LOUVRE ASSEMBLY FOR COOLING TOWERS

Leon T. Mari, Mission Township, Johnson County, Kan., and Homer E. Fordyce, Goshen, Mo., assignors to
The Marley Company, Kansas City, Mo., a corporation of Delaware.

Filed May 1, 1958, Ser. No. 732,340
2 Claims. (Cl. 261—24)

This invention relates to structures for cooling water and has for its primary object the provision of a novel combination of elements formed and arranged to better adapt a water cooling tower for use in extreme cold weather conditions.

Considerable difficulty is experienced in the use of conventional water cooling towers, particularly at the air inlets thereof because of the tendency of ice to collect in a manner to reduce free flow of air therethrough. Such difficulties result from splashing of water from the fill assembly to the air inlet louvers, the latter of which are normally small and relatively close together. Similarly, it is not uncommon for ice to collect between the louvers and virtually close the air inlet spaces therebetween.

It is the most important object of this invention, therefore, to provide an improved air inlet unit for a water cooling tower that is strategically disposed with respect to the fill assembly so that an appreciable amount of the hot water gravitating through the latter, will drain onto the inlet louvers, thereby melting any ice tending to collect thereon and keeping the air inlet spaces between the louvers open for free flow of air therethrough and into the fill assembly to cool the hot gravitating water.

Another important object of the present invention is to provide air inlet louvers structure for water cooling towers that is composed of a stack of relatively wide louvers spaced an appreciable distance apart, whereby the same serve their intended function and at the same time tend to eliminate clogging with ice when considered in conjunction with the way in which hot water is employed as aforementioned.

Still another object of the present invention is to augment the melting of ice tending to collect on and between the inlet louvers through use of means such as a trough for conveying the hot water from the fill assembly to each of the louvers.

A further object of the present invention is to provide inlet louvers structure that is arranged to discharge water from each louver respectively to the louver therebelow and thence ultimately to a cold water collection basin, the latter of which may be appreciably reduced in size due to the unique arrangement of the instant invention.

In the drawing:
FIG. 1 is a side elevational view of a water cooling tower, parts being broken away and in section to reveal details of construction of the louver assembly of the present invention.
FIG. 2 is an enlarged, detailed, cross-sectional view taken on line 2—2 of FIG. 3; and
FIG. 3 is an enlarged, fragmented, detailed, cross-sectional view taken on line 3—3 of FIG. 2.

The water cooling tower shown in FIG. 1 of the drawing and chosen for illustration of the improvements of the instant invention, operates on the conventional cross-flow principle wherein hot water gravitating through a pair of opposed fill assemblies 10 is cooled by the action of air drawn therefrom through means of a single fan located within an outlet ring 14 at the top of the tower. Hot water is fed into an open top distribution system 16 and after traversing the fill assemblies 10, the cold water is collected by a basin 18 underlying the fills 10.

Drift eliminators 20 are provided at the air outlet sides of each fill assembly 16, and except for the air inlet sides of the assemblies 10, the entire tower is closed by a suitable casing 22.

Water cooling towers of the above described character are conventionally provided with a louvered air inlet face to keep water in the confines of the tower and from splashing out of the air inlet opening. Such louver construction under normal conditions of use, presents difficulties when operating under extreme weather conditions such as sub-freezing temperatures.

Accordingly, pursuant to the concepts of the instant invention, the air inlet side or face of the fill assemblies 10 are each provided with a stack of relatively wide louvers 24 that are spaced apart a distance that is appreciably more than the spacing normally provided in conventional air inlet louvers assemblies. Such wide spacing is made possible because of the widths of the louvers 24 themselves, and as seen in FIG. 1 of the drawing, it is but necessary to completely cover the inlet face of the assemblies 10 without overlapping of the louvers 24.

It is to be noted in FIG. 1 of the drawing that the assemblies 10 recede inwardly at the air inlet sides thereof as the basin 18 is approached, and therefore, the louvers 24 are arranged in an inclined stack disposed with a portion of the assembly 10 in overlying relationship thereto. Consequently, at least certain of the louvers 24 receive the hot water gravitating through the assembly 10, and all of the louvers 24 are disposed so as to be subjected to appreciably more splashing of such hot water.

It is to be understood at this juncture that collection of ice to such extent as to virtually close off the air inlet spaces between the louvers, has been the chief difficulty which the instant invention eliminates. Therefore, by permitting an appreciably large amount of the hot water to splash, as well as to fall directly upon the louvers 24, the ice problem is eliminated, particularly when considered in light of the size and spacing of louvers 24 as above described.

Additionally, and to further augment the melting of the ice tending to collect on louvers 24, there is provided means in the instant invention to pour additional amounts of hot water onto the louvers 24. Such hot water may be taken directly from the fill assemblies 10 and fed to the louvers 24 through the medium of a trough 26 that is open at the low, open top troughs 26 for each louver 24 respectively.

As illustrated in FIG. 3 of the drawing, the assemblies 18 are subdivided into a series of side-by-side sections or bays, each of which may, for example, be approximately 8 feet long and set off by vertical framework 28. Thus, it is suggested that there be provided a trough 26 between each pair of frames 28 for each louver 24 respectively and that such troughs traverse the assemblies 18, extending thereinto as far as may be desired, but preferably terminating in a closed, innermost end 30. Troughs 26 may incline downwardly toward the louvers 24 if desired, and be provided with an open outlet end next adjacent the corresponding louver 24 as illustrated in FIG. 2.

The troughs 26 may rest on the splash bars of the fills 10, as well as upon the louvers 24 themselves, and should be formed from relatively thin material such as metal or plastic so that heat can be transmitted therethrough and prevent ice building upon the trough 26 itself.

It is noted that the louvers 24 are corrugated, and while such configuration is not essential, it can be seen that all of the water directed to the louvers 24, by splashing, by direct gravitation, and by the action of troughs 26, channels horizontally and longitudinally of the louvers 24 by virtue of the corrugations therein and, therefore, distributes evenly throughout the uppermost inclined surfaces thereof. Such water gravitating along the louvers
24 transversely thereof, falls by gravity from the lowermost longitudinal edges of the louvers 24 to the louvers therebelow, ultimately discharging into the basin 13. It can now be seen that this construction makes it possible to provide a basin 13 that is appreciably smaller than those heretofore provided, and eliminates the need for water drainboards formerly required on certain towers to drain water from the lowermost louver thereof.

Finally, the improvements above described, reduce the loss of water by splash-out, and provide an overall attractive tower appearance, particularly when the material for the louvers 24 is selected to blend properly with other portions of the tower exterior.

In any event, it is to be understood that the construction forming the subject matter of the instant invention, may be employed in virtually any type of tower and is not limited to the cross-flow principle above explained and embodied in the tower chosen for illustration in FIG. 1.

Having thus described the invention what is claimed as new and desirable to be secured by my Letters Patent is:

1. A cross-flow water cooling tower comprising:
   a generally upright casing having an upright air inlet in one side thereof and air outlet means spaced from said air inlet;
   generally horizontal hot water distribution means on said casing adjacent the upper portion thereof;
   a cold water collection basin positioned across the bottom of said casing;
   splash type fill assembly means in said casing below said hot water distribution means between the air inlet and the air outlet means whereby water from the hot water distribution means gravitates onto and through the fill assembly means into said basin, said fill assembly means being provided with a relatively large number of superimposed, vertically spaced, horizontally disposed fill layers, the outer face of said fill assembly means being disposed in closest proximity to said air inlet generally receding from the vertical in a direction inwardly and downwardly toward the basin;
   fan means on the casing for pulling air in through said inlet and for discharging the air through said outlet means as the air is caused to move substantially horizontally across the fill assembly means by said fill layers; and
   louver structure mounted on the casing independent of the fill assembly means in disposition inclined from the vertical and located across said air inlet of the casing in generally complementary, substantially parallel, proximal underlying relationship to said outer face of the fill assembly means for gravitation of hot water from the fill assembly means onto the louvers, said structure including an upright stack of partially vertically superimposed, generally horizontal, elongated, spaced, parallel, transversely inwardly inclined louvers spanning substantially the full width and height of said air inlet, each of the louvers of said stack thereof being positioned with the upper surfaces thereof in direct facing relationship to said outer face of the fill assembly means, and each disposed in horizontally offset relationship with respect to next adjacent louvers with the lower margin of each louver overlying a horizontal, transversely intermediate, longitudinally extending area of the louvers next therebelow to effect discharge of water from the lower margin of each louver respectively to said horizontally extending intermediate area of the louvers next therebelow and in spaced relationship to the lower margin of said next lower louver, the upright margins of the casing adjacent said outer face of the fill assembly means being inclined from the vertical at an angle to conform with the general inclined configuration of said outer face of the fill assembly means and the stack of louvers, and said basin completely underlying the fill assembly with one end wall thereof located adjacent the lower horizontal margin of the lowestmost louver of said stack, each pair of adjacent louvers of said stack being located in sufficient vertical spaced relationship to cause imaginary horizontal planes through the lower margins and upper margins respectively of said adjacent louvers to be located in vertically spaced relationship and each louver having a transverse width whose projected vertical height is substantially greater than the effective vertical height of at least three of the horizontal fill layers of said fill assembly means whereby the louver stack contains splash and fines from said fill assembly means.

2. A cross-flow water cooling tower comprising:
   a generally upright casing having an upright air inlet in one side thereof and air outlet means spaced from said air inlet;
   generally horizontal hot water distribution means on said casing adjacent the upper portion thereof;
   a cold water collection basin positioned across the bottom of said casing;
   splash type fill assembly means in said casing below said hot water distribution means between the air inlet and the air outlet means whereby water from the hot water distribution means gravitates onto and through the fill assembly means into said basin, said fill assembly means being provided with a relatively large number of superimposed, vertically spaced, horizontally disposed fill layers, the outer face of said fill assembly means in closest proximity to said air inlet generally receding from the vertical in a direction inwardly and downwardly toward the basin;
   fan means on the casing for pulling air in through said inlet and for discharging the air through said outlet means as the air is caused to move substantially horizontally across the fill assembly means by said fill layers;
   louver structure mounted on the casing independent of the fill assembly means in disposition inclined from the vertical and located across said air inlet of the casing in generally complementary, substantially parallel, proximal underlying relationship to said outer face of the fill assembly means for gravitation of hot water from the fill assembly means onto the louvers, said structure including an upright stack of partially vertically superimposed, generally horizontal, elongated, spaced, parallel, transversely inwardly inclined louvers spanning substantially the full width and height of said air inlet, each of the louvers of said stack thereof being positioned with the upper surfaces thereof in direct facing relationship to said outer face of the fill assembly means, and each disposed in horizontally offset relationship with respect to next adjacent louvers with the lower margin of each louver overlying a horizontal, transversely intermediate, longitudinally extending area of the louvers next therebelow to effect discharge of water from the lower margin of each louver respectively to said horizontally extending intermediate area of the louvers next therebelow and in spaced relationship to the lower margin of said next lower louver, the upright margins of the casing adjacent said outer face of the fill assembly means being inclined from the vertical at an angle to conform with the general inclined configuration of said outer face of the fill assembly means and the stack of louvers, and said basin completely underlying the fill assembly with one end wall thereof located adjacent the lower horizontal margin of the lowestmost louver of said stack, each pair of adjacent louvers of said stack being located in sufficient vertical spaced relationship to cause imaginary horizontal planes through the lower margins and upper margins respectively of said adjacent louvers to be located in vertically spaced relationship, each louver having a transverse width whose projected vertical height is substantially greater than the effective vertical height of at least three of the hori-
3,117,170

Horizontal fill layers of said fill assembly means whereby the louver stack contains splash and fines from said fill assembly means; and

trough means for each of the louvers, said trough means extending from a position beneath a portion of said fill assembly means to a location in overlying relationship to a corresponding louver for directing an additional supply of hot water from the fill assembly means onto a respective louver to help prevent accumulation of ice on said louvers, each of said trough means being narrower than the width of a respective louver longitudinally thereof and inclined downwardly from the fill toward a corresponding louver to effect flow of water from the fill assembly means to said louvers.

References Cited in the file of this patent

UNITED STATES PATENTS

Vollman -------------- Apr. 23, 1907

Hart ------------------ May 29, 1917
Nordberg -------------- Dec. 10, 1918
Uhde ------------------ June 28, 1921
Lewis.................... Oct. 14, 1930
Kranz.................... Oct. 28, 1930
Harry..................... Apr. 26, 1932
Mart..................... Oct. 3, 1933
Pabodie................. Nov. 30, 1937
Green.................... June 20, 1950
Fordyce.................. Jan. 1, 1957
Kalthoff.................. Feb. 5, 1957
Mart..................... Dec. 9, 1958
Mart..................... Feb. 3, 1959
Baker et al.............. June 30, 1959

FOREIGN PATENTS

Great Britain............... Mar. 3, 1954