July 27, 1948. J. G. DE FLON ET AL 2,445,908

MECHANICAL DRAFT WATER COOLING TOWER

Original Filed June 15, 1945

Fig. 1.

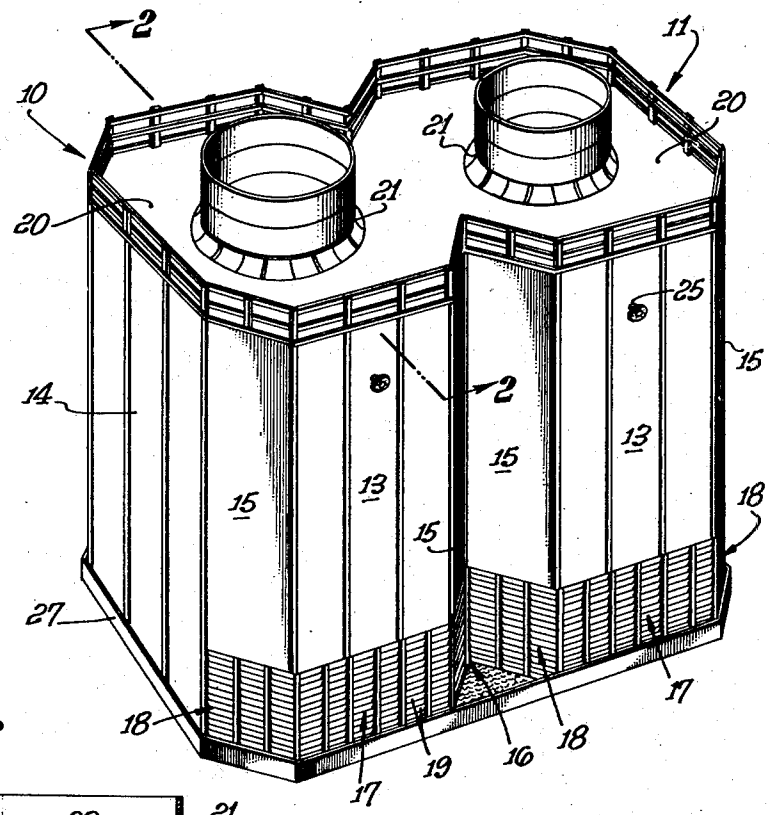


Fig. 2.

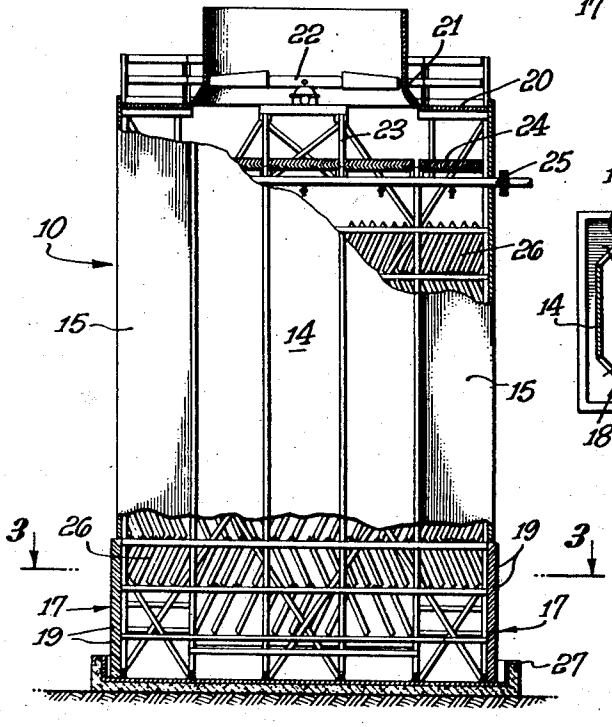
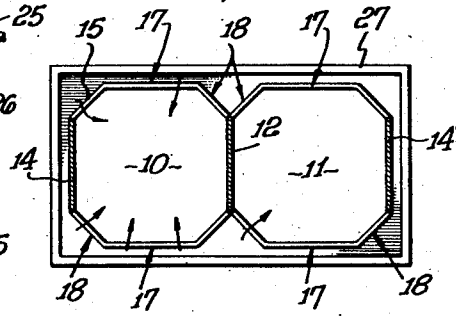


Fig. 3.



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MECHANICAL DRAFT WATER-COOLING TOWER

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Continuation of application Serial No. 599,682, June 15, 1945. This application May 23, 1947, Serial No. 749,987

6 Claims. (Cl. 261—23)

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This invention has to do generally with improvements in mechanical draft water cooling towers, particularly of the multiple cell type comprising a continuous succession of chambers or cells having bottom side wall inlets through which air is taken to flow upwardly through the cells, counter-currently to the down-flowing water.

Our general and primary object is to improve such mechanical draft cooling towers with respect both to structural characteristics, and also the air entrance and distribution in the cells, to the end that the operating efficiency is materially improved. Certain aspects and advantages of the invention are applicable to both forced draft towers, i. e. in which the air is discharged through the cells by fans in their side walls, and also to induced draft towers, i. e. in which fans positioned at the tops of the cells induce upward air flow through inlets in the lower portions of the side walls. Typically, the invention will be described as embodied in induced draft towers, by reason of the added advantages afforded by the air inlet arrangement permitted in that type of tower.

Heretofore multiple cell induced draft water cooling towers have been made to comprise contiguous rectangular cross-section cells each having opposed air inlets in its opposite walls, the inlets thus extending along and being confined to the straight opposite sides of the cells. It has been found that with such arrangement of the inlets, the air rising within the cells does not become distributed across their entire cross-sectional areas with the uniformity required for most efficient heat exchange between the total quantities of water and air flowing through the cells. The difficulty is that the air flow tends to channel or center toward the interior of each cell, leaving relatively little and low velocity air flow in the corner areas of the cell. Thus, with provision made for uniform water distribution across the cell area, the quantities of air in the corner spaces are inadequate to cool to the maximum possible temperature the water which they contact, whereas the air flowing through the central portion of the cell may be in excess of that required for complete cooling of the water which it contacts.

In accordance with the invention we have changed the shape and formations of the cell in a manner resulting in substantial elimination of the described conditions in the corner areas, and in so doing have retained the cells in contiguous or in continuously successive arrangement. Briefly, the invention contemplates departing

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from the conventional rectangular cross-section cells, by forming the individual cell with more than four walls so that in an arrangement of successive cells, their outer walls include angular sections occupying what normally would be the corner areas of rectangular cells, and forming in the tower structure vertically extending recesses from which air is taken into the cells. Thus the angular wall sections eliminate the usual corner spaces in the cell, and serve to contain inlets which, together with inlets in the extreme outer side walls, substantially extend the locations of air entry about the cell's periphery. Preferably the cells are given octagonal shape so that in their contiguous arrangement, the adjacent angular wall sections form V-shaped recesses from which air is drawn into the corners adjacent ends of the cell.

For further details reference is had to the accompanying drawing illustrative of the invention in one of its typical and preferred forms. In the drawing:

Fig. 1 is a perspective view showing a two-cell tower;

Fig. 2 is a vertical cross-section on line 2—2 of Fig. 1; and

Fig. 3 is a reduced scale cross-section on line 3—3 of Fig. 2, no showing being made in this view of the interior decking and baffles.

As illustrative, the invention is shown to be embodied in an induced draft tower having two cells, generally indicated at 10 and 11, it being understood that the showing is typical only and that any greater number of cells may be employed, depending upon the required water cooling capacity of the tower. As best illustrated in Fig. 3, adjacent cells may have a common vertical end wall 12 and individually the cells are octagonal in shape and formed by outer side walls 13, end walls 14 and the angular corner walls 15. Above the inlets 17, the side and angular walls are of closed (i. e. non-apertured) formation. Accordingly, at the cell juncture, the corner walls 15 form V-shaped recesses 16 extending considerable distances inwardly of the tower and vertically throughout its height. As illustrated, air inlets are provided at 17 in the bottom portions of the walls 13 at both sides of the cells, and also at 18 in the angular corner walls 15, the inlets in each instance being baffled by inclined louvers 19.

Otherwise the individual cells may be constructed and equipped with respect to the fan arrangement and mounting, the water distributing system and the baffles or decking employed, in any desired manner. Typically, each cell is

shown to be closed at its top by a wall 20 containing a fan ring assembly 21 within which is mounted the motor driven fan 22 carried on a suitable frame-supported mounting 23. Water is supplied to the cell below the usual drift eliminators 24 to a header 25 from which the water is showered or sprayed over the filler decking or baffles 26 to be finally collected in the basin 27.

The down-flowing water is contacted by air being drawn by the fan upwardly through the cell chamber from locations of entry at both the outer sides and corners of the cell, as permitted by the inlets 17 and 18. By reason of the recessed configuration of the cell arrangement at 16, air is drawn from a single recess space through the angular corner inlets of contiguous cells. Due to the cell formation and the inlet arrangement, we have been able to eliminate the dead air spaces existing in the corners of the conventional cells, and have obtained a far greater uniformity of air distribution and flow through the cross-sectional areas of the cell by reason of the extended relation of the air inlets to the cell perimeters. From an operational standpoint, the effect is to produce a marked increase in the total heat transfer from water to air and in the performance efficiency of the tower.

This application is a continuation of our application Serial No. 599,682, filed June 15, 1945, on "Mechanical draft water cooling towers," which has been abandoned.

We claim:

1. A mechanical draft water cooling tower comprising walls forming a succession of alined cells, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through said cells, the side walls of the cells having portions extending inwardly of the tower at said common wall of successive cells, said inwardly extending portions of the walls containing inlets at the bottoms of the cells through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

2. A mechanical draft water cooling tower comprising walls forming a succession of alined cells, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through said cells, the side walls of the cells having outer alined planar sections and continuing portions converging inwardly of the tower at said common wall of successive cells, said planar sections and converging portions containing inlets at the bottoms of the cells through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

3. A mechanical draft water cooling tower comprising walls forming a succession of alined cells, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through said cells, the side walls of the cells having portions converging inwardly of the tower to form V-shaped recesses extending substantially the height of said walls and having their apices alined with said common wall, said converging portions of the walls containing inlets at the bottoms of the cells through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

4. A mechanical draft water cooling tower comprising vertically extending walls forming a continuous succession of alined cells having substantially octagonal horizontal cross-section, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through the cells, adjacent side walls of the cells converging inwardly of the tower to form V-shaped recesses having their apices alined with said common wall, the lower portions of said converging walls containing inlets through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

5. A mechanical draft water cooling tower comprising vertically extending walls forming a continuous succession of alined cells having substantially octagonal horizontal cross-section, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through the cells, adjacent side walls of the cells converging inwardly of the tower to form V-shaped recesses having their apices alined with said common wall, the lower portions of said converging walls together with the lower outside sections of the walls between said convergent portions containing inlets through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

6. A mechanical draft water cooling tower comprising vertically extending walls forming a continuous succession of alined cells having substantially octagonal horizontal cross-section, adjacent cells being separated by a common wall, means for mechanically inducing air flow upwardly through the cells, adjacent side walls of the cells converging inwardly of the tower to form V-shaped vertical recesses having their apices alined with said common wall and extending the full height of said walls, the lower portions of said converging walls together with the lower outside sections of the walls between said convergent portions containing inlets through which air is drawn into the cells, and said side walls above the inlets being of closed formation.

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