No. 684,217.

Patented Oct. 8, 1901.

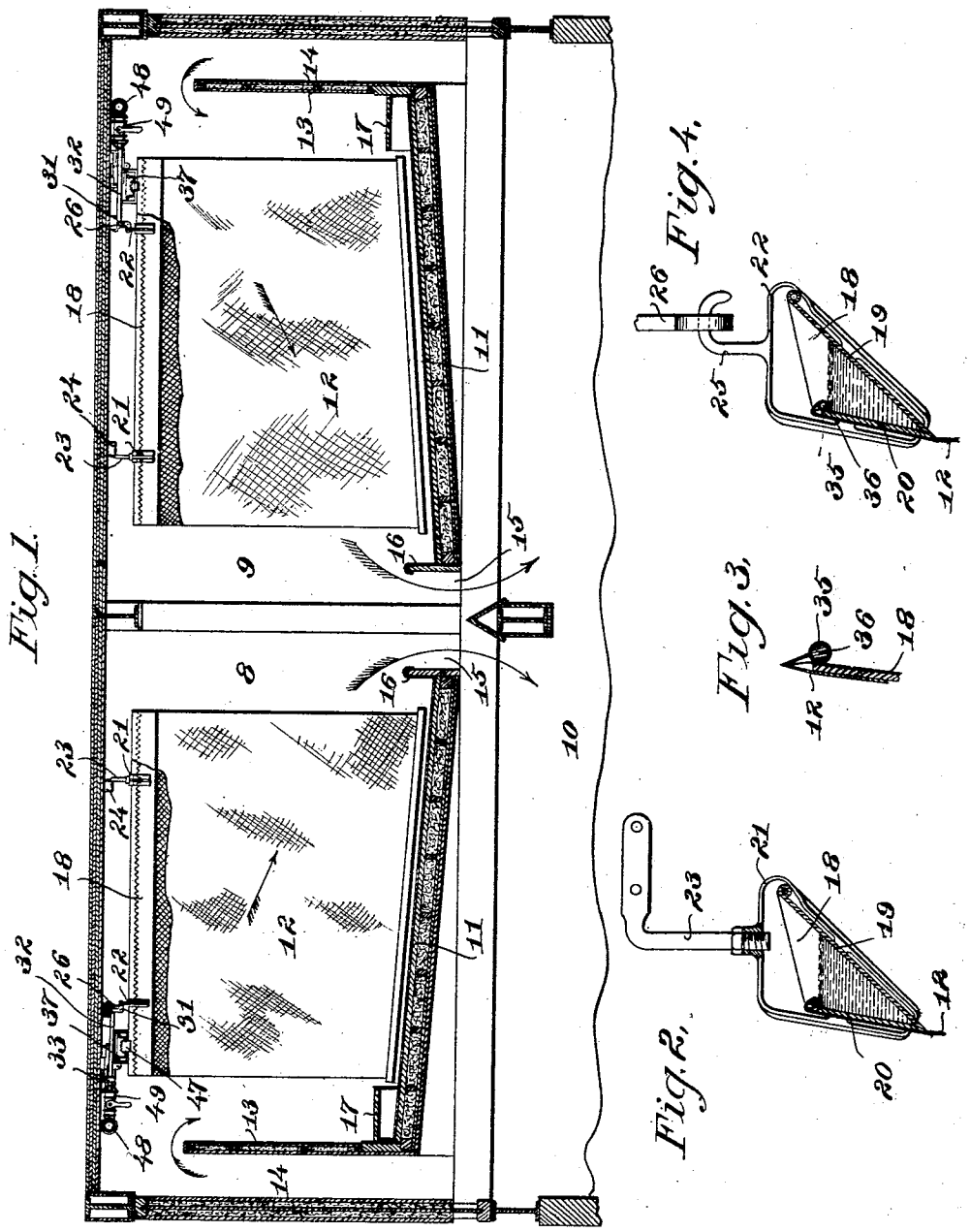
H. C. & F. J. GARDNER.

AIR COOLING APPARATUS.

(Application filed July 30, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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(No Model.) 2 Sheets—Sheet 2.

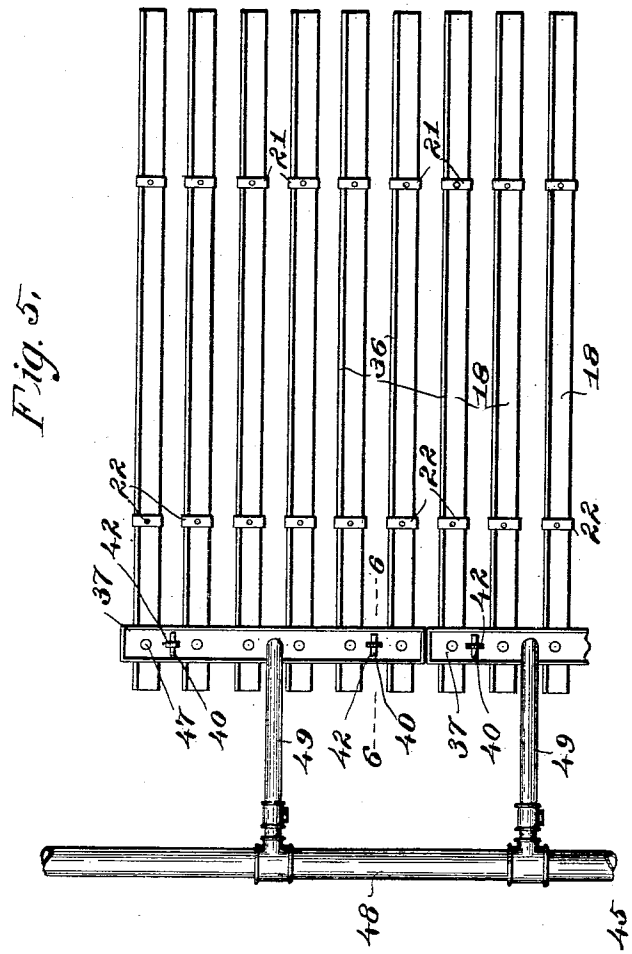

Fig. 5.

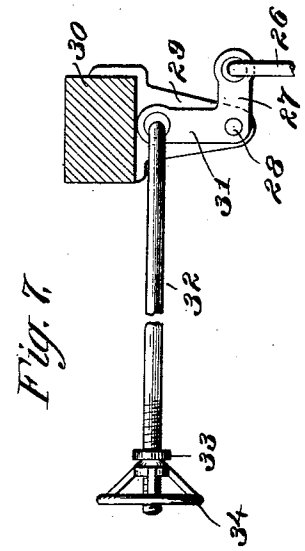

Fig. 7.

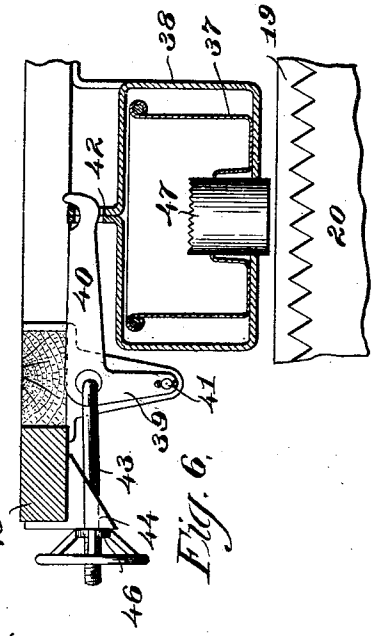

Fig. 6.

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UNITED STATES PATENT OFFICE.

HORACE C. GARDNER AND FRANK J. GARDNER, OF CHICAGO, ILLINOIS, ASSIGNORS TO SAID HORACE C. GARDNER AND GUSTAVUS F. SWIFT, OF SAME PLACE.

AIR-COOLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 684,217, dated October 8, 1901.

Application filed July 30, 1900. Serial No. 25,297. (No model.)

To all whom it may concern:

Be it known that we, HORACE C. GARDNER and FRANK J. GARDNER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Cooling Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

Our invention relates to apparatus for cooling air by exposing it to contact with cold brine, preferably at a temperature below freezing, so that the air will be cooled without becoming laden with moisture and will be suitable for use in packing-houses and similar establishments. In apparatus of this character it has been proposed to pass the air through passages formed by a series of parallel sheets suspended in a suitable chamber, the sheets being kept continually moistened by cold brine supplied from above. Our invention relates to apparatus of this character, and has to do with the devices for suspending the sheets and for supplying them with brine, and also provides for the adjustment and regulation of the devices for moistening the sheets.

What we regard as our invention will be set forth in the claims.

In the accompanying drawings, Figure 1 is a vertical section of a portion of a packing-house, illustrating chambers containing the air-cooling apparatus and the upper part of the refrigerating-chamber in which the meat is stored and cooled. Fig. 2 is a vertical section of one of the brine-troughs and the upper part of one of the sheets, illustrating the manner of supporting the sheets and supplying the brine thereto. Fig. 3 is an enlarged detail, being a sectional view of one side of one of the troughs and the upper end of one the sheets. Fig. 4 is a vertical section of one of the brine-troughs, illustrating also the adjusting devices for adjusting said trough. Fig. 5 is a plan view of a series of troughs and the brine-supplying devices therefor. Fig. 6 is a section on line 6 6 of Fig. 5, and Fig. 7 is an enlarged view illustrating the adjusting devices of one of the brine-troughs.

In the apparatus illustrated each set of air-cooling apparatus comprises a number of sheets arranged in parallelism and suspended from a corresponding number of longitudinal V-shaped troughs. Said troughs are supplied with brine from a series of tanks arranged transversely to said V-shaped troughs, which are in turn supplied from a suitable conduit leading from a suitable source of supply and provided with branch pipes which discharge into said tanks. The troughs, as well as the tanks, are supported by overhead devices, one being provided near each end of said troughs and tanks, one of said suspending devices of each pair being arranged to be vertically adjustable, so that the said troughs and tanks may be adjusted either to bring them into a horizontal position or to tilt them slightly to regulate the flow of the brine contained in them. The sheets are suspended from the V-shaped troughs by folding the upper edge of the sheet over the upper edge of one of the sides of the trough to which it is attached, the edge over which the sheet is folded being serrated or notched to permit the brine contained in it to flow out through said notches to the sheet. For the purpose of causing the sheet to hang closely in contact with the side of the trough over which it extends said side is inclined from the vertical and toward the opposite side of the trough. The result is that that portion of the sheet which projects above the apex of the trough is also inclined from the vertical and lies closely in contact with the surface of the side of the trough, being held so by its own weight. The upper edge of the sheet is provided with a rod or other equivalent device, which is placed in a hem or pocket formed to receive it, said rod serving to prevent the accidental detachment of the sheet from the trough when it is folded over the serrated edge thereof. The sheet may, however, readily be removed by simply raising the rodded edge thereof.

In Fig. 1 we have illustrated two sets of air-cooling apparatus, showing how they are usually arranged in packing-houses, since it is frequently found advantageous to arrange said sets of apparatus in pairs, as shown; but that is not essential, as a single set may

be advantageously employed where the capacity desired is not great enough to warrant the use of duplicate sets.

Referring to the drawings for a more detailed description of our improved apparatus, 8 9 indicate air-cooling chambers arranged at opposite sides of the house and above a refrigerating-chamber 10, which, as shown in Fig. 1, is on the floor below. Inasmuch as each of the chambers 8 9 and the apparatus in it is identical with the other, the only difference being that they are oppositely arranged, it will be unnecessary to describe them separately, and similar parts will be indicated by the same reference-numerals.

11 indicates an inclined floor in the air-cooling chamber, arranged to receive the drippings from the sheets 12, which are suspended in a parallel series above it.

13 indicates a partition which extends from the upper end of the floor 11 to a point near the ceiling of the chamber. Said partition is placed a short distance from the wall of the building, providing an air-passage 14, through which the warm air enters, the arrangement being such that the warm air entering through passage 14 passes over the top of the partition 13 and then between the sheets 12, where it is cooled, thence passing out through a passage 15 at the lower end of the floor 11. The passage 15 leads directly to the refrigerating-room 10. At the lower end of the floor 11 there is a flange 16, forming a gutter to carry off the brine.

17 indicates a runway at the upper end of the floor 11, between the partition 13 and the adjacent ends of the sheets. Said runway is provided for the convenience of the attendant who has charge of the apparatus.

18 indicates the V-shaped troughs, from which the sheets 12 are suspended, the sides of said trough being indicated by numbers 19 and 20, respectively. For convenience of reference the side 19 will be termed the "front" side and the side 20 the "rear" side. It will be understood, however, that such terms are purely arbitrary in this connection. As shown in Figs. 2 and 4, the trough 18 is carried in brackets 21 22, which are suitably shaped to embrace the sides of said trough, said brackets being arranged near opposite ends of the trough, as shown in Figs. 1 and 5. The bracket 22 is placed at what may be termed the "outer" end of the trough—that is to say, the end nearer the runway 17—while the bracket 21 is placed at the opposite or "inner" end thereof. The bracket 21 is supported by a rod 23, secured to a beam 24 or other fixed part of the building, said rod being screwed into said bracket, as shown in Fig. 2, thus providing for adjustment, if necessary. The bracket 22 is provided with a hook 25, which connects with a link 26, the upper end of which is connected to the horizontal arm 27 of a bell-crank lever mounted on a pivot 28, carried by a hanger 29, secured to a beam 30, the ceiling, or other suitable support. The vertical arm 31 of said bell-crank lever has connected with it a rod 32, the outer end of which passes through a fixed support 33, secured to the ceiling, and carries a hand-wheel 34, screw-threaded on its end, as shown in Fig. 7. By adjusting the hand-wheel the bell-crank lever may be rocked, moving the link 26 upward or downward, and consequently raising or lowering the outer end of the trough 18. The flow of the brine in said trough may therefore be accurately controlled. It will be understood that each trough 18 is provided with the adjusting devices just described, and the hand-wheels 34 are all arranged over the runway 17, so that the attendant can conveniently reach them, and thereby regulate the operation of the cooling apparatus at pleasure.

As shown in Figs. 2, 3, and 4, the upper edge of the rear side 20 of the trough 18 is serrated, so that by keeping the trough filled with brine to the level of the depth of the serrations the brine may escape through them, flowing down the outer surface of the rear side of the trough. As also shown in said figures, the rear side of the trough is inclined from the vertical toward the front side of the trough, and the upper edge of the sheet 12 lies in contact with the outer surface of said rear side 20, the upper edge of said sheet being folded over the serrations. To prevent the accidental release of the sheet, it is provided in its upper edge with a longitudinal pocket or hem 35, in which is placed a rod 36, as best shown in Fig. 3, said rod lying on the inside of the trough when the sheet is in place. By this construction it is held closely in contact with the rear side of the trough and receives all the brine which passes through the serrations. The lower portion of the sheet hangs vertically from the apex of the trough and by its weight serves to hold the upper portion of the sheet in contact with the side 20 thereof.

The troughs 18 are supplied with brine from transversely-arranged tanks 37. (Shown in Fig. 5.) Each of said tanks 37 preferably extends over six of the troughs 18; but they may be longer or shorter, as desired. Said tanks are carried by frames 38, which embrace them, as shown in Fig. 6, one of said frames being adjustably supported in somewhat the same manner as the bracket 22, already described. The suspending devices for said adjustable frame 38 are shown in Fig. 6 and consist of a bell-crank lever having a vertical arm 39 and a horizontal arm 40, said lever being pivotally supported upon a pivot 41, on which the arm 39 is mounted at its lower end. The arm 40 of said lever is hooked into an ear 42 at the upper portion of the frame 38. A connecting-rod 43 is secured to the elbow of the bell-crank lever, as shown, and its opposite end passes through a block 44, secured to a beam 45 or to some other suitable fixed support, and carries a hand-wheel 64, screwed upon it. By adjusting the

hand-wheel the positions of the arms 39 40 of the bell-crank lever may be adjusted and the inclination of the tank 37 varied. The hand-wheels 46 also are placed so as to be conveniently accessible to the attendant from the running-board 17, as shown in Fig. 1. The brine in the tank 37 is discharged into the V-shaped troughs 18 through nozzles 47, the upper edges of which are serrated, as shown in Fig. 6. Said nozzles are arranged over the troughs 18, as shown in Fig. 5, and discharge into them as the brine in the tanks 37 overflows the upper edges of said nozzles. Brine is supplied to the tanks 37 from a conduit 48 through branch pipes 49, as shown in Fig. 5.

We have described our improvements in detail as illustrated; but it should be understood that our invention is not restricted to the details described, except in so far as such details are specifically claimed, our invention including various modified arrangements and the use of equivalent devices.

That which we claim as our invention, and desire to secure by Letters Patent, is—

1. In an air-cooling apparatus, the combination of a trough adapted to contain a suitable liquid, said trough having passages in its upper edge for the discharge of the liquid, and a sheet suspended from the said upper edge of the trough and overlying said passages, the upper portion of said sheet projecting above the level of the liquid in said trough, substantially as described.

2. In an air-cooling apparatus, the combination of a trough having one of its upper side edges serrated, means for supplying a cooling liquid to said trough, and a sheet suspended from the serrated edge of said trough and in close contact with the side thereof so as to receive the liquid discharged therefrom as it escapes from the serrations, substantially as described.

3. In an air-cooling apparatus, the combination of a trough, means for supplying a cooling liquid thereto, one of the upper side edges of said trough being serrated to provide for the discharge of the liquid therefrom, and a sheet suspended from said trough in contact with the serrated portion thereof so as to receive the discharged liquid as it escapes from the trough, the upper edge of said sheet being folded over the serrated edge of the trough from which it is suspended, substantially as described.

4. In an air-cooling apparatus, the combination of a trough, means for supplying a cooling liquid thereto, one of the upper side edges of said trough being serrated to provide for the discharge of the liquid therefrom, a sheet suspended from said trough in contact with the serrated portion thereof so as to receive the discharged liquid as it escapes from the trough, the upper edge of said sheet being folded over the serrated edge of the trough from which it is suspended, and a rod in the folded-over edge of said sheet, substantially as described.

5. In an air-cooling apparatus, the combination of a trough, means for supplying a cooling liquid thereto, a sheet suspended from the upper edge of said trough and hanging in close contact with one side thereof, the side of said trough adjacent to the sheet being inclined so that the upper edge of the sheet projects over the lower edge of said side of the trough, whereby the action of gravity will cause the sheet to lie closely in contact therewith, and means for supplying a cooling liquid to said trough, said trough having passages for the discharge of the liquid therefrom upon said sheet, substantially as described.

6. In an air-cooling apparatus, the combination of a V-shaped trough, one of the sides of said trough having a serrated upper edge, and a sheet suspended from said trough and receiving the discharged liquid, the upper edge of said sheet being folded over the serrated edge of the trough, the upper portion of the sheet hanging in close contact with the side of the trough having the serrated edge, substantially as described.

7. In an air-cooling apparatus, the combination of one or more troughs, means for supplying a cooling liquid thereto, sheets receiving the cooling liquid from said troughs, and means for vertically adjusting one end of each of said troughs to vary the longitudinal inclination of the troughs with reference to a horizontal plane, substantially as described.

8. In an air-cooling apparatus, the combination of a plurality of troughs, sheets carried thereby receiving the liquid discharged therefrom, a feed-trough extending transversely of said first-mentioned troughs, means for vertically adjusting one end of each of said first-mentioned troughs, and means for vertically adjusting said feed-troughs, substantially as described.

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