(No Model.) 3 Sheets—Sheet 1.

T. C. EASTMAN.

METHOD OF AND APPARATUS FOR COOLING THE AIR IN ROOMS.

No. 306,725. Patented Oct. 21, 1884.

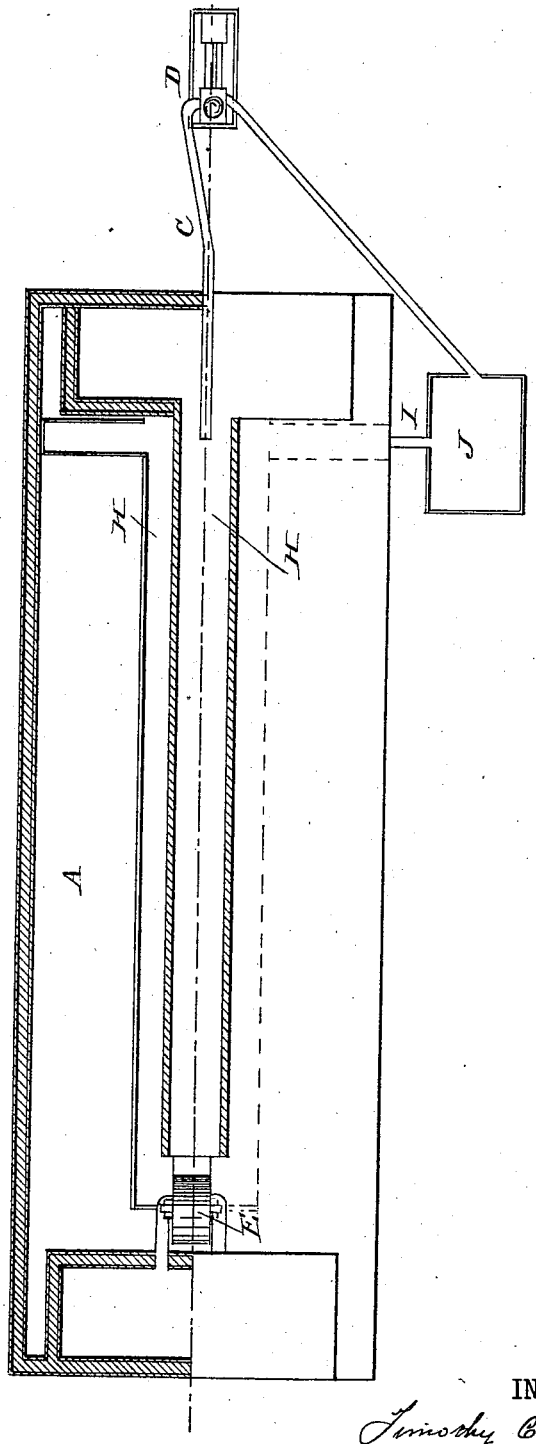

FIG. 1.

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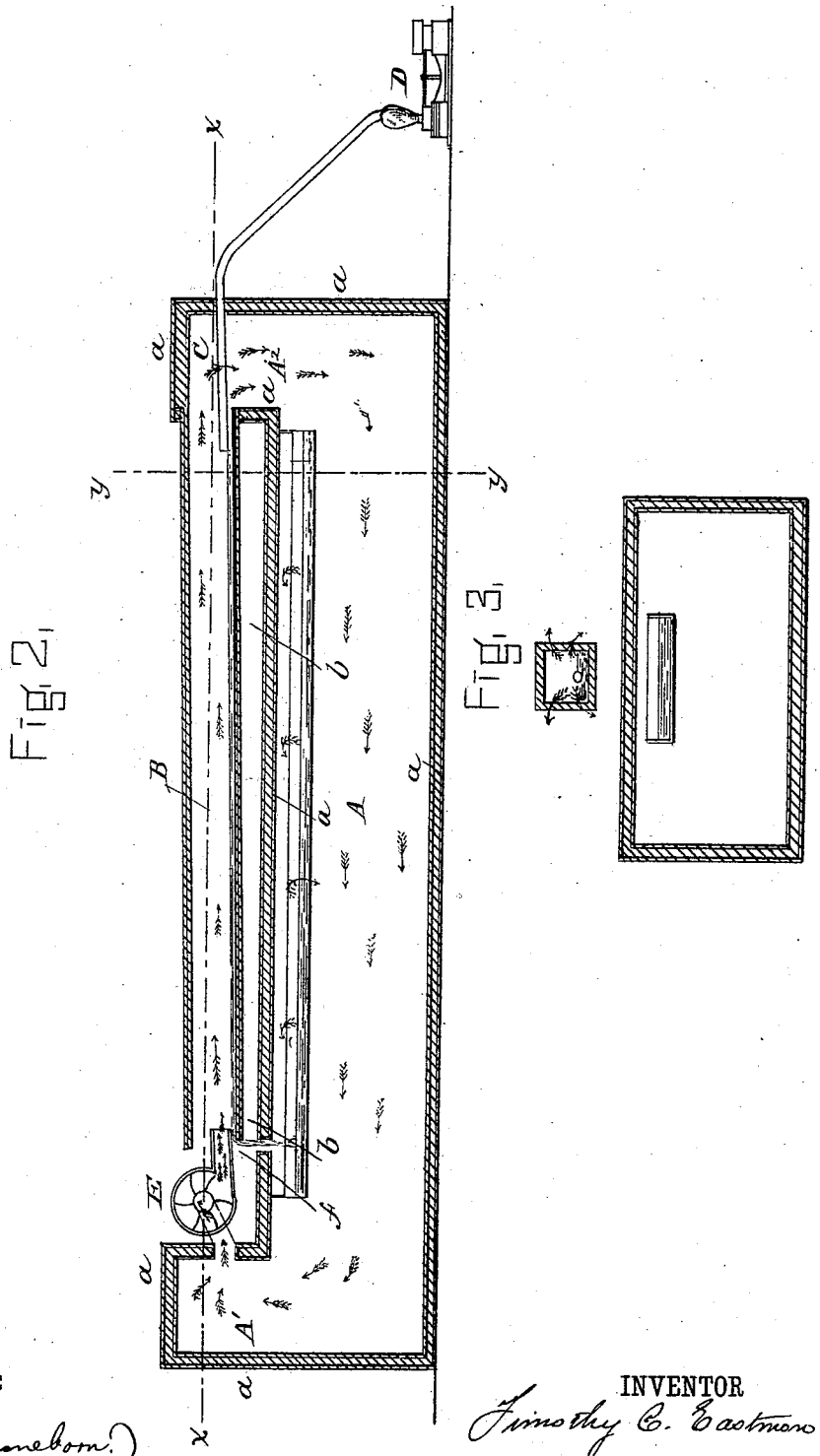

Fig. 2.

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

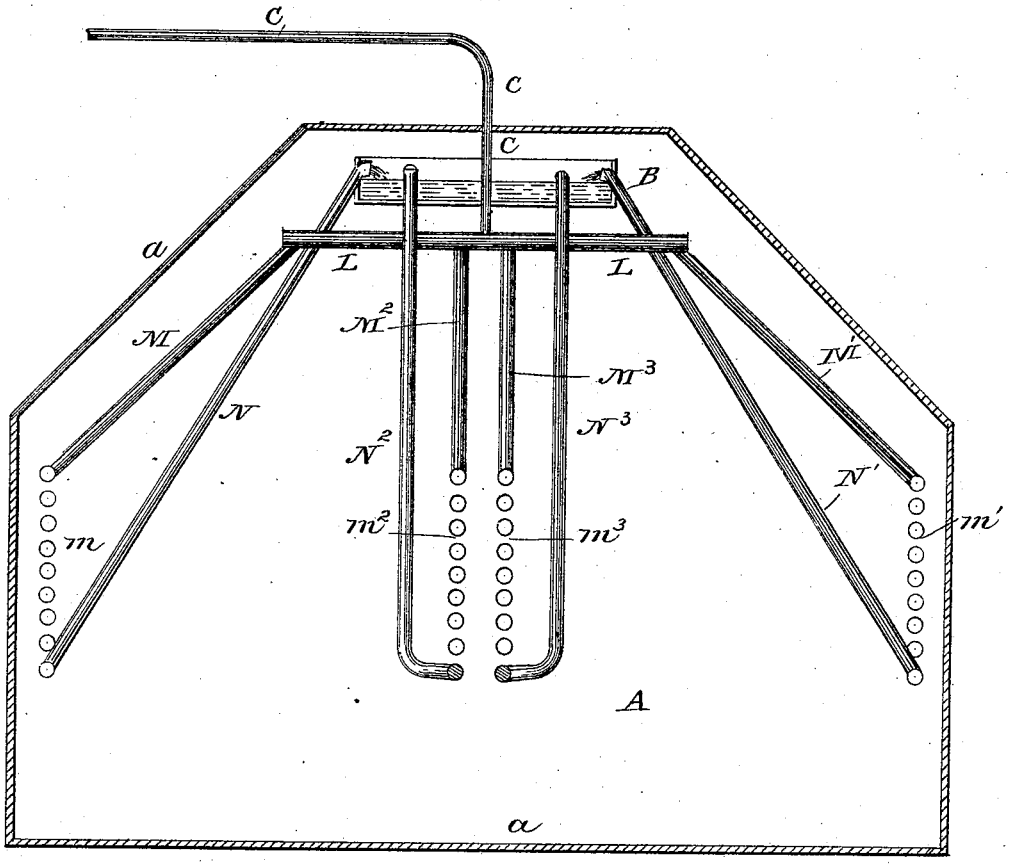
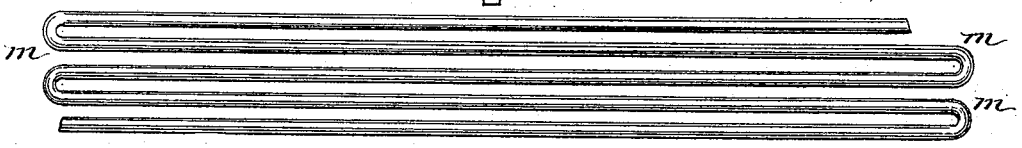


Fig. 5.



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TIMOTHY C. EASTMAN, OF NEW YORK, N. Y.

METHOD OF AND APPARATUS FOR COOLING THE AIR IN ROOMS.

SPECIFICATION forming part of Letters Patent No. 306,725, dated October 21, 1884.

Application filed August 29, 1884. (No model.)

To all whom it may concern:

Be it known that I, TIMOTHY C. EASTMAN, a resident of the city, county, and State of New York, and a citizen of the United States, have invented certain new and useful Improvements in the Method of and Apparatus for Cooling the Air in Refrigerating-Rooms, of which the following is a specification.

My invention consists in injecting into a refrigerating-room air drawn from the top of such room and cooled by contact with a stream of cold liquid flowing through a flue or pipe outside the refrigerating-room and returning by a trough inside the room, the air being forced to circulate over the cooling-liquid by a revolving fan or other suitable apparatus for blowing or sucking air.

In connection with the above-described apparatus I may also use a series of coiled pipes placed in the cooling or chill room, and through which the cold brine is forced to circulate before it enters the open brine-trough over which air-blast is forced. The cooling flue through which the cold brine or other cooling-liquid circulates is covered with non-conducting material. It begins at one end of the refrigerating or chill room and slopes slightly downward toward the uptake-shaft at the other end at a short distance above the top of the room. Between the end of this cooling-flue and the uptake-shaft there is placed a fan or other blower, to assist in causing the air to circulate over the cooling-liquid. At the end of the cooling-flue next the downtake-shaft the nozzle of an injector-pipe is inserted. Through this pipe a constant stream of chilled brine or other cooling-liquid flows, and escapes or is injected into the cooling-flue, down which it flows toward the lower end of the flue, whence it escapes at the bottom and runs into a trough placed inside the chill-room a few inches below the ceiling and immediately beneath the cooling-flue. At the same time that the cooling-liquid is flowing through the flue in one direction a counter-current of air is forced over the surface of the liquid in the opposite direction by a revolving fan-blower or other blowing device. The air thus forced is drawn from the uptake-shaft, into which it ascends by the suction of the blower and by the natural tendency of warm air to rise. After the air is chilled by passing over the cooling-liquid it escapes into the downtake-shaft, whence it falls by its greater weight and the impetus that it has received, circulates through the chill-room, and as it becomes warm ascends the uptake-shaft and again goes over the same course, which is repeated indefinitely. One advantage of forcing the air over the cooling-liquid in the opposite direction to the flow of the liquid is that a much larger amount of cooling-surface is exposed in a given time. The air, however, may be forced in the same direction as the flow of the liquid. The bottom of the cooling-pan through which the cooling-liquid returns to the tank is covered with non-conducting material. A small space is left between the ceiling and the top of the sides of this pan, as well as around the edges, so that vapors that may arise can pass over the surface of the liquids and be condensed. I prefer to use, as an auxiliary to the above system of flowing brine and forced air circulation, one or more coils of pipe, through which the brine or other cooling-fluid is forced to circulate before emptying into the brine-trough, in which it is exposed to the air of the fan-blast. I have found that the use of these cooling-pipes materially assists in the cooling process, and enables me to bring the temperature of the chill-room very low.

The accompanying drawings of a refrigerating-room provided with apparatus suitable for carrying out my invention are as follows:

Figure 1 is a top view and section of a refrigerating-room provided with an uptake and a downtake shaft joined by a cooling-flue and provided with a fan-blower, also showing the brine-reservoir and service-pipes for supplying the cooling-liquid to the injector-nozzles. The lower half of this view is a plan, and the upper half is a horizontal section on the line X X of Fig. 3, the top of the refrigerating-room being removed. Fig. 2 is a vertical longitudinal section through the line Z Z of Fig. 1. Fig. 3 is a vertical cross-section through the line Y Y of Fig. 2. Fig. 4 is a sectional view of a portion of chill-room and brine-box, together with the circulating brine-coils that I employ as an auxiliary cooling agent. Fig. 5 is a side view of one of these brine-coils.

The dimensions of the flue-pipes, &c., will vary according to the size of the refrigerating-room.

In the drawings the proportions are shown for a room eighty feet long, twenty-seven feet wide, and twelve feet high. In actual practice I have found the sizes of flue and shafts shown to be effectual in a room one hundred and sixty long and other dimensions remaining the same. For the sake of convenience the shorter length is shown.

For the above proportions I have found a flue four feet square inside, and uptake and downtake shafts each twenty-three feet by eight feet, practical.

The refrigerating or chill room A is shown in outline only. At one end there is an uptake-shaft, A′, and at the other end a similar downtake-shaft, A². Above the chill-room A is a flue of wood, B, lined with metal. At one end of this flue there enters the nozzle of a pipe, C, coming from a pump, D. At the other end of the cooling-flue B is a fan-blower, F. The brine *b*, after flowing down the flue, passes through an opening, *f*, and is collected by a trough, H, suitably supported a few inches below the ceiling, and is conducted by a pipe, L, into a tank, J, from whence it is pumped again through the injector-pipe C. The fan preferably forces a current of air drawn from the uptake-shaft A counter to the current of brine flowing through the cooling-flue B; but the fan may also be used to suck the air in the same way as the current of brine flows, or may be placed at the other end and blow the air in the same direction as the current of cooling-liquid.

L is a large pipe, through which the brine from the supply-pipe flows, and by means of which it is distributed to the coils $m\ m'\ m^2\ m^3$ by means of the pipes M M′ M² M³ and the return-pipes N N′ N² N³, which return the brine, after its circulation through the coils, to the brine-trough B, where it is subjected to an air-blast, as described. The brine only rises slightly in temperature by passing through the coils, and is perfectly adapted to its use in cooling the air blown over it, while the coils add much to the effectiveness of the apparatus.

In application Serial No. 123,225, filed by me March 6, 1884, I have explained and illustrated the general principles and mode of operation of this invention. The following are, however, new features, which are the subject-matter of my present invention: The air is made by means of a fan or other suitable means to flow over the stream of cooling-liquid, and preferably in a direction opposite to that of the current of cooling-liquid. This arrangement allows the height of the building to be much less, as no space is required for the elevated uptakes, as in my former application.

Another new feature is the improved chill-room shown in Fig. 4, in which, by the use of ice or any of the many well-known ice-machines or cold-producing engines, the brine or other liquid used to cool the air in refrigerator-buildings is easily kept at any desirably low temperature.

The brine-box or means for cooling the liquid may be in the refrigerator-room or outside.

The general details have also been modified, as will appear on inspection of the drawings.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method herein described for cooling refrigerating-rooms, consisting in circulating the air within the room by means of a fan or other equivalent mechanical blower, and carrying the air over a stream of flowing brine or other cold liquid, all substantially as set forth.

2. In the method of cooling refrigerating-rooms, the combination of the following steps, viz: circulating the air within the rooms by means of a mechanical blower, causing a stream of cold brine or other liquid to flow under and in contact with the air, and then passing the liquid through a chill-room to be cooled and returned through the refrigerating-room, as set forth, the liquid and the air each forming a complete circuit and coming in contact within the refrigerating-room.

3. In apparatus for cooling a refrigerating-room, A, the combination of a cooling-flue, B, injector-pipe C, pump D, and blower E, all as set forth.

4. The combination of cooling-flue B and collecting-trough H, situated beneath and so as to collect condensed vapors, as described.

5. In apparatus for cooling rooms, the combination of the uptake A′, downtake A², flue B, pipe C, pump D, and blower E, substantially as described.

6. The combination of the chill-room and brine-box, provided with circulating-coils, with cooling-fluid and air-circulating apparatus, as set forth and described.

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