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E. BURHORN

COOLING TOWER

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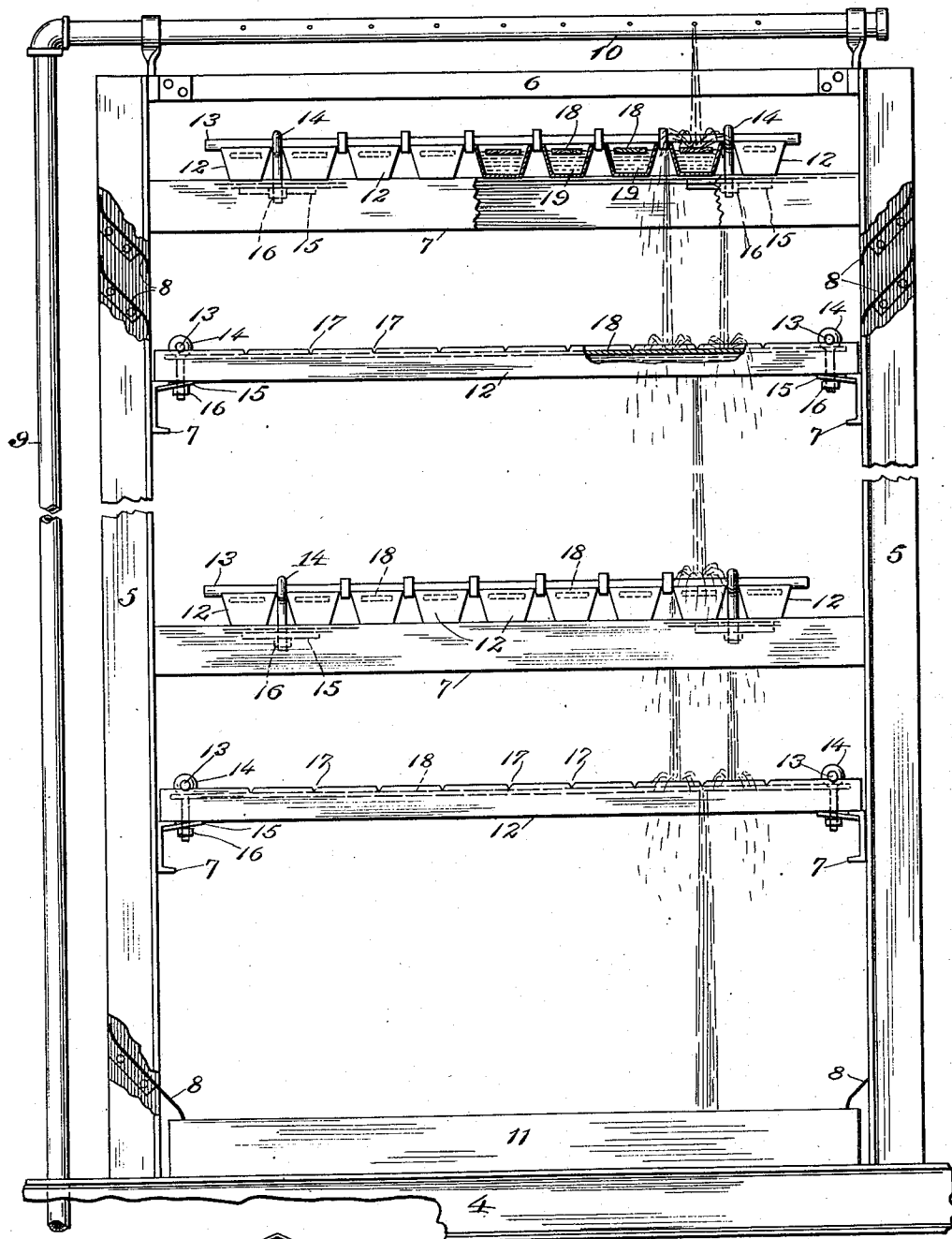


Fig. 1.

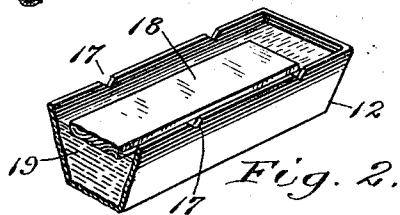


Fig. 2.

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COOLING TOWER.

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This invention relates to cooling towers, referring especially to structures used for bringing about the cooling of warm water by utilization of natural air currents, although the novel features could be employed with any cooling towers in which are series of superposed cooling decks, each consisting of water troughs or vessels and arranged for distribution or spilling from each deck into the troughs of the next deck below. Outdoor cooling towers of this type are well known, consisting for example of an open upright frame supporting the successive decks, and a convenient instance of such a tower is my prior Patent Number 1,443,974 of February 6, 1923, this tower showing water troughs formed with notches for directing the overflow into the troughs beneath, although the present invention could be used with other types of troughs, for example, as seen in my prior Patent Number 1,014,371 of January 9, 1912.

The general object of the present invention is to improve the efficiency and cooling effect of towers of the kinds above referred to. A particular object is to improve efficiency by increasing the rate of evaporation of the warm water and by increasing the breaking up and distribution of the descending water. A notable objection to prior towers has been the extent of agitation of the water standing in each trough, thus interfering with the intended uniform overflow and causing unequal distribution of the descending water, which exists in all prior towers, especially in those having troughs without overflow notches. The objection is accentuated by the effect of a strong wind current, since this tends to displace the falling water toward one side of the tower and one function of the troughs in each deck is to receive and redistribute the water, which will not be done properly if the surface of the water in each trough is too greatly agitated; and it is an object of this invention to overcome this difficulty. Other objects and advantages of the present improvement will be explained in the hereinafter following description or will be understood to those skilled in the subject. To the attainment of such objects and advantages the present invention consists in the novel cooling tower and the novel features of construction, operation, combination, arrangement and detail herein illustrated or described,

In the accompanying drawings Fig. 1 is a side elevation of a cooling tower embodying the features of the present invention, the same broken away in height to condense the drawing, and broken away elsewhere to show details.

Fig. 2 is a perspective view of a short section of one of the troughs shown in Fig. 1.

Some of the well known general parts of a cooling tower, as shown herein, and for example in said prior Patent Number 1,443,974, may be as follows. Above a base are indicated tower uprights 5. There may be one of these at each of the four corners of a square tower, and they may be interconnected by braces or cross beams 6 at the top and other cross beams 7 at other points, the latter of which may be used also for supporting the cooling decks, to be described. The space within the tower may be surrounded by a system of louvers 8, extending from upright to upright, controlling the air flow, and minimizing loss of water. A pipe 9 is shown conducting warm water to a perforated distributed pipe 10 at the top, the apertures of which discharge the water downwardly and laterally to the troughs of the decks to be described, the water eventually being received in a collecting vessel 11 at the bottom.

Four cooling decks are shown, although the number may be increased indefinitely. Each deck is shown as comprising a system of overflow troughs 12. These may be arranged in close formation, with their ends resting on the cross beams 7 of the frame. To hold the troughs in place each series may have overlying it a pair of hold down rods 13 passing through the apertures in eye-bolts 14, which bolts extend downwardly through washers 15, underlying the flanges of the cross beams 7, and with nuts 16 at the lower ends of the bolts, securing the whole in place.

Referring to the troughs or overflow vessels 12 these are shown of the preferable type in which notches 17 are formed along the rims or edges of the troughs to direct the overflow at specific points. In this way the overflow from one deck or series of troughs can be directed into the troughs of the deck below, as clearly seen in the accompanying drawings and illustrated in the prior patent.

The novel feature of the present invention may be described as consisting in the combination of the described elements, or some of

them, or their equivalents, with a flat member, slat or the like, overlying or arranged above the water in each trough. While this special slat or member might be mounted in various ways to serve the purpose it is preferably a buoyant member floating upon the surface of the water. Thus the drawings show a series of floating members or slats 18 resting upon the surface of the water 19 in the several troughs. This principle of a system of overflow troughs or vessels containing floating members or slats is the preferred embodiment of the present invention. Specifically the floating members 18 may take the form of flat wooden slats, of a size somewhat shorter and narrower than the vessel or trough, so as to float loosely upon the surface of the water, with ample margins or spaces at the sides and ends. As an example the troughs may be metal troughs $1\frac{1}{2}$ " deep, $2\frac{1}{2}$ " wide at the top and $1\frac{1}{2}$ " wide at the base, the upper edges provided with notches as indicated in Fig. 2, and the wooden slats being of a size about $1\frac{1}{2}$ " wide x $\frac{1}{4}$ " thick, and of a suitable length to extend substantially to the ends of the troughs, although the slat may be in sections if desired.

This novel construction attains the objects first mentioned. The slats themselves are always in wetted condition and exposed to evaporation, thus improving evaporation. The breaking up of the water is improved because of the spattering effect caused by the impact of the descending water upon the wooden surface, causing it to scatter in small drops as indicated on the drawings. The avoidance of the agitation of the surface of the water is attained because each slat overlies the water surface and protects it from the impact. For this reason the water itself is comparatively still, and is able to assume a level condition from end to end and side to side. This insures even overflow around all parts of the trough. Therefore any tendency of the water toward one side of the tower, due to strong wind or otherwise, is corrected by the even redistribution brought about by the uniform overflow from the troughs. Practical use of this invention has demonstrated that the degree of cooling of

warm water is thereby increased by a substantial percentage.

It will thus be seen that I have described a cooling tower embodying the principles and attaining the advantages of the present invention; and as many matters of type, design, combination, arrangement and structure may be variously modified without departing from the principles, it is not intended to limit the invention to such matters except so far as set forth in the appended claims.

What is claimed is:

1. In a cooling tower a series of distributing decks each discharging through the intervening air space to the deck below, comprising a series of overflow troughs arranged to receive the descending water from the deck above, and a flat, longitudinal, movable member arranged in each trough to receive directly the impact of falling water and cause spattering thereof.

2. In a cooling tower a deck comprising distributing vessels arranged to receive falling water from above and redischARGE it, and floating members in said vessels covering a large part of the water surface in each vessel and arranged to receive and scatter water falling from above.

3. A cooling tower comprising an overflow vessel and a floating member covering a large part of the water surface therein, and means above said vessel for discharging water thereupon.

4. A cooling tower having water distributing means at the top, and therebelow a deck comprising a system of overflow troughs in the path of the descending water and having loosely floating members therein covering a large part of the water surface.

5. A cooling tower having a deck comprising a system of overflow troughs, each having a slat floating therein and covering a large part of the water surface, and means above such deck for discharging water thereupon.

In testimony whereof, I have affixed my signature hereto.

EDWIN BURHORN,