Nov. 30, 1937. R. R. PABODIE 2,100,667

COOLING TOWER

Filed Nov. 16, 1936 2 Sheets-Sheet 1

Fig. 1.

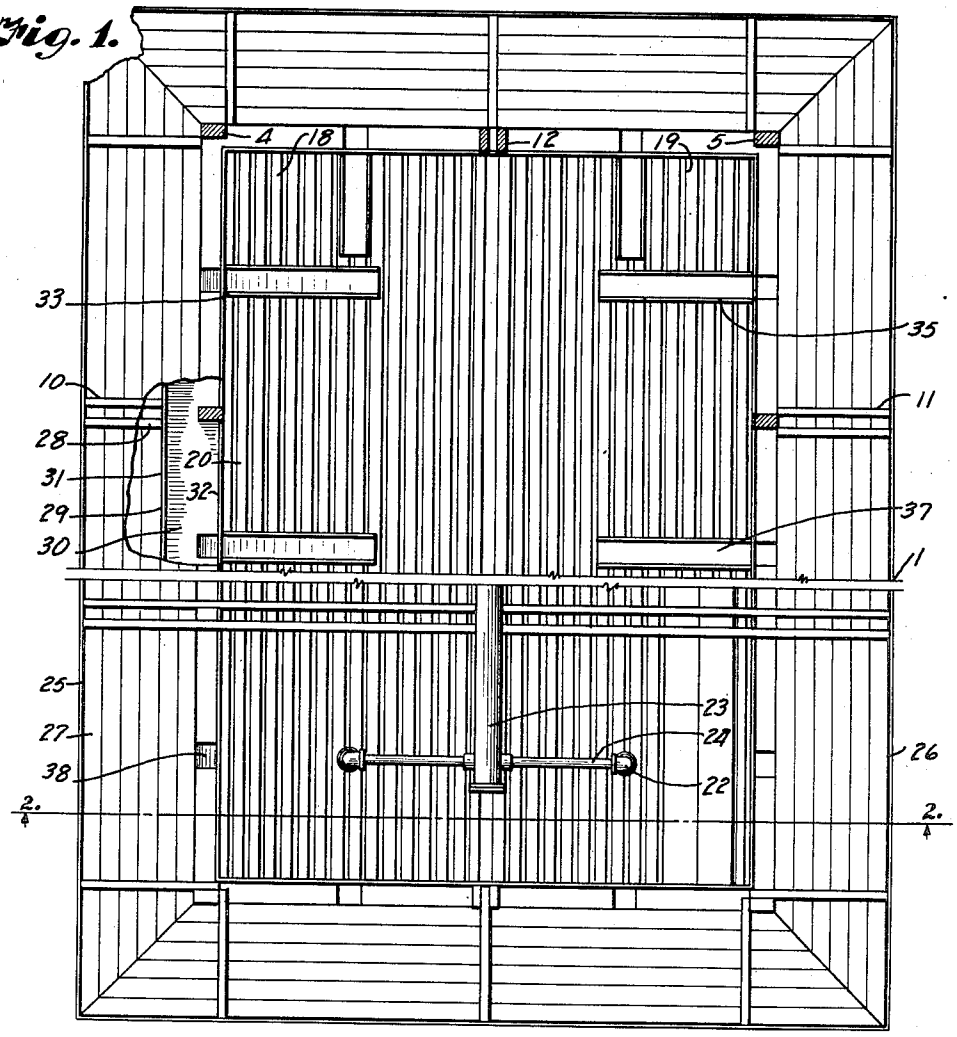


Fig. 6.

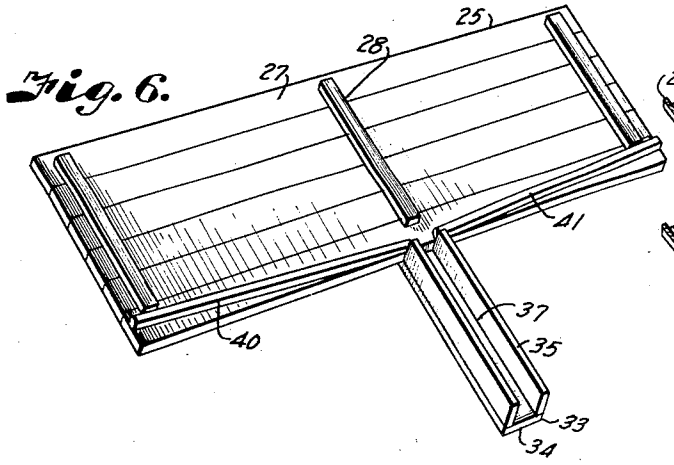
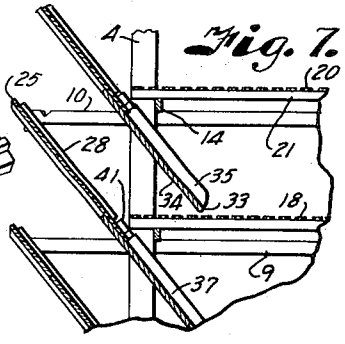


Fig. 7.



INVENTOR

Robert R. Pabodie.

BY Arthur C. Brown

ATTORNEY

Nov. 30, 1937. R. R. PABODIE 2,100,667

COOLING TOWER

Filed Nov. 16, 1936 2 Sheets-Sheet 2

Fig. 2.

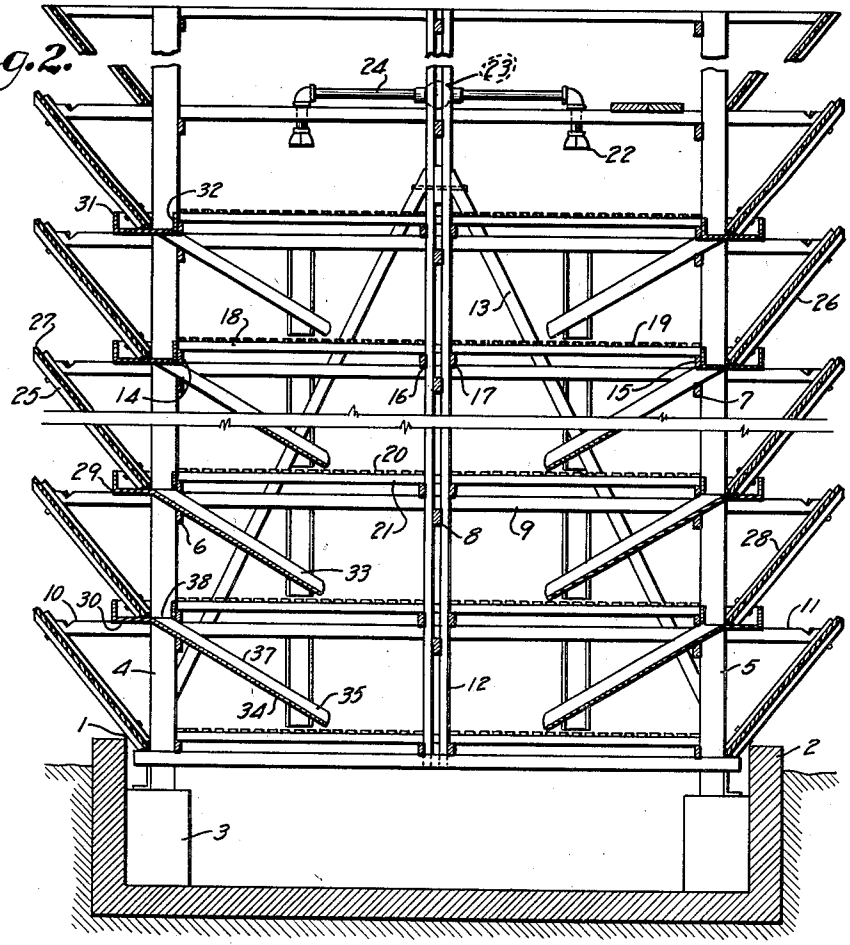


Fig. 3.

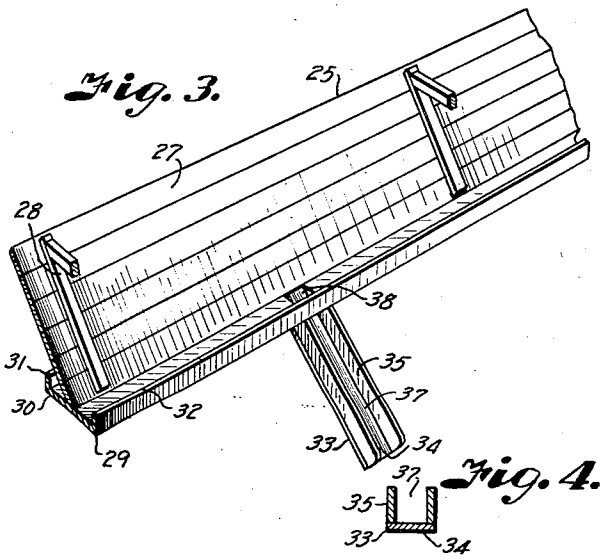
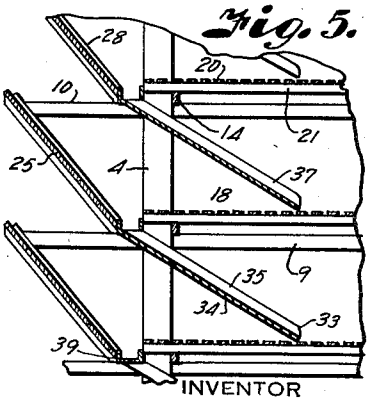


Fig. 4.

Fig. 5.



INVENTOR

Robert R. Pabodie

BY Arthur B. Brown

ATTORNEY

Patented Nov. 30, 1937 2,100,667

UNITED STATES PATENT OFFICE

2,100,667

COOLING TOWER

Robert R. Pabodie, Kansas City, Mo., assignor to J. F. Pritchard & Company, Kansas City, Mo., a corporation of Missouri

Application November 16, 1936, Serial No. 111,030

9 Claims. (Cl. 261—110)

This invention relates to cooling towers, particularly those including a plurality of vertically spaced decks from which the liquid to be cooled is caused to drip from deck to deck and across air currents moving transversely therebetween. These air currents vary in direction and velocity and tend to carry the droplets of liquid toward the leeward side of the tower, consequently the liquid tends to collect and run down the leeward side of the tower in progressively increasing amounts as the bottom of the tower is approached, so that the liquid is not effectively cooled. Moreover, due to the concentrated flow of liquid at the side of the tower, much of it is blown to the ground or is carried away with the wind, resulting in loss of the liquid.

It is, therefore, the principal object of the present invention to provide a tower of this character with means for returning the liquid from the sides of an upper deck toward the center of the next lower deck so as to maintain more uniform distribution of the liquid.

It is also an important object of the invention to provide for return of the liquid without limiting the volume of air moved between the decks of the tower.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a plan view of a cooling tower embodying the features of the present invention.

Fig. 2 is a vertical section through the tower on the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of a portion of one of the louvers, a portion of the catch trough associated therewith, and the spout for returning the liquid from the catch trough toward the center of the tower.

Fig. 4 is a cross-section through the return spout.

Fig. 5 is a fragmentary section through a tower equipped with a modified form of catch trough.

Fig. 6 is a perspective view of a further modified form of the invention.

Fig. 7 is a fragmentary section through a tower equipped with the form of the invention illustrated in Fig. 6.

Referring more in detail to the drawings:

1 designates a cooling tower including a tank or sump 2 having supports 3 therein for mounting vertical pairs of posts 4 and 5 of the tower. Connecting the posts 4 and 5 at the respective sides of the tower are vertically spaced stringers 6 and 7 cooperating with intermediate stringers 8 to support transverse sills 9. The transverse sills extend across the width of the tower and have projecting ends 10 and 11 to provide louver supports, as later described. The intermediate longitudinal stringers are carried between spaced vertical members 12 aligning with the pairs of posts and braced therefrom by props 13 having their upper ends connected with the upper ends of the members 12 and their lower ends to the deck posts, as best shown in Fig. 2.

Carried on the cross sills 9 adjacent the inner sides of the pairs of posts and the facing sides of the members 12 are longitudinal joists 14—15 and 16—17 carrying superimposed deck sections 18 and 19, the deck sections being composed of a plurality of spaced slats 20 secured by cleats 21 having their ends supported on the joists as illustrated in Fig. 2.

The liquid to be cooled is distributed over the top deck by means of a distribution system comprising rows of spray nozzles 22 having connection with a main supply line 23 through branches 24, as in conventional cooling tower practice.

Cooling towers of the character described are usually provided between the respective decks with louvers 25 and 26 each composed of a plurality of boards or the like 27 secured in edge to edge contact by battens 28 that are located in alignment with the projecting ends of the transverse sills. The louvers are preferably formed in bays and supported in outwardly and upwardly inclined relation with their lower edges secured adjacent to the tower posts while their upper edges are secured to the projecting ends of the transverse sills 9.

The louvers thus described extend along each side and end of the tower at the respective decks and form stops to prevent the liquid that is picked up by the air currents from blowing out of the tower, however, the air currents often move with such velocity that the liquid drifts toward the leeward side of the tower in such amounts that it is not effectively cooled. This condition is aggravated as the concentrated flow of liquid approaches the bottom of the tower. Also since the liquid tends to concentrate at the leeward side of the tower it is ordinarily necessary that the louvers be supported in as near a perpendicular direction as possible to prevent splashing or blowing away of the liquid from the tower.

As above pointed out, it is the purpose of the present invention to provide means for preventing concentration of the drifting droplets of

liquid toward the leeward side of the tower by returning the liquid from the lee side of an upper deck toward the center of the next lower deck. Thus while the liquid may tend to drift toward the side of an upper deck it is returned toward the center of the next lower deck so that it is maintained in distributed condition for uniform gravitation substantially across the entire area of the respective decks.

In the form of the invention shown in Figs. 1 to 3 inclusive, this is accomplished by providing the sides and ends of the tower with troughs **29** having horizontal boards **30** supported on the projecting ends of the sills **9** and provided with side boards **31** and **32** of such a height that the upper edges thereof substantially align with the plane of the respective decks. The troughs **29** are arranged so that the lower inner edges of the respective louvers are contained therein so that any of the liquid blown across the louvers gravitates down the inner faces thereof to collect in the troughs.

In order to return the collected liquid from the respective troughs back toward the center of the tower the troughs are provided intermediate each of the bays with a spout **33** having a bottom **34** and spaced side walls **35** to provide an open top **37** wherethrough air currents moving between the decks can directly contact the liquid moving down the respective spouts. The upper ends of the spouts are connected with the troughs and communicate therewith through drain openings **38** formed in the bottoms **29**. The spouts extend across the longitudinal sills and have their lower ends resting on the next lower deck at a point slightly beyond the center of the decks between the outer posts and the intermediate supporting structure, as best shown in Fig. 2.

It is thus obvious that liquid drifted toward the lee side of the deck is caught by the louvers and gravitated into the troughs from where it drains through the openings into the spouts for gravitational flow back toward the center of the next lower deck. The liquid is thus kept from concentrating along the lee edge of the tower. Since the liquid is kept within the confines of the tower better ground conditions are maintained around the tower.

In the form of the invention shown in Fig. 5 the catch troughs are illustrated as having their outer sides **39** attached directly to the lower edges of the louvers, otherwise the construction and function is substantially the same as that illustrated in the preferred form of the invention.

In Fig. 6 is shown a modified form of the invention wherein the catch trough is formed by attaching strips **40** and **41** having their outer ends secured to the outer edges of the bays and their inner ends inclined downwardly toward the open upper end of the spouts which are attached to the lower intermediate portions of the respective bays.

Attention is particularly directed to the fact that since the top of the spouts are open, a cooling effect is provided for the liquid while it is being returned toward the center of the tower. With the arrangement as described all of the decks are effective for cooling purposes regardless of the direction from which the wind is blowing. It is also obvious that by preventing concentration of the liquid at the lee sides of the tower the louvers may be arranged at a flatter angle to allow for greater volume of air flow between the respective decks without losing the liquid being cooled.

What I claim and desire to secure by Letters Patent is:

1. In a cooling tower including decks, means supporting the decks in superimposed relation, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs on the deck supporting means below the edges of the decks to collect any liquid that drifts laterally between the decks, and ducts connected with the troughs to return the liquid toward the opposite side of a lower deck.

2. In a cooling tower including superimposed decks, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs supported at the edges of and below the surfaces of the decks to collect any liquid that drifts laterally from the decks, and open ducts connected with the troughs to return the collected liquid toward opposite sides of the tower.

3. In a cooling tower including superimposed decks, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs supported at the edges of the decks to collect liquid that drifts between the decks, louvers supported in the troughs for catching the drifting liquid and to effect flow of the liquid into the troughs, and ducts connected with the troughs to return the collected liquid in the direction of the opposite side of a lower deck.

4. In a cooling tower including superimposed decks, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs supported at the edges of the decks to collect liquid that drifts between the decks, louvers supported in the troughs for catching the drifting liquid and to effect flow of the liquid into the troughs, and open topped spouts connected with the troughs to return the collected liquid toward the opposite side of a lower deck.

5. In a cooling tower including superimposed decks, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs supported at the edges of the decks to collect liquid that drifts between the decks, louvers supported in the troughs and inclined upwardly and outwardly relatively to the decks for catching the drifting liquid and to effect flow of the liquid into the troughs, and ducts connected with the troughs to return the collected liquid toward the opposite side of a lower deck.

6. In a cooling tower including vertical posts, vertically spaced horizontal sills carried by the posts and having ends projecting beyond the posts, decks supported by the sills between said posts, troughs carried by the projecting ends of the sills at the edges of the decks, louvers having their lower edges supported in the troughs and their upper edges fixed to the projecting ends of the next upper sills, and spouts connected with the troughs for returning liquid collecting in the troughs toward the opposite side of the tower.

7. In a cooling tower including vertical posts, vertically spaced horizontal sills carried by the posts and having ends projecting beyond the posts, decks supported by the sills between said posts, troughs carried by the projecting ends of the sills at the edges of the decks, louvers having their lower edges supported in the troughs and

their upper edges fixed to the projecting ends of the next upper sill, and inclined spouts connected with the troughs for returning liquid collecting in the troughs toward the opposite side of a lower deck.

8. In a cooling tower including vertical posts, a plurality of decks, means on the posts for supporting the decks in superimposed relation, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs carried by the deck supporting means, louvers connected with the troughs and inclined upwardly and outwardly relatively to the decks for catching the liquid drifting from the decks and to effect flow of the liquid from the louvers into the troughs, and ducts connected with the troughs to return the collected liquid toward the opposite side of a lower deck.

9. In a cooling tower including vertical posts, a plurality of decks, means on the posts for supporting the decks in superimposed relation, means for delivering the liquid to be cooled to the uppermost deck for gravitation to the lower decks, troughs carried by the deck supporting means along the sides and below the surfaces of the decks, louvers extending upwardly and outwardly from the troughs for catching the flow of the liquid from the decks and effecting flow of the liquid from the louvers into the troughs, and means for returning the collected liquid in the troughs toward the opposite side of the lower deck.

ROBERT R. PABODIE.