1898.

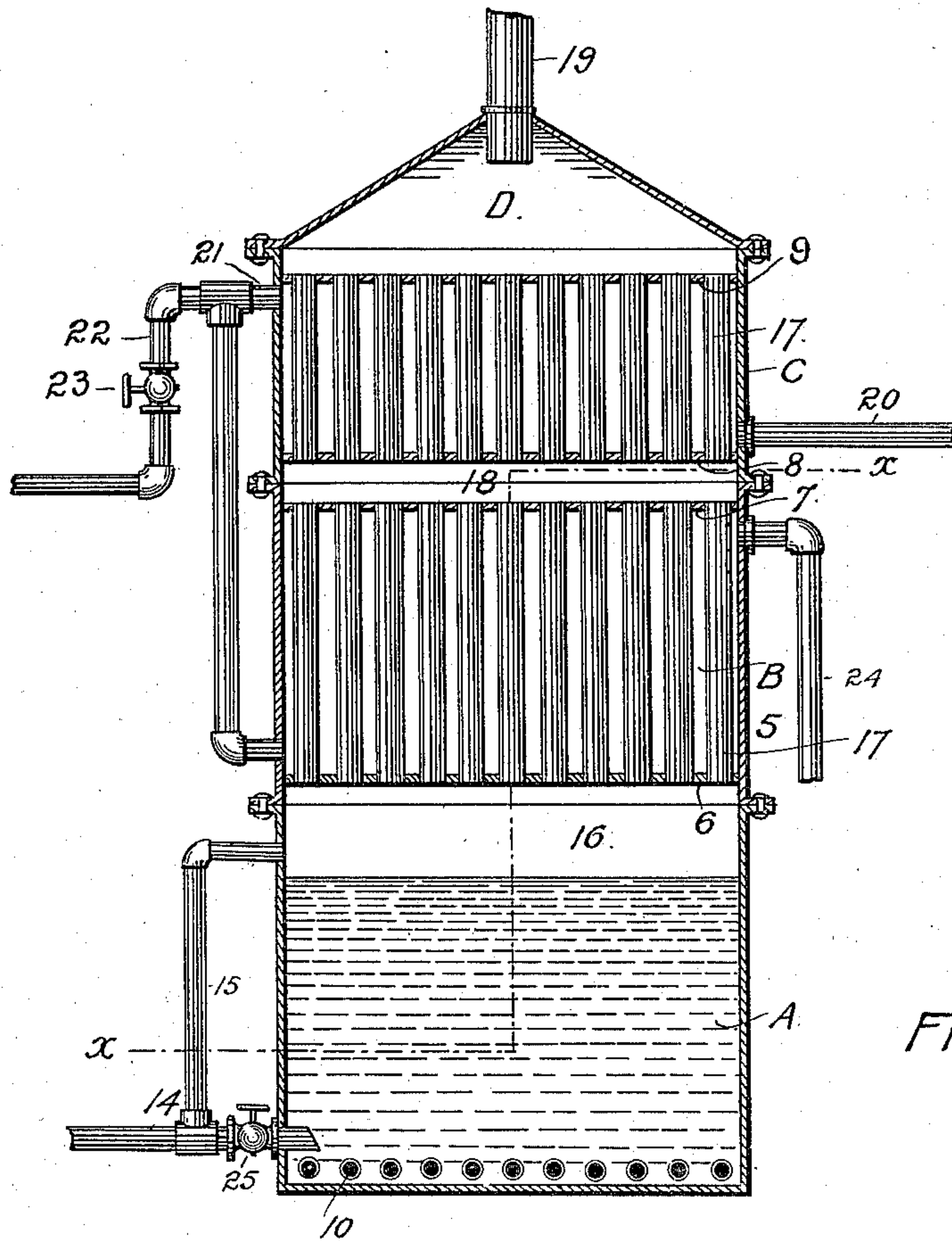


FIG. 1.

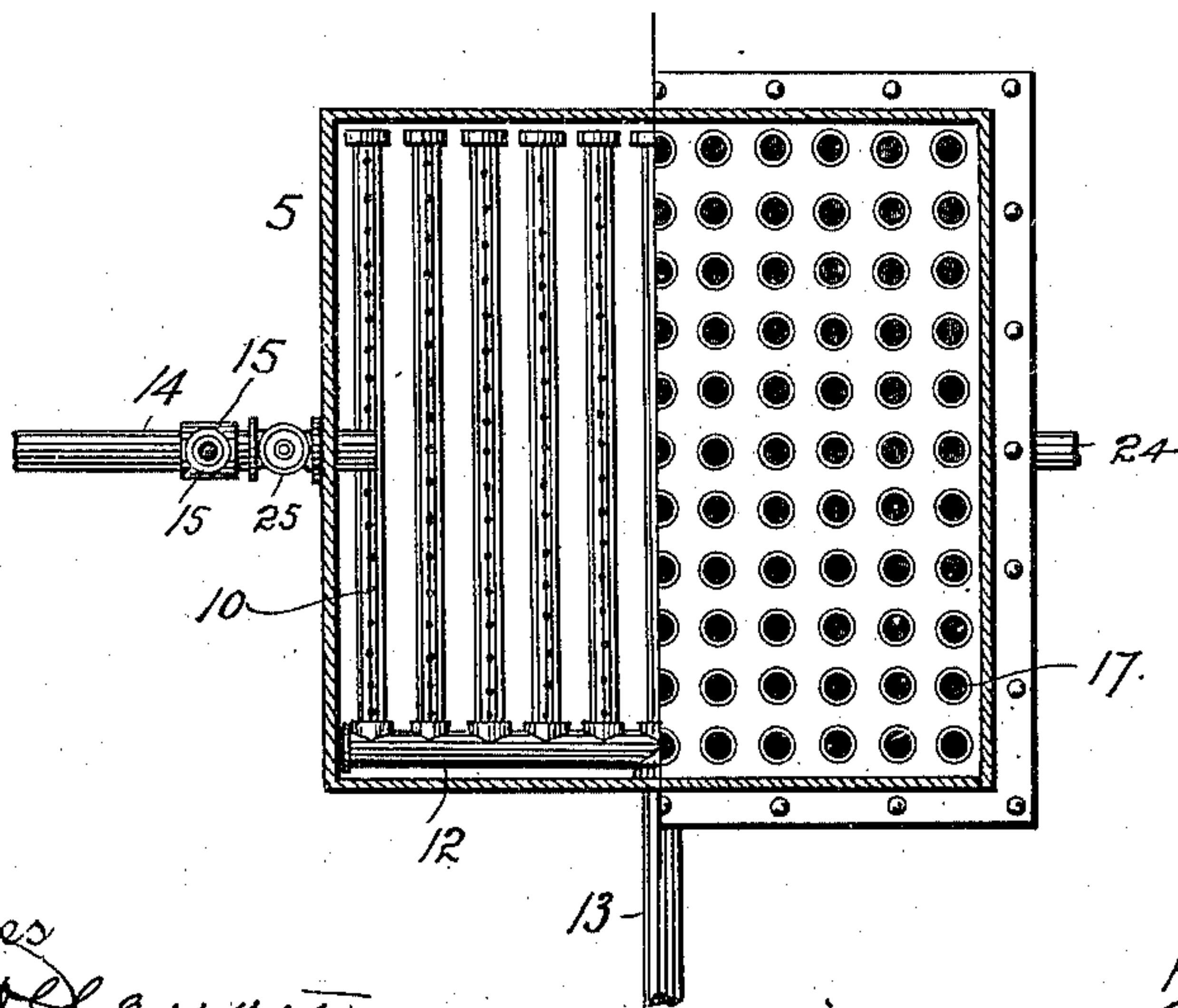


FIG. 2.

Witnesses  
*[Signature]*  
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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR DEAERATING WATER.

SPECIFICATION forming part of Letters Patent No. 598,470, dated February 1, 1898.

Application filed December 19, 1896. Serial No. 616,367. (No model.)

*To all whom it may concern:*

Be it known that we, FRANKLIN K. SOWERS, GEORGE L. VAIL, and LOUIS M. PETITDIDIER, citizens of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Apparatus for Deaerating Water; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Our invention relates to an improved apparatus for the deaeration of water preparatory to artificial freezing. Perfect deaeration is a desideratum in the art of ice-making in order that the ice may be clear and transparent.

The object of our invention is three-fold—namely, the saving of the steam, the utilization of the heat which it contains, and the more nearly perfect deaeration of the water. By our improvement all the steam is condensed and falls back into the tank or water-receptacle. The condensation of the steam results in perfect deaeration, and as the water-supply is largely maintained from this condensed steam the deaeration of the water is practically perfect. It may also be stated that it is impracticable to boil the water long enough to effect perfect deaeration, whereas the condensation of the steam in our improved apparatus produces instantaneous deaeration.

The apparatus employed in practicing or carrying out our invention is provided with one or more compartments formed in the tank or casing above the water and containing open-ended tubes, into which the steam rises from the water. Cold water is introduced to the compartment or compartments and flows around the tubes, where it is heated and afterward carried to the boiler. The steam is condensed in these tubes and falls back into the tank. There is an opening in the top of the apparatus for the escape of air, but no steam whatever escapes with the air, as experience demonstrates. That the deaeration

of the water is more nearly perfect than under the old system is evidenced by the ice made from the water, which is clear, transparent, or practically non-porous, there being a marked difference in favor of this ice when compared with ice made from water deaerated by the old process.

The invention will now be described in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment of the apparatus.

In the drawings, Figure 1 is a vertical longitudinal section of the apparatus. Fig. 2 is a horizontal section showing a combination view taken on the broken line  $x x$ , Fig. 1.

Similar reference characters indicating corresponding parts in the views, let the numeral 5 designate an upright casing, which, as shown in the drawings, is composed of several sections suitably connected. The chamber or space within this casing is divided by horizontal partitions 6, 7, 8, and 9 into four compartments A, B, C, and D. The lowermost compartment A contains a quantity of water. In the bottom of this compartment is a series of perforated pipes 10, connected with the main conduit 12, to which leads the steam-pipe 13 from the retort or other suitable source of steam-supply. Connected with the compartment A is an outlet-pipe 14 for the escape of the deaerated water. The compartment A is provided with an overflow-pipe 15, connected with the pipe 14, whereby the water in compartment A is prevented from rising too high therein. It is necessary that a suitable space 16 should be left between the water-level and the partition 6. The partitions 6 and 7 are fast in the casing and perforated to receive the extremities of a series of open-ended vertical pipes 17, which communicate at their lower extremities with the compartment A and at their upper extremities with a space 18 between the partitions 7 and 8. The partitions 8 and 9 are also perforated to receive open-ended pipes 17, whose lower extremities communicate with the space 18, while their upper extremities open into the compartment D in the top of the casing. This compartment D has an opening in its apex, in which is secured a short open-ended pipe 19 for the escape of air.



The cold water is conducted to the compartment C by way of an inlet-pipe 20, located near the bottom of the compartment, and after passing through the compartment around the pipes 17 escapes therefrom by way of a pipe 21, whose opposite extremity communicates with the bottom of the compartment B. The water escapes from this last-named compartment by way of a pipe 24, leading from the upper part of the compartment to the boiler.

If more water is needed for condensing purposes than is required by the boiler, a pipe 22, connected with the pipe 21 and provided with a valve 23, may be employed to carry away this surplus water. When all the water is needed by the boiler, the valve 23 is kept closed. By opening this valve the superfluous water will be carried away by the pipe 22. The pipe 14 is provided with a valve 25, located between the overflow-pipe and the casing to control the exit of the deaerated water.

The steam introduced to the compartment 16 by way of the pipe 13 may be either exhaust-steam or live steam, or both. In other words, the steam may come from any suitable source. This steam boils the water in the compartment A and afterward, rising from the boiling water, is condensed in the tubes 17 and returns to the compartment A, the water being replenished from this source.

The boiling of the water alone but imperfectly expels the air during the limited time the water remains in the tank; but the condensation of the steam in the pipes is believed to effect instant and perfect deaeration. Hence the superiority of our new process over the old, since most of the steam now condensed by the tubes 17 was lost by the old process. Moreover, the heat contained in the steam is now utilized to heat the water for the boiler. It will thus be seen that our improved apparatus is a combined deaerator, heater, and condenser.

Having thus described our invention, what we claim is—

1. The herein-described deaerating, condensing, and heating apparatus, comprising a casing having two compartments A and B, the compartment A adapted to contain water to be deaerated and having perforated pipes

located in its lower portion and connected with a steam-supply source and having an outlet for the deaerated water, the compartment B being inclosed by two perforated partitions having open-ended pipes, whose extremities are fast in the partitions, and inlet and exit pipes for cooling-water connected with the compartment B, the casing having an exit for the air in its upper portion, and a space between the water in chamber A and the lower partition of chamber B.

2. A deaerating, condensing, and heating apparatus comprising a casing divided by horizontal partitions into a number of compartments the lowermost containing water to be deaerated, perforated pipes located in the lowermost compartment, said pipes being connected with a steam-supply source, said compartment having also an exit for the deaerated water, the upper compartments being inclosed by perforated partitions having open-ended pipes whose extremities are made fast in the partitions, and means for passing cooling-water successively through the upper compartments around the pipes, the lowermost compartment being separated from the compartment next above, and the upper compartments from each other by a suitable space, the upper part of the casing having an exit for the air.

3. The herein-described deaerating, heating and condensing apparatus comprising a casing having perforated pipes located in its lower portion which is adapted to contain water to be deaerated, said pipes being connected with the steam-supply source and having an outlet for the deaerated water, means located in the upper part of the casing for passing cooling-water therethrough, and forming a condensing-surface, and means for allowing the steam to rise to contact with the condensing-surface, the upper part of the casing being provided with an exit for the air.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANKLIN K. SOWERS.

GEORGE L. VAIL.

LOUIS M. PETITDIDIER.

Witnesses:

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