

(No Model.)

J. M. W. NEFF.

2 Sheets—Sheet 1.

ICE MACHINE.

No. 322,550.

Patented July 21, 1885.

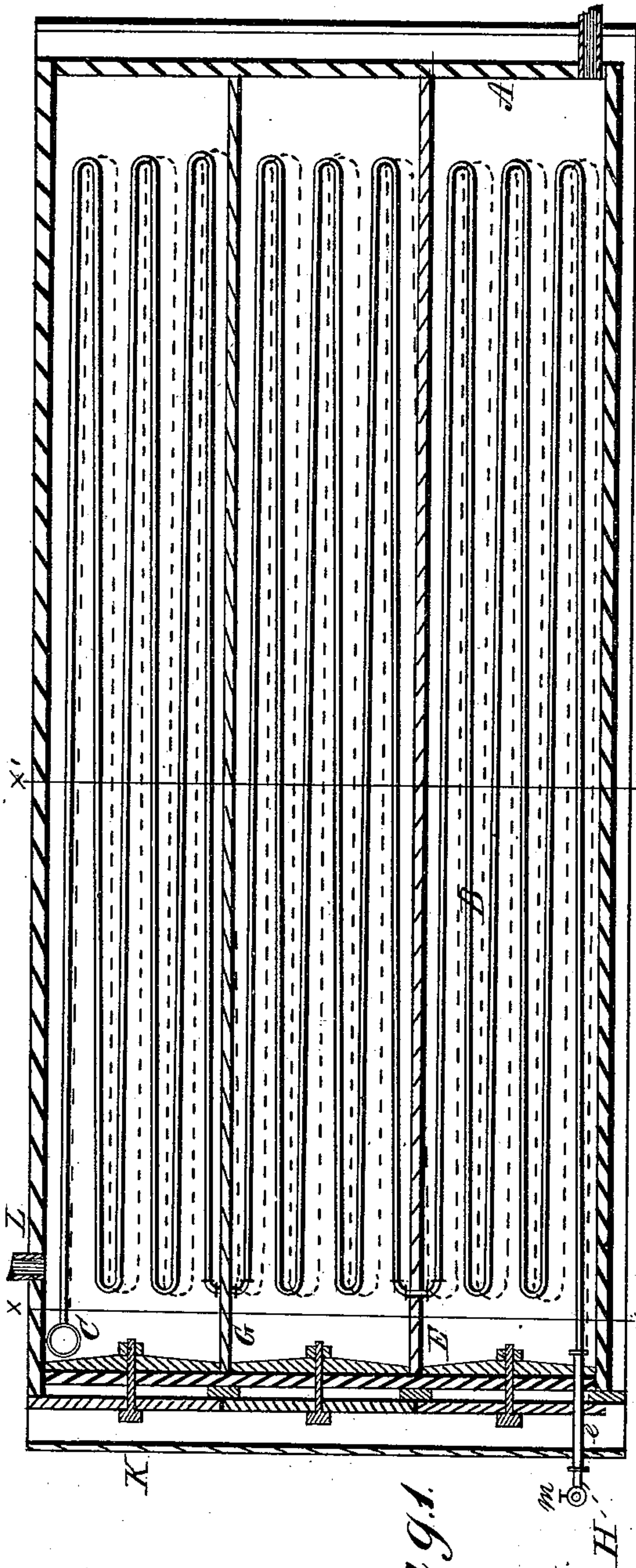


Fig. 1.

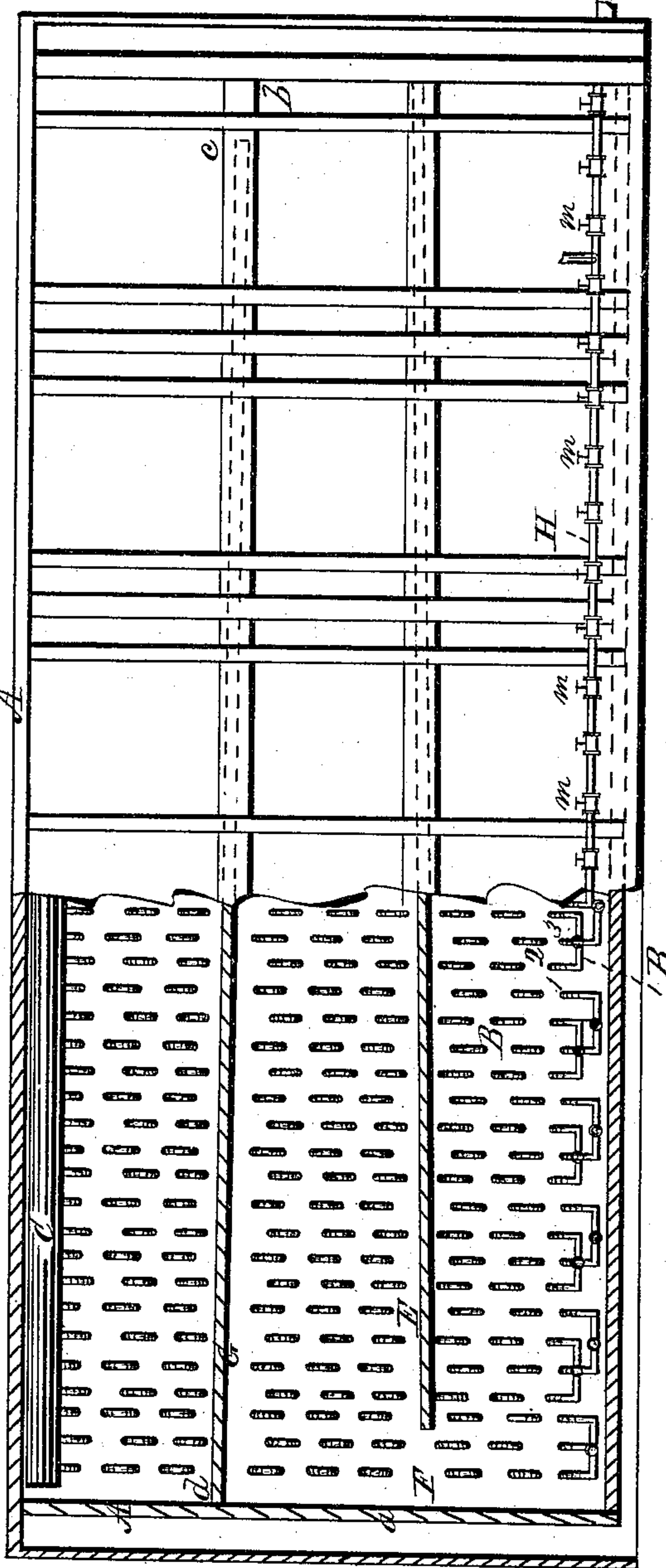


Fig. 2.

Witnesses.  
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(No Model.)

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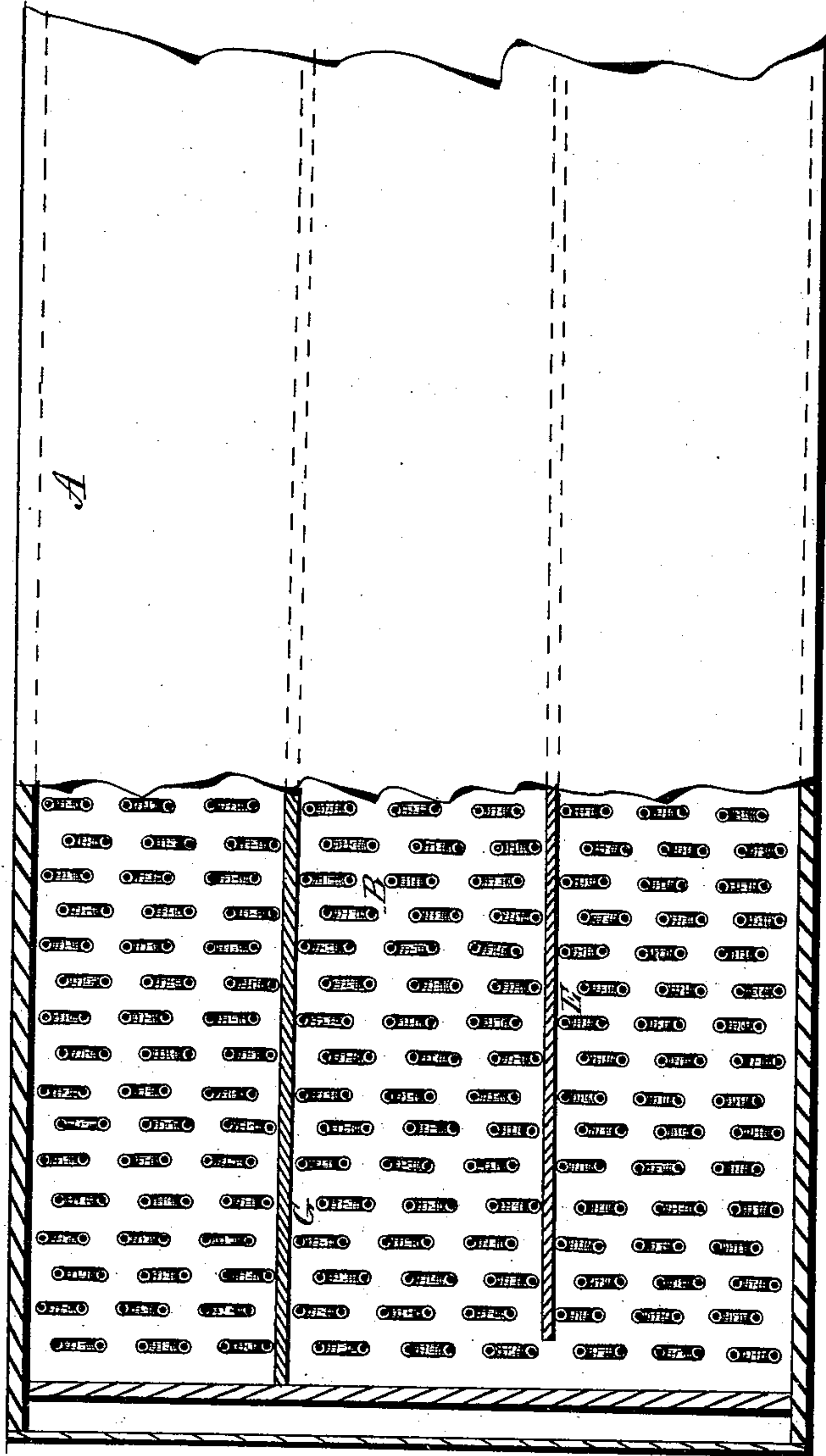


Fig. 3.

Witnesses.

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# UNITED STATES PATENT OFFICE.

JAMES M. W. NEFF, OF CINCINNATI, OHIO.

## ICE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 322,550, dated July 21, 1885.

Application filed December 27, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES M. W. NEFF, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a certain new and Improved Refrigerating Apparatus; and I do hereby declare that the following is a full and complete description thereof.

The special purpose of the above-said invention is for reducing a body of water to a low degree of temperature by the expansion of liquid ammonia while passing through coils of pipes, arranged in relation to partitions, in a tank filled with water to be reduced in temperature, and in which the coils of pipes are immersed. The water is continuously inducted into the tank, and in passing through it flows alternately from one side of the tank to the other, and is conducted therefrom by a main pipe into a building or a compartment therein, along the ceiling of which, or along the sides of the same, is a ramification of pipes, through which the cold water from the tank or refrigeratory is forced, thereby reducing the temperature of the building or room therein, and making of the same a refrigerator in which to preserve fruits, meats, beer, and other articles needing to be preserved.

Heretofore the refrigerating-tank consisted of a tank in which the refrigerating-coils of pipes were arranged longitudinally therewith, and the water to be subjected to the chilling influence of said pipes was conducted into the tank at one end and passed directly through it in the direction of the pipes to the opposite end of the tank, from which it was conducted to the ramification of pipes in the refrigerator or preserving-room above mentioned.

The objection to passing the water so directly through the refrigerating-tank and in line of the pipes therein is, the water continues in the tank for so short a time it fails to be reduced to as low a degree of temperature as that of the refrigerating-pipes, hence the efficiency of the pipes is not fully realized in the reduction of the temperature of the water; therefore the preserving-room or refrigerator is not sufficiently cooled by the ramifying pipes therein above alluded to.

That the full chilling effect of the coils of pipes in the tank shall be expended upon the water flowing through it to the preserving-

room, is the subject-matter of this invention, and which is fully described in the following specification, and shown in the accompanying drawings, making a part of the same, in which—

Figure 1 represents a vertical longitudinal section of the improved refrigerating-tank. Fig. 2 is a transverse vertical sectional view through the tank at the end, and in the vertical plane, line  $x x$ . Fig. 3 is also a transverse vertical sectional view through the middle of the tank on the vertical plane, line  $x' x'$  of Fig. 1.

Like letters of reference denote like parts in the drawings.

The refrigerating-tank consists of a rectangular tank, A, the sides of which may be of equal length or not, and of any desirable holding capacity. The sides of the tank may be double and filled in with some non-heat-conducting material usually employed for such purpose. In the tank is arranged a system of pipes in a series of groups having a serpentine course or coil through the tank, and associated with partitions more or less in number, as shown in Figs. 1 and 2, in which B represents one group of said system of pipes, consisting of three pipes—viz., 1 2 3—but which may be more or less in number. From near the bottom of the tank each pipe extends upward in a coil or serpentine manner to the top of the tank and terminates openly in a large pipe, C, called a "header." It will be observed that the pipes in each group are so arranged as to be in an alternate relation in respect to each other, as shown in Fig. 2, which represents the union or U ends of the pipes. A portion of the side of the tank is shown as removed that the return ends of the pipes may be seen, and also their alternate relation above mentioned. The alternate relation the pipes have to each other is such that the union ends of the pipe 1 are not directly opposite the union ends of the pipe 2—that is to say, the U ends of the pipes 2 and 3 are opposite the spaces between the U ends of the coil or pipe 2, and so of each of the groups of pipes that the tank may contain, all of which, after their serpentine coil from the bottom of the tank upward, terminate in the header C. Fig. 3 represents a transverse section of the several groups of



pipes, which may contain more or less number of pipes, and more or less number of groups in a tank and the coils of which may be carried upward to any desirable height, or according to the height that the tank may be made.

E, Fig. 1, is a partition extending horizontally, or nearly so, across the inside of the tank and in close contact with three sides thereof, but not in contact with the fourth side or end, *a*, of the tank, there being a space between the end of the partition and the end or side of the tank, as seen at F, in Fig. 2. Said partition occupies a space between the coils or traverse of the pipes; hence the partition and the pipes have a transverse relation to each other—that is to say, the pipes cross the partition at right angles and parallel with the opening F. It will be noticed that the end of the partition at the side or end *a* of the tank is preferably a little lower than the opposite end, thereby giving to the partition a slight downward grade to the opening F.

Abovesaid partition E is a similar partition, G, passing, as does the partition F, between the coils of pipes, and is close fitting to three sides of the tank and not at the fourth side or end, *b*, the side opposite the side *a*. The partition G not extending to the side of the tank, but stopping short thereof, as indicated by the dotted line at *c*, causes an opening between the end of the partition and the side of the tank corresponding to the opening F of the lower partition. The partition G is also given a slight grade from the closed end *d* down to the open end *e*.

From the above it will be seen that the open end of the lower partition is under the closed end of the upper partition; and should other partitions be added (and which may be) in the construction of the tank, the same relation of the open and closed ends of the partitions will be continued in the same order.

Along the outside or casing of the tank is a pipe, H, which, by a suitably-arranged pipe, is put in communication with a receiver (not shown in the drawings) containing fluid ammonia, forced therein from a condenser, (not shown in the drawings,) as it and the receiver above mentioned form no part of my invention, and which is or may be like gas condensers and receivers in ordinary use—mechanisms well known in the arts.

Each group of the refrigerating-pipes is in communication with the pipe H by means of side pipes respectively adapted to each group. One of said side pipes is shown at *e* in Fig. 1. Each side pipe is provided with a stop-cock or valve, *m*, for admitting liquid ammonia to the groups of pipes and for shutting it off therefrom.

The operation of the refrigerating-tank is as follows: Water having in solution salt forming a brine is discharged into the tank at or about the point or place L through an inlet-pipe, L. The water on entering the tank falls upon the closed end of the partition G, down which it flows slowly to the open end, and falls there-

from onto the closed end of the partition below, down which it flows to the opening F at the end of the partition, and falls therefrom onto the bottom of the tank, from which it is drawn or forced by a pump (not shown) into the ramification of pipes in the preserving-room or refrigerator, above referred to. The brine having circulated through the system of pipes in the refrigerating-room is returned to the refrigerating-tank and again passed through it, as above described. In consequence of the slight grade given the partitions the flow of the water over them is slow through the tank, and alternately from one side to the other, and as often as the number of partitions that may be therein; also, the groups of refrigerating-pipes being arranged transversely across the partitions, and being alternating in their relation to each other, as above described, the water is retarded thereby in its passage through the tank, and by its long continuance in contact with the pipes it becomes wholly reduced to the temperature of them, over which and among them the water slowly and continuously flows, and receiving the full chilling influence of the whole system of refrigerating-pipes, and which is fully realized in the desirable low temperature of the preserving-room or refrigerator.

The cold produced in the refrigerating-pipes is the well-known result of the expansion of the fluid ammonia therein into ammoniacal gas or vapor, which, as above said, escapes therefrom into the pipe or header C, and conducted thereby into a collector, from which it is returned to the condenser and reduced to a liquid condition, to be again used for the purpose above described.

The refrigerating-pipes are shown in the drawings, and described as arranged vertically in the tank. They may, however, have a horizontal position therein, with more or less interposed partitions, as the height of the tank may require, and which may be of any desired height without changing the nature of my invention.

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

A tank for refrigerating purposes having series of vertically-arranged coils of pipe, and horizontally-inclined partitions arranged one above another and alternately inclined from a level line, each one having the higher end attached to the side of the tank and the lower end with an outlet for the passage of water to the one below, whereby the water will flow from the inlet-pipe at the top backward and forward over the several partitions in a thin sheet in contact with the pipes until it reaches the bottom of the tank.

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

JAMES M. W. NEFF.

Witnesses:

W. H. BURRIDGE,  
J. H. BURRIDGE.