May 2, 1933. G. T. MARTIN 1,907,330

COOLING TOWER

Filed May 2, 1930

Fig. 2.

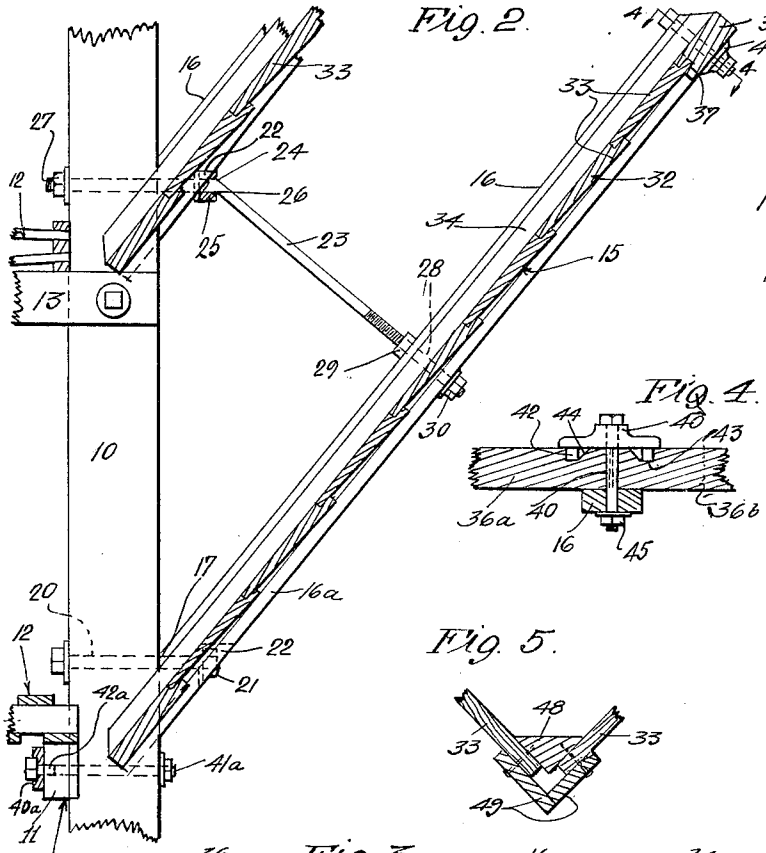


Fig. 1.

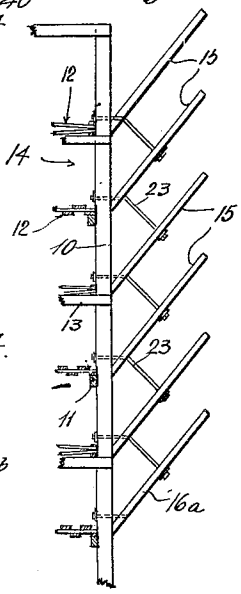


Fig. 4.

Fig. 5.

Fig 6.

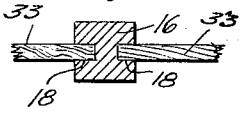
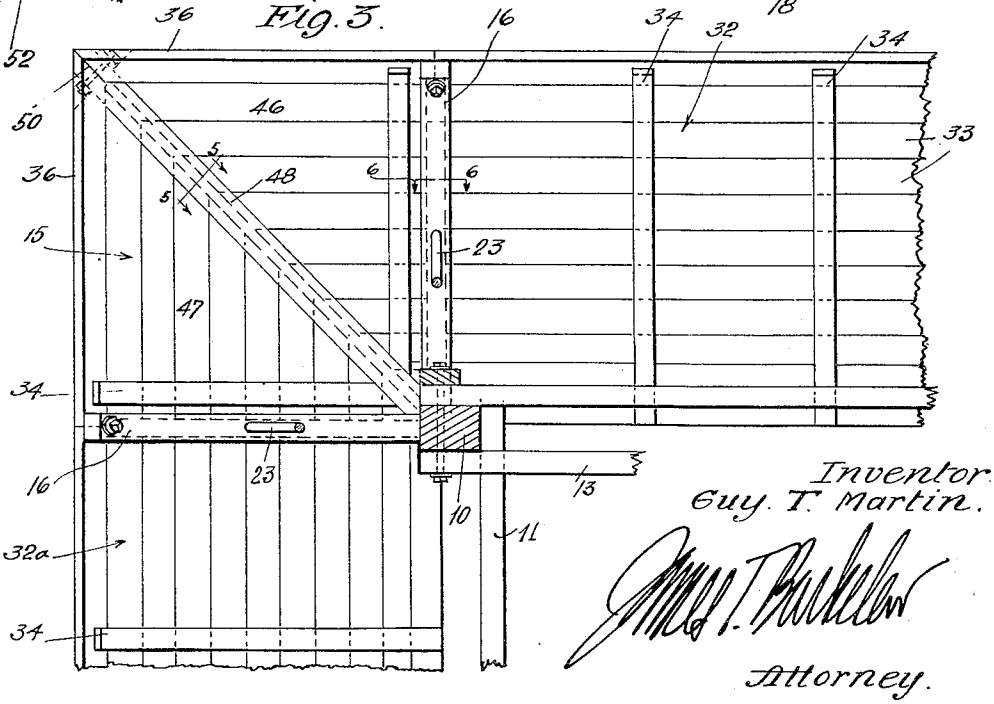


Fig. 3.



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1,907,330

UNITED STATES PATENT OFFICE

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COOLING TOWER

Application filed May 2, 1930. Serial No. 449,200.

This invention has reference to atmospheric cooling towers, and is concerned mainly with the construction of louvers and mountings for supporting them on the cooling tower frame work.

The present louver construction and mountings are of the type in which the louvers are carried on inclined brackets which extend upwardly and outwardly from the tower frame columns, and which are supported from the column both at their lower ends and at intermediate points above their lower ends. In this respect, the present construction is similar to that described in Patent No. 1,632,397, issued June 14, 1927, to J. S. Fluor. In accordance with the invention, I have provided improvements in louver mountings of this type, involving the use of supporting means for the vertically spaced louver brackets, which supporting means serves the dual purpose of adjustably supporting the bracket at an intermediate longitudinal point, and of joining the bracket next above, to the frame column, thereby obviating the necessity for using separate means for joining the lower ends of the brackets to the columns and for supporting them at points above their junctures with the columns. Certain additional improvements are made in louver mountings, whereby the louvers at the corners of the tower are rendered self-supporting.

A further purpose of the invention is to provide an improved joint between abutting members, which will preclude the possibility of the members becoming loose or pulling apart at the joint, and which will serve, in addition, to draw the members together as the joint is taken up.

The above and additional objects and features of the invention, as well as the various details thereof, will be discussed more fully and to best advantage in the following detailed description of a typical and preferred embodiment of the invention. For purposes of description, reference is had to the accompanying drawing, in which:

Fig. 1 is a diagrammatic elevational view showing a vertical section of a cooling tower louver wall embodying the present type of louver mountings;

Fig. 2 is a fragmentary enlarged and detailed view showing a typical pair of vertically spaced louvers, and the method for mounting the louvers on the tower frame;

Fig. 3 is a fragmentary enlarged plan view showing the louver construction and mounting at the corner of the tower;

Fig. 4 is an enlarged detailed section on line 4—4 of Fig. 2 showing my improved form of rail joint;

Fig. 5 is an enlarged section on line 5—5 of Fig. 3; and

Fig. 6 is a fragmentary enlarged section on line 6—6 of Fig. 3.

In the drawing, I have shown only certain parts of the tower frame work upon which the louvers are mounted, since the frame construction in towers of the present type is more or less standardized, and the relation of the illustrated members to the remaining parts of the tower will be readily understood by those familiar with the art. Also, since the arrangement of the louvers on cooling towers is commonly known, an illustration and description of a typical louver assembly constructed in accordance with the invention, will serve to make obvious the applicability of the hereinafter described features to the louver construction and mounting throughout the tower.

In the drawing, I show the cooling tower frame to comprise supporting columns 10 which, according to the usual construction, are arranged in series longitudinally of the tower, and vertically spaced and horizontally extending chords 11 which serve to support alternate decks 12. Extending transversely of the tower are horizontal members 13 upon which the remaining alternate decks rest. Although the deck construction comprises no part of the present application, it may be mentioned that preferably the decks are of the staggered slat type described in the hereinabove mentioned Patent No. 1,632,397, to J. S. Fluor, or of the type described in my copending application, Ser. No. 449,201, on atmospheric cooling tower, filed on even date herewith. As is well known, the

decks serve to cause the warm water distributed over the uppermost deck by suitable means (not shown) to become intimately exposed to the air currents in flowing downwardly through the decks and through the vertical series of cooling chambers 14 defined by the decks.

Mounted on the outside of columns 10 is a series of vertically spaced louvers 15, there being a horizontal series or tier of louvers surrounding the tower at the outside of each cooling chamber 14, the lower ends of the louvers of a given tier terminating substantially at the lower deck defining the respective cooling chamber. The louvers thus serve to direct atmospheric wind currents horizontally through the chambers between decks, and also, by virtue of their inclined arrangement, to prevent the wind currents from carrying water out of the tower.

In Fig. 2 I have shown in detail the construction and mounting of the lowermost pair of louvers in the vertical series. Generally speaking, each tier of louvers is comprised of a series of panels removably carried on inclined supporting brackets which extend upwardly and outwardly from each frame column 10. Each louver supporting bracket comprises an elongated member 16, the lower end of which is beveled as at 17 to abut against the frame column, and the sides of which are grooved longitudinally throughout their length as at 18, see Fig. 6. It will be understood that on the outside of each column 10 will be mounted a series of vertically spaced and alined brackets of the described construction. The lowermost bracket 16*a* of each vertical series is secured to the column by means of a bolt 20, the nut 21 on which is seated within an outside recess 22 in the bracket.

The brackets thereabove, however, are joined to the column at their lower ends by means of the series of louver hangers, which I will now describe. In accordance with the invention I have provided bracket supporting means which serves to join the lower end of the upper bracket of a given pair to the column, and also to support the lower bracket of the pair at an intermediate longitudinal point. Thus, as shown in Fig. 2, the upper bracket immediately above the lowermost bracket 16*a* is joined to the column by means of a bracket supporting rod 23 which extends horizontally through the post and the bracket, and thence downwardly to connect with the lower bracket. Rod 23 is bent at 24 so as to extend downwardly and outwardly in a line substantially normal with the plane of the louver. A bearing ring 25 is carried on rod 23 and is seated within recess 22 so as to bear against the outer side of the bracket. The outer end of bearing ring 25 engages the downwardly sloping portion of the rod at the bend 24, and preferably the outer end face of the ring is curved as at 26 in order to permit angular adjustment of the louver, as will be described, without binding. The column and bracket joint is taken up by tightening nut 27 on the inner end of the rod.

The outer end of the supporting rod 23 extends through a bore in the bracket, as at 28, this portion of the rod being threaded for a considerable length, and the bracket being securely joined thereto by nuts 29 and 30 threaded on the rod and bearing against the inner and outer sides of the bracket respectively. Thus in case it is desired to adjust the angular position of the bracket, for example for the purpose of "truing up" the various louver sections of the tower, nuts 29 and 30 may be adjusted within such limits as will permit substantial variations in the position of the louver.

The louver panels 32 are made up of horizontally extending and overlapping boards 33 which are held together by cleats 34. Panels 32 are mounted between horizontally spaced brackets 16 by inserting the ends of the panel within the longitudinal grooves in the sides of the bracket, this being done by inserting the panel in the upper ends of the grooves and it sliding downwardly therein. Extending along the upper edge of each louver panel is a railing 36 of slightly greater length than the panel and joined to the panel by cleats 34, the lower edge of the railing being grooved as at 37 to receive the upper edge of the panels. The panel and rail assemblies are secured to the brackets by joints at the abutting ends of adjacent rail lengths as will later be described. In assembling the louver structures, the supporting brackets may be mounted on the columns independently of the panels, and the latter thereafter inserted in the brackets by a simple operation. If for any reason it should be desired to remove or replace the panels, this may be easily done by disconnecting the railing sections 36 and sliding out the panels.

The louver railing 36 comprises a series of elongated members substantially in end to end engagement, each of such length that it overlaps two or more of the louver panels 32. By the present invention I have provided a joint which is particularly satisfactory for tying together the rail members at their abutting ends, and which may be applied with equal advantage for joining together other abutting members of the cooling tower structures, as will be mentioned later. This type of joint is shown in detail in Fig. 4, wherein the ends of rail sections 36*a*, and 36*b* are shown to come together at the point of connection of the railing with the bracket at the upper end of the latter. The joint comprises what may be termed a clamping washer 40 caried on bolt 41 extending between the ends of the rail members and through the bracket 16. Washer 40 overlaps the rail members;

and has on its inner face a pair of projections or lugs 42 which engage the rail sections and serves to hold them together when the joint is taken up. Holes 43 are drilled in each of the rail members at distances from the ends of the members corresponding substantially to the distance of lugs 42 from the center of the washer. Preferably webs 44 are formed on the washer at the inner sides of the lugs, the edges of the webs extending diagonally inward to the inner surface of the washer. In making up the joint, rail members 36*a* and 36*b* are brought sufficiently close together that projections 42 on the washer can be partially inserted into openings 43. Thereafter, upon tightening nut 45, and as washer 40 is brought to engage the outer surface of the railing and lugs 42 to be entirely inserted within opening 43, webs 44 are caused to bite into the rail members at the inner sides of openings 43. Because of the diagonal shape of the webs, there is a slight amount of slippage between them and the members as the webs bite into the wood, which results in the rail sections being drawn together to the point at which the ends thereof will be in tight engagement. The openings 43 will of course be of sufficiently larger diameter than the projections to accommodate this slight amount of take up. Thus the joint serves not only to secure the rail members against parting, but also to draw them tightly together.

As previously mentioned, this same type of joint may be used for tying together other abuting members in the tower structure, such as horizontal frame members, hand rails, etc. For example, in Fig. 2 I show such a joint at 52, where two lengths of the longitudinal chords 11 come together at one of the columns 10. The end portion of one only, however, is shown in the drawings, but the construction will be apparent in view of the description of the railing joint. Here two abutting members 11 are joined together by the overlapping clamping washer 40*a*, bearing against the inner surface of the member and carried on bolt 41*a* extending between the members and through the column. It will be understood that washer 40*a* is of similar nature to washer 40, and that on its inner surface are lugs 42*a* engaging the end portions of the abutting members.

In Fig. 3 I show an improved corner construction for the louvers, by which the use of bracket supports at the juncture of the triangular corner louver panels is dispensed with, thereby rendering these panels partially self-supporting. The sides of the triangular corner panels 46 and 47 adjacent panels 32 and 32*a*, and extending along the side and one end of the tower, are supported by brackets 16, the ends of the corner panels terminating in longitudinal grooves therein as previously described. The diagonally extending edges of the corner panels are joined together by means of inner and outer cleats 48 and 49, see Fig. 5, extending substantially the full length of the diagonal edges of the panels, and nailed together through the panels as indicated. The louver railings 36 are joined together at the corner of the louvers as at 50. Thus by tying the corner louvers together along their diagonal edge in the manner described, no direct support from the columns is required other than that provided by brackets 16, thereby obviating the necessity for using additional brackets at the corners, as in previous constructions.

I claim:—

1. In a cooling tower, the combination comprising, a vertical column, a louver supporting bracket extending upwardly and outwardly from said column, and a single louver hanger rod extending horizontally through said column and thence angularly downward through said bracket and at substantially right angles therewith, and means for securing the bracket to said rod.

2. In a cooling tower, the combination comprising, a vertical column, a louver supporting bracket extending upwardly and outwardly from said column, and a single louver hanger rod extending horizontally through said column and thence angularly downward through said bracket at substantially right angles therewith, the lower portion of said rod being threaded, and a pair of nuts on said rod at opposite sides of the bracket.

3. In a cooling tower, a vertical column, a pair of vertically spaced louver supporting brackets extending upwardly and outwardly from said column, and a single bracket supporting rod extending horizontally through said column and through the lower portion of the upper bracket and extending downwardly through the lower bracket and at substantially right angles therewith.

4. In a cooling tower, a vertical column, a pair of vertically spaced louver supporting brackets extending upwardly and outwardly from said column, and a single bracket supporting rod extending horizontally through said column and through the lower portion of the upper bracket, said rod having an inclined portion extending downwardly through the lower bracket, and a bearing ring on said rod at the upper end of said inclined portion, engaging the outside of said upper bracket.

In witness that I claim the foregoing I have hereunto subscribed my name this 26th day of March 1930.

GUY T. MARTIN.