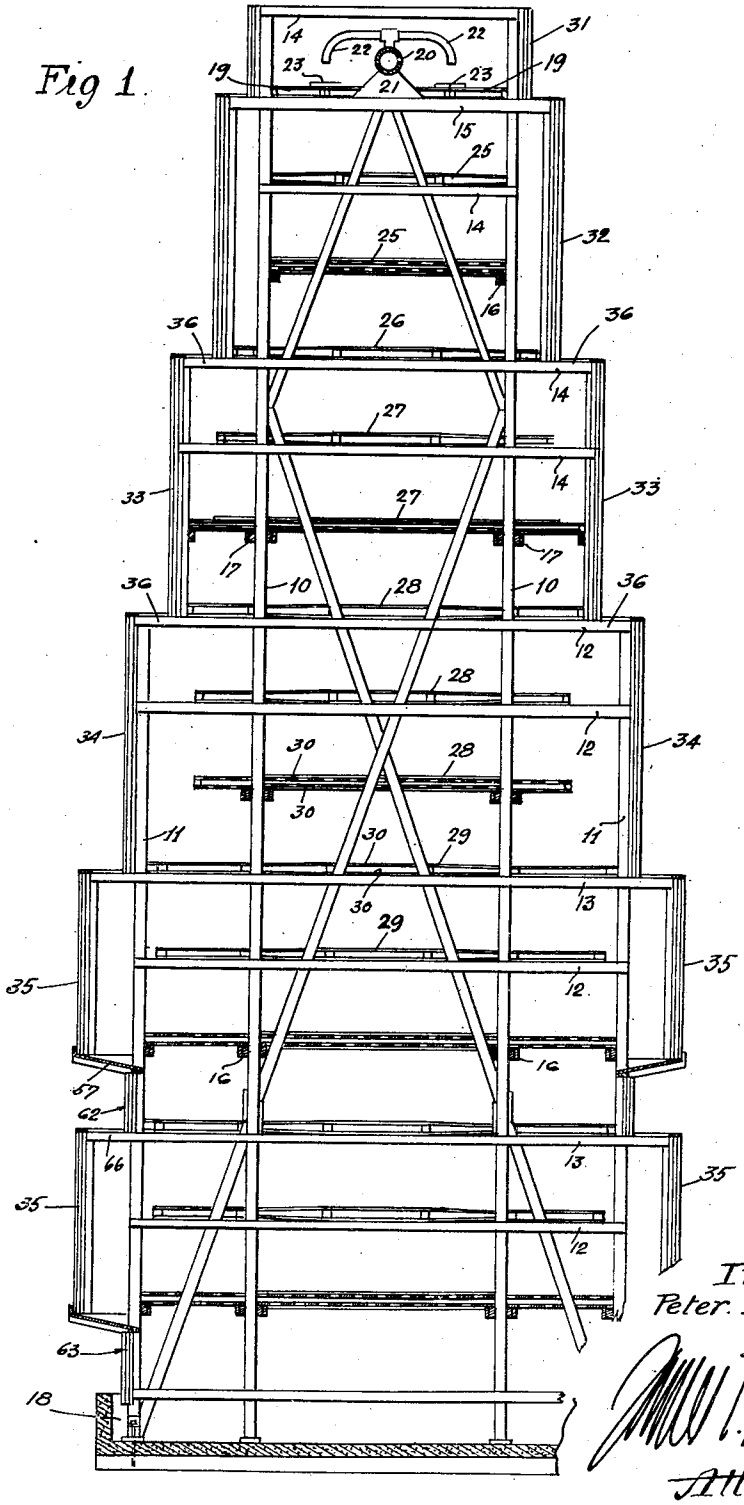
July 4, 1933. P. E. FLUOR 1,916,724

ATMOSPHERIC COOLING TOWER

Filed July 5, 1932 4 Sheets-Sheet 1

Fig 1.



Inventor
Peter E. Fluor.

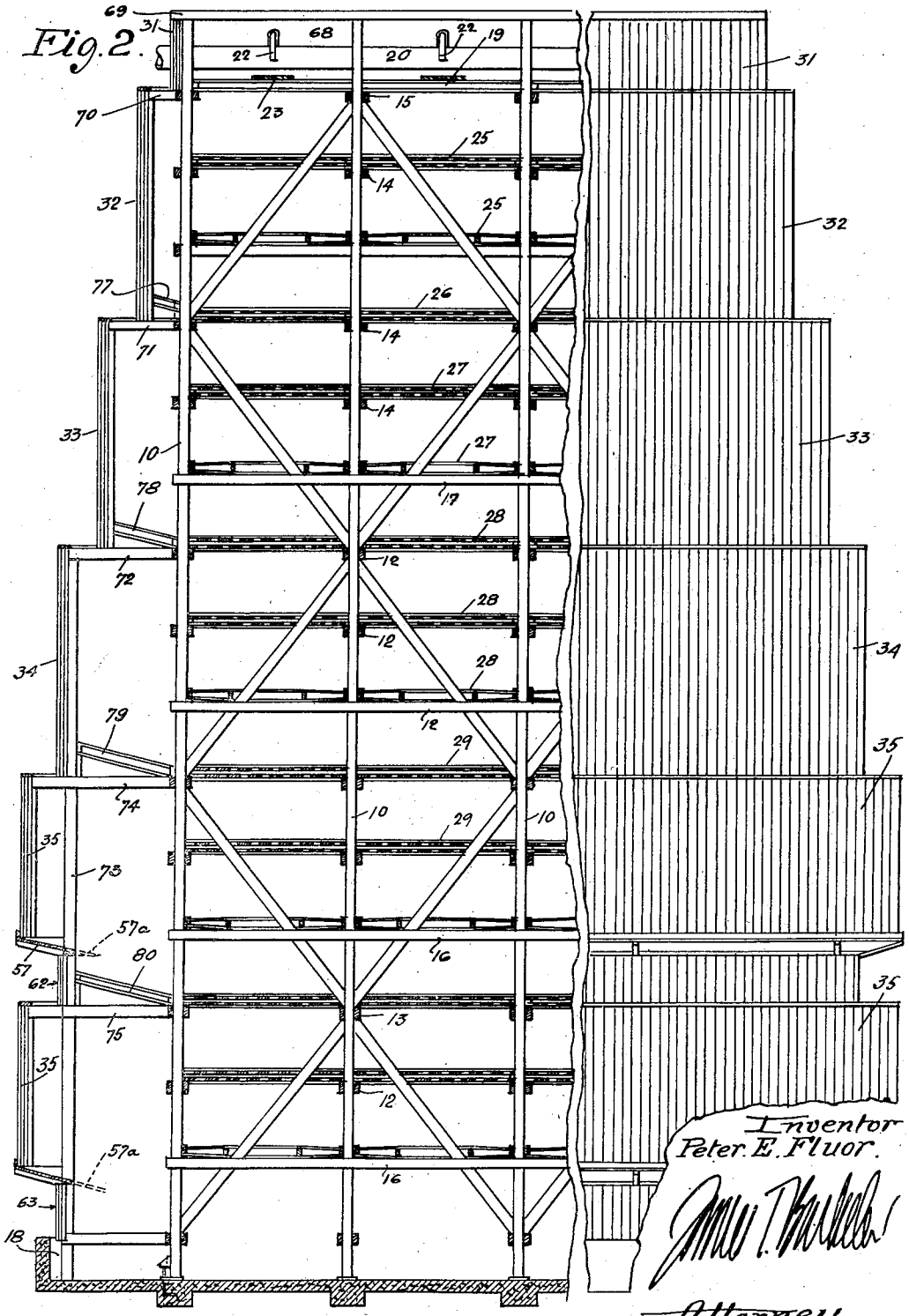
Attorney.

July 4, 1933. P. E. FLUOR 1,916,724

ATMOSPHERIC COOLING TOWER

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Fig. 2.



Inventor
Peter E. Fluor.

Attorney.

July 4, 1933. P. E. FLUOR 1,916,724

ATMOSPHERIC COOLING TOWER

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Fig. 3.

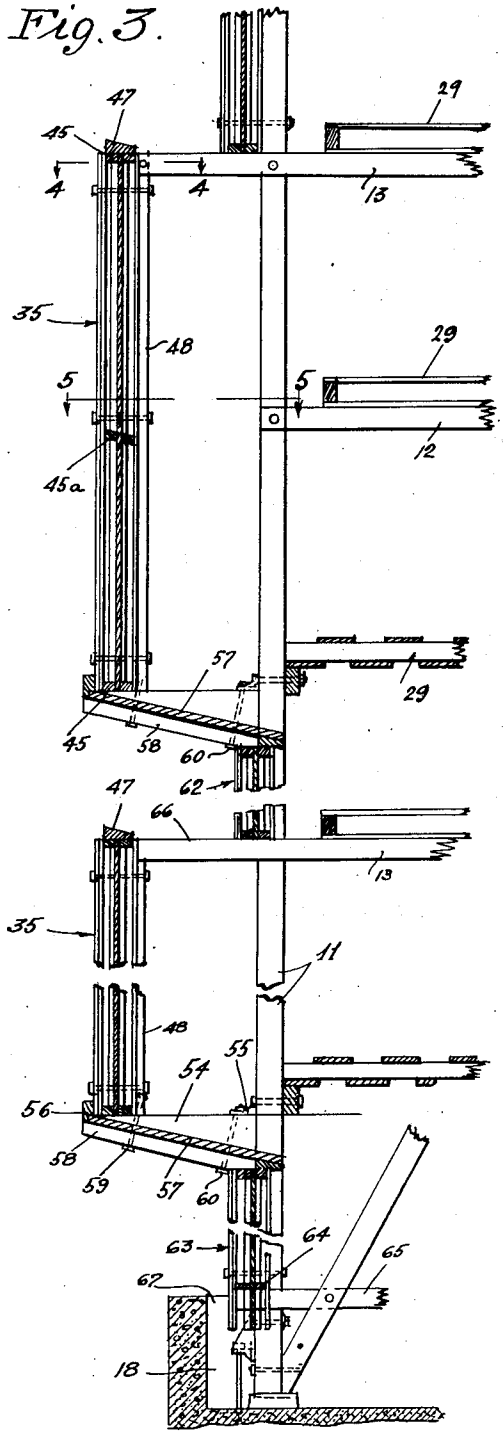
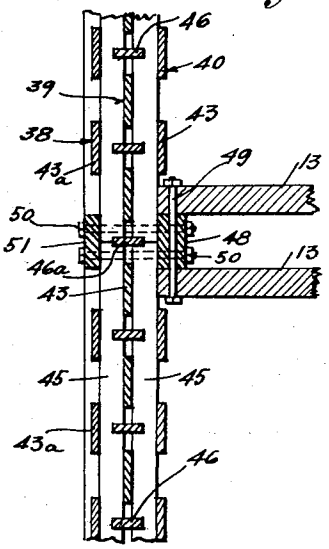


Fig. 4



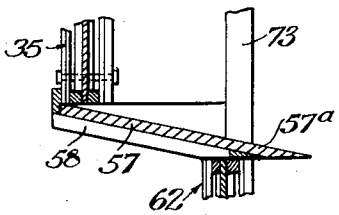


Fig. 7.

Inventor.
Peter E. Fluor.

Attorney.

July 4, 1933. P. E. FLUOR 1,916,724

ATMOSPHERIC COOLING TOWER

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Fig. 5.

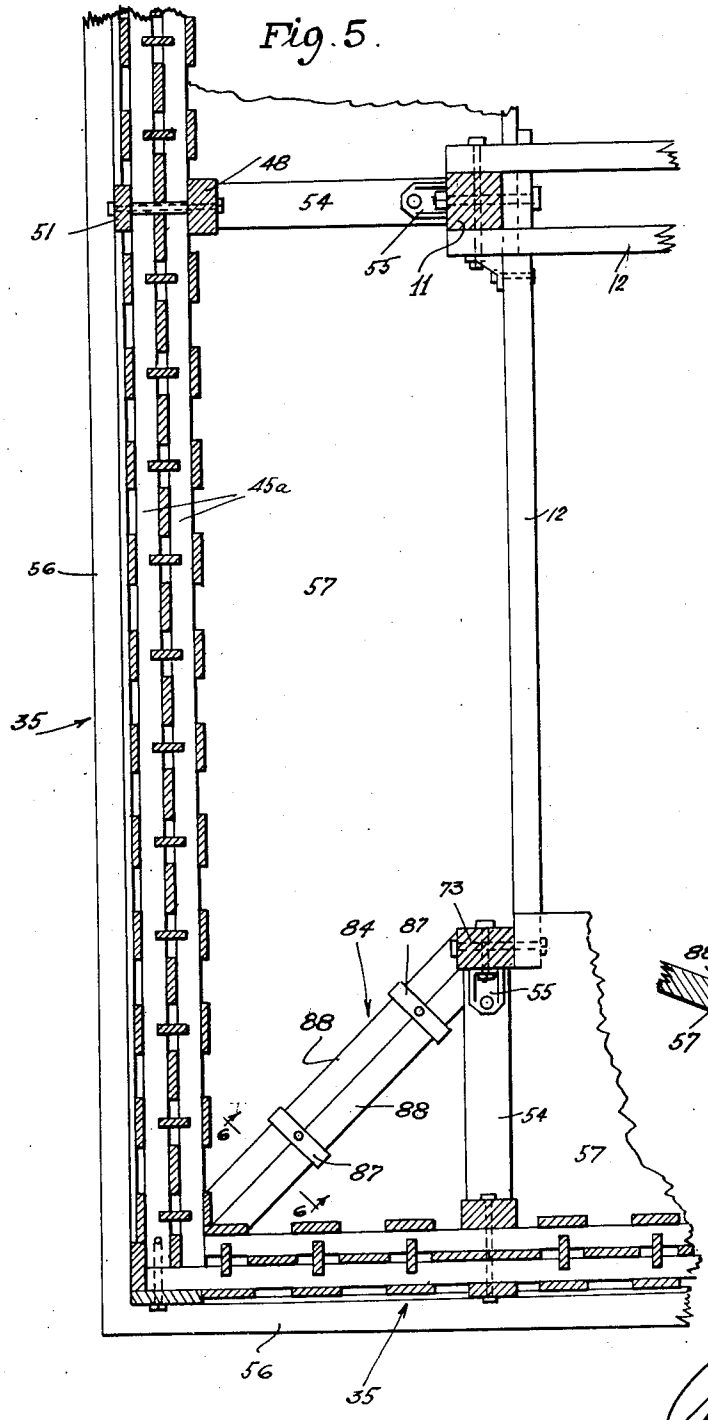
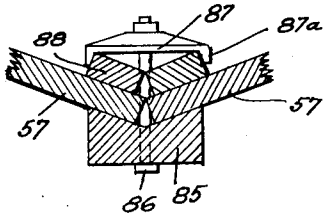


Fig 6.



Inventor
Peter E. Fluor.

Attorney.

Patented July 4, 1933 1,916,724

UNITED STATES PATENT OFFICE

PETER E. FLUOR, OF ANAHEIM, CALIFORNIA, ASSIGNOR TO THE FLUOR CORPORATION LTD., OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA

ATMOSPHERIC COOLING TOWER

Application filed July 5, 1932. Serial No. 620,790.

This invention has to do with atmospheric cooling towers, and particularly with improvements in connection with the type of cooling tower comprising the subject matter of co-pending application Ser. No. 587,710, filed jointly by Amel A. Stillger and me, on January 20, 1932, on Cooling tower.

The type of cooling tower disclosed in the said joint application, may be distinguished over the usual inclined louver tower in that the conventional inclined louvers are replaced by vertically progressing series of baffles extending in vertical and offset planes, with open air passing spaces between the upper end of each baffle and the lower end of the baffle next above. One of the principal objects of the present invention is directed to improvements in the vertical baffle arrangement and mounting whereby towers may be built of considerable height without impractically increasing their base dimensions, and whereby all the advantages incident to this improved type of tower construction may be retained without structure disadvantages, hereinafter fully explained, that may be encountered in the absence of the improvements contemplated by this invention.

Further objects of the invention deal with improvements in the deck arrangement within the tower, whereby more efficient air circulation may be maintained to accomplish maximum cooling, and also improvements in the construction of the offset baffles, made to increase the water holding efficiency of the baffles.

The invention contemplates further improvements which, in addition to the above mentioned objects, will be explained to best advantage and understood more fully from the following detailed description. Throughout the description reference is had to the accompanying drawings illustrating a typical and preferred cooling tower construction embodying the invention. It is to be understood however, that the illustrated tower construction is to be regarded as typical and illustrative only; since various changes and modifications may be made without departure from the true spirit and scope of the invention.

In the drawings:

Fig. 1 is a transverse sectional view taken through a cooling tower embodying the invention;

Fig. 2 is a longitudinal view of the tower taken partly in section and partly in side elevation;

Fig. 3 is a fragmentary enlarged view showing the lower baffle and drip panel construction and mounting;

Fig. 4 is an enlarged fragmentary section on line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary plan section on line 5—5 of Fig. 3, and showing the baffle and drip panel arrangement at the corner of the tower;

Fig. 6 is a fragmentary section on line 6—6 of Fig. 5, showing the corner joint between side and end drip panels; and

Fig. 7 is a fragmentary view showing a variational form of drip panel construction.

The cooling tower frame is shown in the drawings to comprise a plurality of inner vertical columns 10 arranged in pairs at spaced intervals longitudinally of the tower, and outer columns 11 positioned transversely of the tower in line with columns 10. As shown in Fig. 1, the inner columns 10 extend the full height of the tower, whereas columns 11 terminate at vertically intermediate points depending upon the tower height and the number of baffles in the vertically extending series. Deck supporting transverse chords 12, 13, 14, and 15, extend between, and in certain instances beyond the frame columns, these transchords being attached to the columns and serving as mountings for both the decks and the baffles, hereinafter described.

Chords 16 and 17 extend longitudinally of the tower to connect the columns and also to serve as deck supports. The frame columns have footings within a basin 18, which may be of concrete, wood or steel, and within which the water is collected after having been cooled in its downward flow through the tower.

Distributing decks 19 are supported on transchord 15 at the upper end of the tower, these decks serving to distribute the water discharged thereon, transversely of the interior of the tower. Water to be cooled is pumped through a pipe, not shown, extending from the ground to connect with a main flume or header 20 extending centrally and longitudinally of the tower at its top, the header resting on suitable supports 21. The water flows from the header through downwardly discharging branch pipe 22 spaced at suitable intervals longitudinally of the tower. Distributing decks 19 are shown typically as

being of the slatted type, well known to those familiar with the art. Water being discharged from the branch pipes is caused to spread transversely within the tower by being directed onto splash boards 23 placed on the distributing decks.

A series of vertically spaced horizontal decks 25, 26, 27, 28, and 29 are supported on the frame transchords and longitudinal chords, as illustrated, the decks preferably being made up, as in the case of the distributing decks, of a plurality of spaced slats 30 in relatively staggered positions. The subject matter of the present invention is independent of such features as the details of the slat arrangement in the decks, and it will therefore be understood that the invention broadly contemplates the provision of decks having any suitable construction. The water discharged from the main header onto the distributing decks, is showered downwardly through the series of decks below to be finally collected in the basin. The decks accomplish, by virtue of their slatted construction, thorough surface exposure of the water passing over them, and effectively break up the water so as to maintain the latter in a state of fine division.

The outside walls of the tower are formed by vertical series of baffles 31, 32, 33, 34, and 35, extending in substantially vertical and relatively offset planes. By virtue of the offset positions of the baffles, spaces are provided at 36 at their adjacent upper and lower ends, through which spaces air currents may pass in their transverse course through the tower. In the broad aspects of the invention, these relatively offset baffles may be of any suitable construction. Preferably, they are made up in such manner as to permit comparatively free passage of air therethrough, but at the same time to cause the air to follow such tortuous paths that moisture particles carried in the air will be deposited on the impinging surfaces of the baffles.

A preferred form of baffle construction is shown in Fig. 4 to comprise three substantially parallel and spaced rows 38, 39, and 40, of battens 43, these battens extending vertically of the baffle and being arranged in relatively staggered positions. The battens in the outside rows 38 and 40 are arranged in corresponding positions transversely of the baffle, and the intermediate battens in row 41 offset from those in the outside rows in order to obstruct the straight passage of air through the baffle. Battens 43*a* are preferably of slightly greater width than the battens in rows 39 and 40 and the spaces between the individual battens in these rows.

The battens are nailed to horizontally extending cleats, 45, the latter serving to maintain the battens in predetermined spaced relationship. The inner edges of cleats 45 are notched at intervals corresponding to the spacing of the battens in the outside rows, and into the notches are fitted deflector strips 46 extending in transverse planes at right angles to the planes of the rows of battens. The advantage gained by the provision of the deflector strips, in addition to the staggered battens, are to substantially increase the baffling surfaces against which the air currents are brought to impinge, and to make more tortuous the path which the currents are required to take in passing through the baffles.

As shown in Fig. 3, the intermediate cleats 45*a* are inclined toward the interior of the tower. Experience has indicated that should cleats 45*a* be placed horizontally, there is a tendency for water to accumulate on their top and bottom surfaces, this being particularly true in the lower baffles of the tower. Also, where the cleats are positioned horizontally, the water accumulating thereon tends to flow to the outside of the baffle just as readily as to the inside, and where there are drops of water splashing on the cleats, substantial water losses will be encountered as a result of the water accumulating or splashing on the cleats being picked up by the wind and carried out of the tower. Where the cleats are inclined inwardly, as I have shown, water is prevented from accumulating on the cleats since it is required to immediately drain toward the interior of the tower. Also, drops splashing on the cleats will be directed toward the interior, rather than the outside of the tower. I may also place caps 47 having inwardly inclined top surfaces, on the upper ends of the baffles, so that any water that might accumulate on the caps, will be directed back into the tower.

The baffles in each tier are placed end to end, the ends of cleats 45 and 45*a* being notched, see Fig. 4, and deflector strips 46*a* inserted within the notches. The baffles are connected to the outer ends of the frame transchords, the latter being attached in pairs to opposite sides of the frame columns and projecting beyond the columns. Vertically extending members 48 are placed between the outer ends of the transchords and are held in place by bolts 49. In attaching the upper ends of the baffles to the outer ends of the transchords, the overlapping ends of the baffles are placed opposite members 48, and the baffles are attached thereto by means of bolts 50 extending through cleats 51 at the outside of the baffles. By virtue of the offset positions of the baffles 31 to 34, the latter not only are supported by their connections with the transchords as described, but they are also supported by resting on the projecting ends of the transchords below.

In cases where it is necessary to cool the water through a considerable temperature drop, it may be necessary to erect a tower of such height that should all the baffles in the vertical series be relatively offset as in the

case of upper baffles 31 to 35, the base dimension or width of the tower at its base would be impractically great. In order to compensate for the use of greater numbers of baffles in the higher towers, and yet maintain cooling efficiency without increasing the base dimension beyond practical limits, I arrange the lowermost baffles 35 in vertical alinement, so that the base dimension is not increased over the width, or length of the tower at the uppermost of these lower alined baffles. It will be understood that any suitable number of the upper relatively offset, as well as the lower alined baffles, may be used, although for purposes of illustration, I have shown four of the former, and two tiers of vertically alined baffles at the base of the tower.

As shown most clearly in Fig. 3, the lower ends of baffles 35 are supported on brackets 54 attached to frame columns 11 by mountings 55, and carrying blocks 56 at their outer ends to prevent flow of water beyond the baffles. Inwardly inclined drip panels 57 are clamped between brackets 54 and cleats 58 by means of bolts 59 and 60, the former passing through the lower ends of members 48 to securely lock the baffles in place. As will be noted, drip panels 57 extend entirely across the lower ends of the baffles, so that water draining to the bottom of the latter will be deposited on the drip panels to be conveyed to the interior of the tower.

Baffles 62 and 63 of similar construction to baffles 35, are placed below the lower ends of the drip panels, adjacent columns 11, baffle 62 being supported on transchord 13, and cleats 64 of baffle 63 being supported on frame member 65. Preferably baffles 62 and 63 are set in from the outer surfaces of columns 11 and are bolted thereto. An air passing space is provided at 66 between the lower end of baffle 62 and the upper end of the lowermost baffle 35. The lower end of baffle 63 projects down into the basin as illustrated, suitable clearance being left between baffle and the wall of the basin as at 67.

As shown in Fig. 2, the vertical series of baffles at the ends of the tower are mounted in relative positions corresponding to their arrangement at the sides of the tower. The uppermost baffles 31 enclosing the ends of chamber 68 above the distributing decks, is attached at its upper end to top longitudinal frame members 69, and rests at its lower on supporting members 70 attached by suitable means to columns 10 and projecting outward to connect with baffles 32 at their upper ends. Baffles 33 and 34 are attached to the outer ends of similar supporting members 71 and 72 projecting outward from their connections with the frame columns. Columns 73 corresponding in height to previously described columns 11, extend upward from their footings in the basin 18 to members 72, baffles 34 being placed against the outside of these columns. Lower baffles 35 connect at their upper ends with members 74 and 75, similar to the connections of the corresponding baffles at the sides of the tower with transchords 13. The construction and mounting of the end drip panels 57 and baffles 62 and 63, are similar to the construction and mounting of the corresponding parts at the sides of the tower, and need not require further description.

In Figs. 5 and 6 I have shown the details of the drip panel mounting and joint at the corner of the tower. The drip panel 57 at the side and end of the tower have their diagonally cut ends connected by a joint generally indicated at 84, the details of which appear in Fig. 6. The ends of the drip panels are overlapped from beneath by cleat 85 connected by bolts 86 with clamps 87, lugs 87*a* on which engage the outer edges of cleats 88. When bolts 86 are taken up, the drip panels are securely clamped between the cleats 85 and 88. The former, it will be noted, is trough shaped, so that any water leaking through the joint will drain toward the interior of the tower.

In order that water draining from the end baffles may be prevented from dropping through the space between the baffles and frame columns 10, into the basin at the bottom of the tower, with possible water loss from the tower as a result of the falling drops being picked up by transverse air currents and carried out through the baffles or the offset spaces 36 between baffles, I preferably place a vertical series of decks in between the baffles and the frame columns. While these decks may be arranged at any suitable vertical intervals and mounted in any desired manner, I preferably place them upon the baffle supporting members as shown. Decks 77, 78 and 79, shown typically as being of the overlapping slat type, are placed at substantially the lower ends of baffles 32, 33, and 34, deck 80 being arranged somewhat below the inner end of the drip panel. In order that these short decks interposed between the baffles and the main decks may more effectively direct the water deposited thereon or received from the baffles, toward the interior of the tower, they preferably are placed on a slight incline.

In some cases, it may be desirable to extend the drip panels, as indicated at 57*a* in Fig. 7, toward the interior of the tower so as to overlap the inclined decks. If for any reason it is found desirable to do so, the drip panels may be extended inwardly to the main decks, which are shown to terminate, longitudinally of the tower, at the columns 10.

The described panel construction has been developed primarily to decrease the overall width of the tower, and to provide for greater air passing spaces between the offset baffles, without requiring the tower to be made of

excessive width. Where the tower width becomes too great, air circulation through the tower at low winds is restricted to such an extent that cooling efficiency is greatly reduced. As stated, the drip panels also serve to return to the main decks of the tower, water which would otherwise fall from high points in the tower through an unobstructed space into the basin, without having been properly cooled. Where high winds prevail, the quantity of water accumulating on and being directed against the leeward baffles may be considerable, and by returning the water to the main decks, excessive water loss and accumulation of excessive water on the baffles, particularly the lower baffles, is reduced and the wind loss thus kept at a minimum.

Referring back to Fig. 1, it will be noted that the main decks opposite the lower ends of the baffles, extend outwardly to substantially the inner surfaces of the baffles to prevent the rise of any considerable quantities of air between the baffles and these decks. Thus decks 19, 26, 28 and 29 are shown to extend outwardly in close proximity to the lower ends of baffles 31, 32, 33 and 34, respectively. The decks below the uppermost deck 29 may be of uniform width and may extend substantially to the outer frame columns 11. The intermediate decks 25, 27 and 28, however, are spaced substantial distances from the baffles opposite them in order that the air currents that may be warmed as a result of contact with the water in flowing transversely between the decks, may rise and pass out of the tower through the openings at 36.

There is thus formed a substantially closed chamber, except for the openings 36, between the upper and lower ends of the baffles arranged in the offset series, and no open spaces are left through which water may fall without contacting and being filmed over deck cooling surfaces. Due to the chambers within the tiers of baffles being substantially closed above and below, air currents are prevented from rising upwardly within the tower further than the height of each chamber, and the heated air within each chamber is required to pass out through the offset spaces 36. Thus cooling efficiency is maintained in that when once heated, the air is immediately expelled from the tower and is prevented from remaining therein to the exclusion of cool air currents.

A further advantage is gained by virtue of the described deck arrangement, in that air entering the offset spaces, especially at low wind velocities, is forced to pass directly through the cooling chambers between decks, without being permitted to rise within the tower, this being due to the fact that no substantial openings are left between the baffles and the decks opposite their lower ends. A certain amount of up draft outside a series of decks is desirable, but not all the way up the tower, as humid air rising within the tower, and saturated with water vapor, seriously reduces the cooling efficiency. It is important therefore that the air currents be forced to pass transversely through the tower, except for the vertical flow permitted through the spaces between the intermediate baffles 25, 27, and 28, and the baffles opposite them.

Another advantage gained by spacing the intermediate decks from the baffles, is to cause the downwardly deflected air entering the tower through the offset spaces 36, to sweep under as well as over both intermediate decks and to rise in the space at the lee side of the tower. By virtue of this feature, the tower is caused to have particularly high cooling efficiency, as compared with other towers, when the wind velocity is low.

Baffles 31 at the top of the tower are provided to assure the passage of air currents under the top distributing decks. Since the water loses more heat in passing over the distributing decks than over any other one deck in the tower, it is important that the most effective circulation of air be maintained across the tower in the region of the distributing deck.

I claim:

1. In an atmospheric cooling tower comprising a frame, a substantially vertically extending apertured baffle mounted at one side of the tower, a panel extending inwardly of the tower, from the lower end of said baffle, a vertically extending apertured baffle offset inwardly of the tower from the first mentioned baffle, and extending downwardly from said panel, and a plurality of vertically spaced decks within the tower, both said baffles being spaced transversely of the tower from said decks.

2. In an atmospheric cooling tower comprising a frame which includes a series of vertical columns, an upper vertically extending apertured baffle mounted at the outside of said columns and spaced therefrom, a transverse supporting member extending from the columns to connect with the baffle at its upper end, an inclined imperforate panel extending inwardly from the lower end of said baffle to said columns, and a lower baffle offset outwardly of the tower from the lower edge of said panel.

3. In an atmospheric cooling tower comprising a frame. a pair of substantially vertically extending and vertically spaced baffles mounted at one side of the tower, there being a space at the inside of the upper end of the lower baffle through which air currents may pass into the tower, and a panel extending inwardly of the tower from the lower end of the upper baffle and serving to direct water accumulating thereon, toward the interior of the tower.

4. In an atmospheric cooling tower com-

prising a frame, a pair of substantially vertical and vertically spaced baffles mounted at one side of the tower, said baffles being substantially in vertical alinement, and a panel extending inwardly of the tower from the lower end of the upper baffle and serving to direct water accumulating thereon, toward the interior of the tower, there being an air passing space opening into said tower between said baffles and below said panel.

5. In an atmospheric cooling tower comprising a frame, a pair of substantially vertically extending and vertically spaced baffles mounted at one side of the tower, a panel extending inwardly of the tower from the lower end of the upper baffle and serving to direct water accumulating thereon, toward the interior of the tower, and an apertured wall extending between the spaced ends of said baffles and offset inwardly of the tower from the baffles.

6. An atmospheric cooling tower comprising a frame, a pair of substantially vertical upper and lower baffles mounted at one side of the tower, a plurality of upper horizontally extending decks within the tower opposite the baffles and spaced a substantial distance therefrom, and a lower deck opposite the lower portion of the lower baffle and extending substantially to the inner surface of that baffle, there being an air passing space between said baffles.

7. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, a vertically extending apertured baffle mounted at one side of the tower, a second vertically extending apertured baffle below and offset outwardly of the tower from the first mentioned baffle, a plurality of vertically spaced apertured decks within the tower opposite the intermediate portions of said baffles, said decks being spaced from said baffle to provide open air passing spaces for rising air currents, an apertured deck opposite substantially the lower end of the upper baffle, and means for restricting the upward flow of air currents between the last mentioned deck and baffle.

8. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, a vertically extending apertured baffle mounted at one side of the tower, a second vertically extending apertured baffle below and offset outwardly of the tower from the first mentioned baffle, a plurality of vertically spaced apertured decks within the tower opposite the intermediate portions of said baffles, said decks being spaced from said baffle to provide open air passing spaces for rising air currents, and an apertured deck opposite substantially the lower end of the upper baffle and extending substantially to the inner surface thereof.

9. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, a vertically extending apertured baffle mounted at one side of the tower, a second vertically extending apertured baffle below and offset outwardly of the tower from the first mentioned baffle, supporting members extending outward from said columns and attached to said baffles to support the baffles in spaced relation to said columns, and a horizontally extending apertured deck within the tower opposite one of said baffles and extending into the space between that baffle and said frame columns.

10. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, a vertically extending apertured baffle mounted at one side of the tower, a second vertically extending apertured baffle below and offset outwardly of the tower from the first mentioned baffle, supporting members extending outward from said columns and attached to said baffles to support the baffles in spaced relation to said columns, and a plurality of horizontally extending and vertically spaced decks within said tower opposite said baffles and extending into the spaces between the baffles and said frame columns.

11. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, a vertically extending apertured baffle mounted at one side of the tower, a second vertically extending apertured baffle below and offset outwardly of the tower from the first mentioned baffle, supporting members extending outward from said columns and attached to said baffles to support the baffles in spaced relation to said columns, and a plurality of horizontally extending and vertically spaced decks within said tower opposite said baffles and extending into the spaces between the baffles and said frame columns, the decks opposite the lower baffle being wider than the decks opposite the upper baffle.

12. In an atmospheric cooling tower comprising a frame, a pair of substantially vertical and vertically alined baffles mounted at one side of the tower, a panel extending inwardly of the tower from the lower end of the upper baffle and serving to direct water accumulating thereon, toward the interior of the tower, a deck within the tower and extending outwardly to a point in substantially vertical alinement with the inner edge of said panel, and a plurality of decks above and below the first mentioned deck and having their edges offset inwardly of the tower substantial distances from the edge of the first mentioned deck.

13. A cooling tower comprising, a wall at one side of the tower through which air currents are permitted to pass, said wall comprising a vertically progressing series of baffles extending in substantially vertical planes, said baffles being relatively offset in downward progression toward the outside of

the tower and a supporting frame comprising inner vertical frame columns extending at the inside of the uppermost of said baffles, and outer vertical frame columns positioned at the outside of the first mentioned columns, and outside the planes of a plurality of the upper baffles.

14. A cooling tower comprising, a wall at one side of the tower through which air currents are permitted to pass, said wall comprising a vertically progressing series of baffles extending in substantially vertical planes, said baffles being relatively offset in downward progression toward the outside of the tower and a supporting frame comprising inner vertical frame columns extending upwardly from the base of the tower and at the inside of the uppermost of said baffles, and outer vertical frame columns positioned at the outside of the first mentioned columns, and outside the planes of a plurality of the upper baffles.

15. In an atmospheric cooling tower, means for passing water downwardly within the tower, a substantially vertical baffle mounted at one side of the tower, and means for directing water draining to the bottom of said baffle, toward the interior of the tower, and an apertured baffle below and offset inwardly of the tower from the first mentioned baffle, the first mentioned baffle comprising a series of spaced relatively offset battens and deflector strips extending between and at substantially right angles with said battens.

16. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, means for passing water downwardly within the tower, a substantially vertical apertured baffle mounted at one side of the tower at the outside of said columns, a panel extending inwardly of the tower from said baffle and serving to direct water accumulating in the baffle, toward the interior of the tower, and an apertured baffle extending downward from said panel in a substantially vertical plane offset inwardly of the tower from the first mentioned baffle but outside of the widest portion of the path of water falling within the tower, and a transverse frame member connected to the upper end of the first mentioned baffle.

17. In an atmospheric cooling tower, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement, the lower end of the upper baffle being spaced above the upper end of the lower baffle, and a baffle between the first mentioned baffles and offset relative thereto, toward the interior of the tower.

18. In an atmospheric cooling tower, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement, the lower end of the upper baffle being spaced above the upper end of the lower baffle, and a substantially vertical apertured baffle between the first mentioned baffles and offset relative thereto, toward the interior of the tower.

19. In an atmospheric cooling tower, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement, the lower end of the upper baffle being spaced above the upper end of the lower baffle, and a substantially vertical apertured baffle between the first mentioned baffles and offset relative thereto, toward the interior of the tower, there being an air passing space leading into the tower at the lower end of said inwardly offset baffle.

20. In an atmospheric cooling tower, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement, the lower end of the upper baffle being spaced above the upper end of the lower baffle, a baffle between the first mentioned baffles and offset relative thereto, toward the interior of the tower, and a panel extending between one of the first mentioned baffles and said inwardly offset baffle.

21. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement at the outside of said columns, the lower end of the upper baffle being spaced above the upper end of the lower baffle, and transverse frame members extending from said columns to connect with said baffles.

22. In an atmospheric cooling tower, a frame comprising a plurality of vertical columns, means for passing water downwardly within the tower, a pair of substantially vertical apertured baffles mounted at one side of the tower in substantial vertical alinement at the outside of said columns, the lower end of the upper baffle being spaced above the upper end of the lower baffle, there being an air passing space at the inside of one of the adjacent ends of said baffles leading into the tower, and transverse frame members extending from said columns to connect with said baffles.

In witness that I claim the foregoing I have hereunto subscribed my name this 8th day of June 1932.

PETER E. FLUOR.