No. 693,625. Patented Feb. 18, 1902.

H. B. SCHMIDT.

TOWER FOR COOLING AND CONDENSING WATER.

(Application filed Mar. 8, 1897.)

(No Model.) 2 Sheets—Sheet 1.

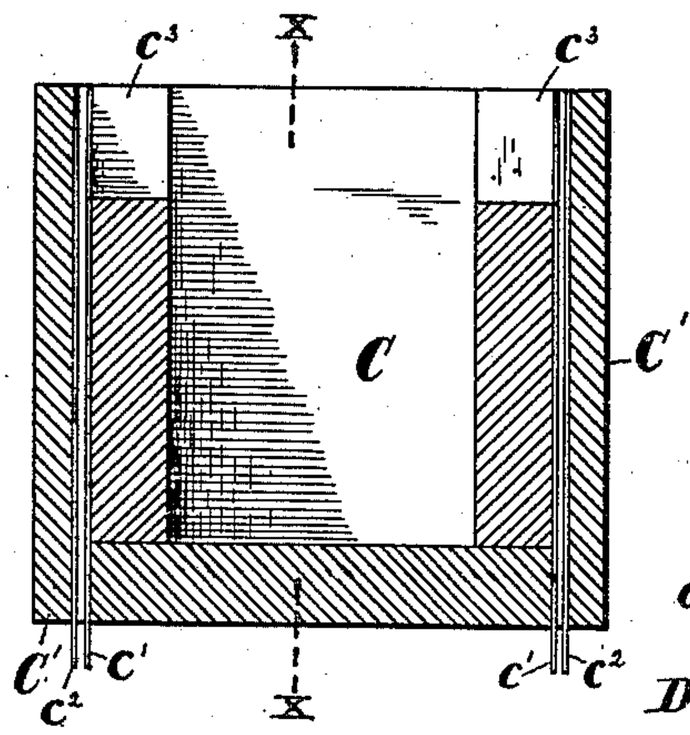

FIG. 2

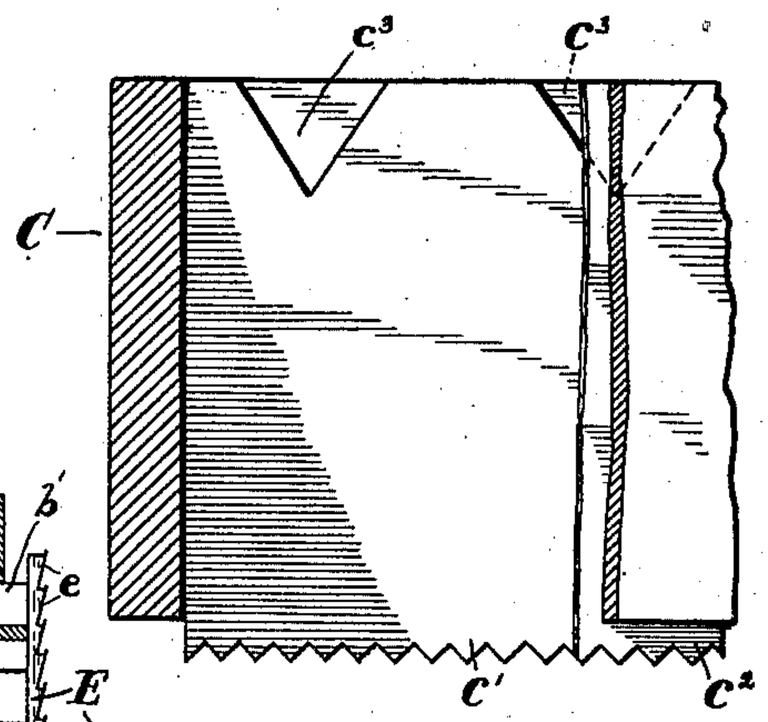

FIG. 3

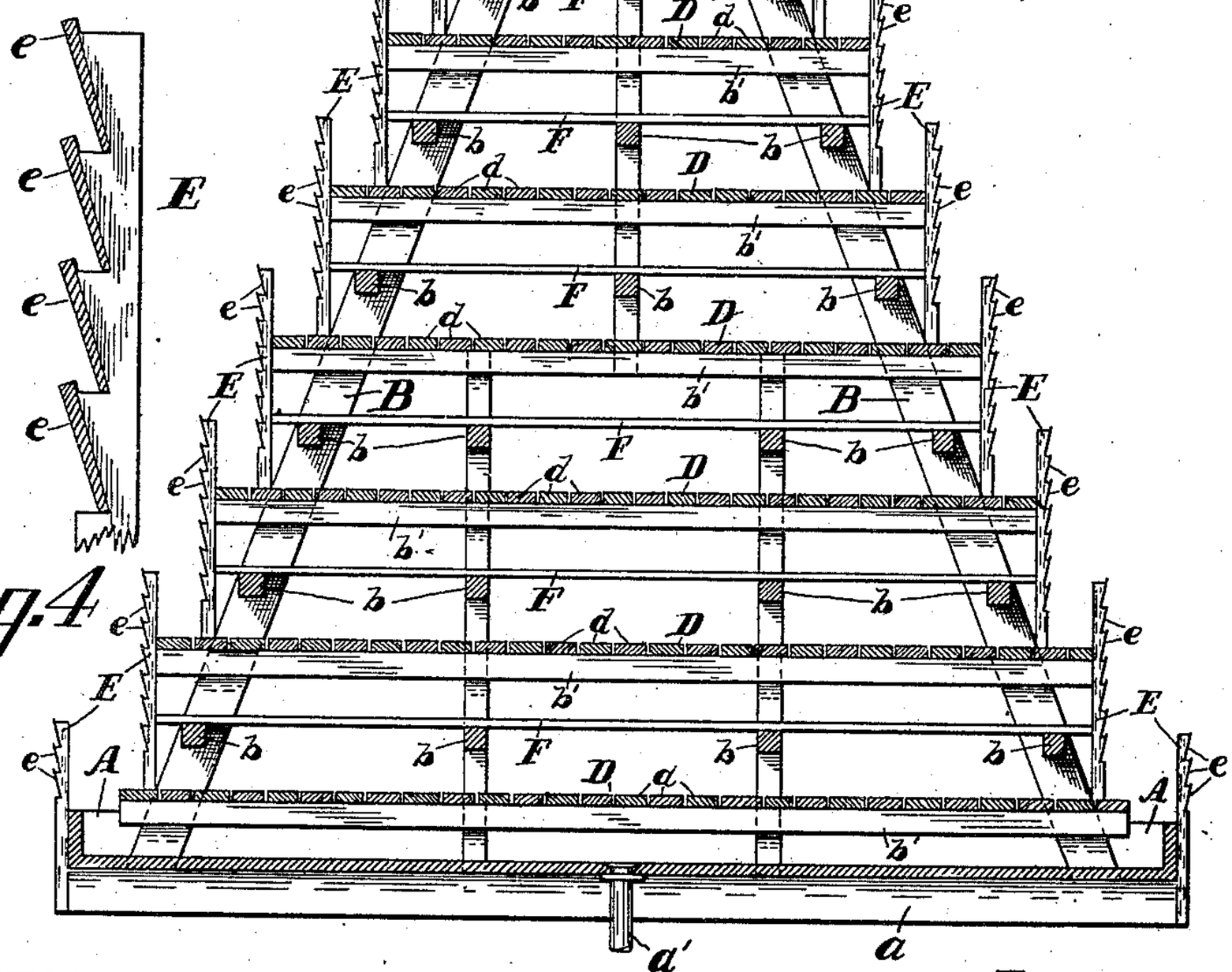

FIG. 4

FIG. 1

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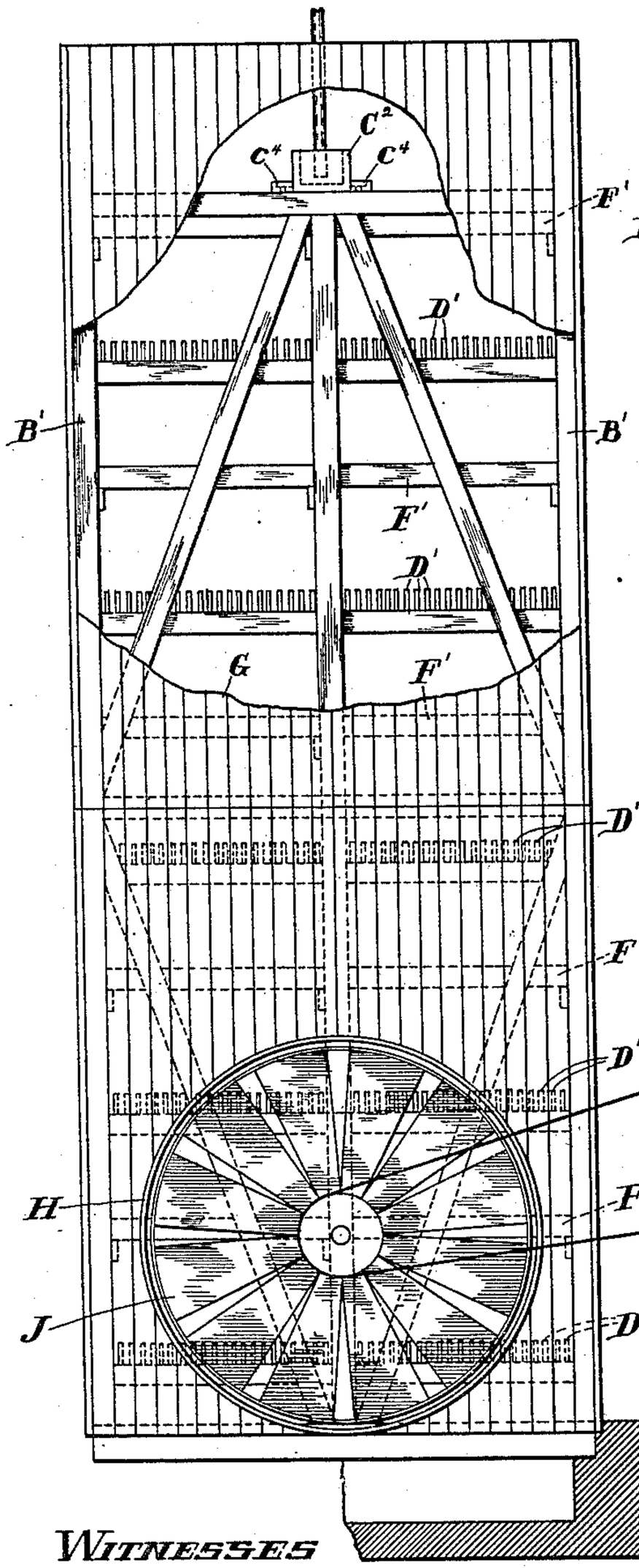

Fig. 5

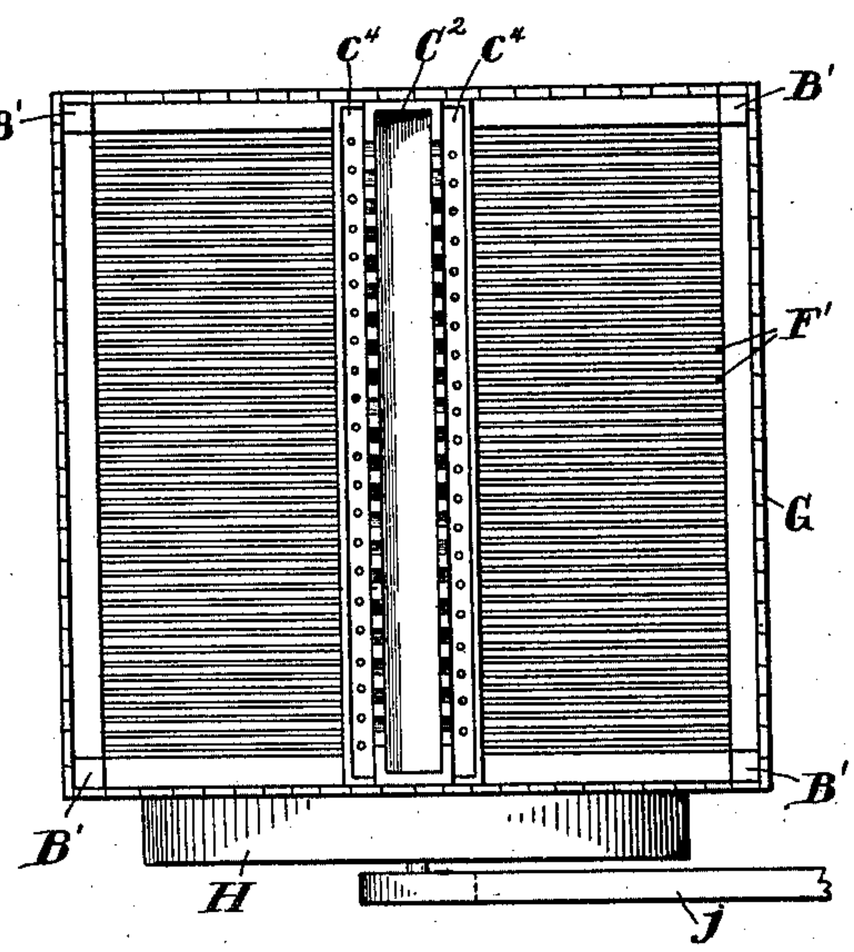

Fig. 6

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UNITED STATES PATENT OFFICE.

HERMAN B. SCHMIDT, OF CINCINNATI, OHIO.

TOWER FOR COOLING AND CONDENSING WATER.

SPECIFICATION forming part of Letters Patent No. 693,625, dated February 18, 1902.

Application filed March 8, 1897. Serial No. 626,389. (No model.)

To all whom it may concern:

Be it known that I, HERMAN B. SCHMIDT, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Towers for Cooling and Condensing Water, of which the following is a specification.

My invention relates to means for cooling and condensing water, and is especially adapted for use in connection with ice-machines.

It consists in the means hereinafter described for subdividing a body of water into fine jets and projecting the finely-divided jets upward in the form of minute particles against downwardly-directed currents of air.

The invention will be first fully described in connection with the accompanying drawings, and then particularly referred to and pointed out in the claims.

Referring to the drawings, in which like parts are indicated by similar reference-letters wherever they occur throughout the various views, Figure 1 is a transverse vertical sectional view of the cooling-tower embodying my invention. Fig. 2 is a vertical sectional view, upon a greatly-enlarged scale, of one of the tanks which receive the water to be cooled in its passage from the top of the tower to the reservoir or receiver at its base, the view in this case being taken on a plane parallel to the view shown in Fig. 1. Fig. 3 is a view, partly in elevation and partly in vertical section, in a plane at right angles to the view shown in Fig. 2, the section being taken through the outer side board and its lining-plate to expose the lining-plate secured to the side of the tank. Fig. 4 is a detail view upon the same scale as Figs. 2 and 3, taken in a vertical plane through the deflecting-strips, showing one of the uprights which support said strips in elevation, this figure being simply an enlarged view of any one of the uprights shown in Fig. 1. Fig. 5 is a view in side elevation of a modification of my inventiion, in which the descending spray is met by an ascending current of air. A portion of the side casing is broken away to expose the interior of the tower, and a part only of the receiving-tank is shown in section. Fig. 6 is a plan view of the same.

The cooling-tower here shown is intended to be erected on the top or roof of a building in which the ice-machine is used. The structures which I have erected to test the value and practicability of my invention have been proportioned about as follows: about sixteen feet across at the base by twenty-two feet long and about twenty feet in height; but the proportions may be varied at will, depending upon the amount of water to be cooled and the temperature of the atmosphere employed as a cooling agent. I have also found it more economical to construct the framework of the tower upon timbers inclined from the base toward each other at the top, forming practically an inverted-V-shaped structure in cross-section, and providing the inclined sides with deflecting-strips, so that the air employed for cooling will strike the deflecting-strips upon each side. The ends of the tower may be left open or may be closed, as desired, the tower being so arranged that its sides, which are covered by the deflecting or baffle plates, may be presented to the prevailing winds.

Having now stated the general proportions of the structure, I will proceed to describe it in detail.

Referring first to Figs. 1 to 4, inclusive, the structure is erected in a receiving-tank A, which is supported upon any suitable number of timbers *a*. B represents the upright framing-timbers, any suitable number of which may be employed. These timbers upon each side of the tower are connected by joists or timbers *b*, and the two inclined uprights B are braced apart by transverse joists or timbers *b'*. The timbers *b* and *b'* support the floors or shelves upon which the finely-divided streams or jets of water fall and through which the water trickles or passes in thin sheets or jets to the shelf beneath. The upper transverse timbers *b'* support two tanks C, of similar construction, which receive the heated water from a pipe *c*, leading from a pump or other elevating apparatus, the said pipe having T branches discharging into each of the tanks. These tanks are covered upon their outer side walls with galvanized-iron plates *c'*, which, like the upper longitudinal edges of the tank, are notched to allow the water to overflow and pass down to the floor or shelf beneath. Upon each longitudinal side of the tank is a side board C', which stands

a short distance away from the side of the tank proper. The inner faces of these boards C′ are lined with galvanized-iron plates c^2. The lower edges of the plates c' and c^2 are notched, as seen plainly in Fig. 3, so that the water passing out of the tank through the notches c^3 trickles over the adjacent surface of the plates c' and c^2 and is delivered in thin streams from teeth in their lower notched edges upon the first floor or shelf D. The water striking the shelf splashes upward in a finely-divided spray, and this spray, with the water that falls in thin streams from the teeth of the notched plates c' and c^2, is subjected to currents of air deflected downward by the inclined longitudinal strips *e*, which are secured upon the uprights E. The water having received a preliminary cooling falls through the interstices between the boards *d* to the floor or shelf F below it. The boards of the shelves D and F are arranged at right angles to each other, and these alternate from bottom to the top of the tower. By this means the thin stream of water which spreads over each floor is more perfectly subdivided in its passage from one shelf to the other, and passing through the interstices, which are narrow, the water will by attraction pass partially over the under side of each shelf before it drops to the shelf below, thus distributing the water practically over the whole of the shelves, and consequently subjecting it to a greater contact with the atmosphere.

In practice I have found it best to make longitudinal shelves or floors D of boards two inches thick by six inches wide and the cross-shelves F one inch thick by six inches wide and making the distance between the shelves about twelve to fourteen inches; but these proportions may be varied according to the duties to be performed and the mean temperature of the atmosphere in the locality where the tower is to be erected.

It is evident that as the water descends from the narrower shelves at the top to the broader shelves at the bottom of the tower the jets or sprays of water will be more finely divided at each step from the time it leaves the tanks until it reaches its storage-reservoir A at the bottom. The water is drawn off from the reservoir by a pipe a' to be used over again for cooling the condensing-coils of the ice-machine or if not sufficiently cooled in its passage through the tower is returned to a pump, (not shown,) as an ordinary pump will answer the purpose, which forces it again through the pipe *c* to the tanks C. The deflecting-plates *e* not only give a downward direction to the air passing through the tower, but prevent the finely divided or cooled spray of water from being wasted in the atmosphere, as (if the wind is strong) this spray will strike against the inner surfaces of the deflecting-strips upon the opposite side from which the wind is blowing and trickle down over them to the floors or shelves beneath.

In practice I have found it sufficient to protect the two sides of the shelves by deflecting-strips and to make the shelves decrease in width from bottom to top of the tower, the tower being, as before stated, inclined from bottom to top on two sides only; but it is obvious that the tower may be made pyramidal in shape, if desired, and the four sides inclosed by deflecting-strips instead of two sides, as shown. The form shown, however, is believed to be the best and most economical in construction.

In the modification shown in Figs. 5 and 6 the tower is shown as inclosed by an outer casing G and erected in a receiving-tank A′, which may be built either on the roof or in any desired position. In this case the uprights B′ are perpendicular and the tower rectangular in shape, as shown in Fig. 6. There is but a single tank C^2 employed in this modification, with overflow-notches in the side which drop into a gutter c^4, which is perforated to allow the water to trickle through upon the grated flooring beneath. The floors, or shelves are in this case, like in the former, arranged alternately, with their interstices at right angles; but I have found it preferable to arrange the boards D′ and F′ on edge instead of flatwise, as in Fig. 1, to allow the spray when it strikes one floor to trickle down the sides of the slats while the upper current of air passes between. It will be seen that in this case the air as it is forced upward changes its direction as it passes through each of the shelves in the series, and therefore comes in contact with all parts of the thin streams or sprays of descending water.

Upon one side of the case, near the bottom, is a circular opening having a flanged rim or hoop H around it, within which is mounted a ventilator fan or wheel J, which is journaled in suitable bearings in the upright timbers of the tower. This is driven by a belt *j*, passing over a pulley *j′*, driven from any suitable source of power.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a cooling-tower of the reservoir for the cool water, the tower erected thereon, said tower being provided with a series of shelves each shelf having a series of interstices to pass the water falling upon it to the shelf beneath in thin streams or jets, the interstices in each shelf being arranged at an angle to those in the adjacent shelf or shelves, the tank or tanks supported above the upper shelf to distribute the water to be cooled in thin streams thereon, and means such as shown to direct a current of air against and through the finely-divided jets or spray of water falling from one shelf to the other, substantially as shown and described.

2. The combination of the reservoir for the cooled water, the cooling-tower erected thereon, said tower being provided with a series

of shelves, each shelf having a series of interstices to pass the water falling upon it to the shelf beneath in thin streams or jets, the interstices in each shelf being arranged at an angle to those in the adjacent shelf or shelves, inwardly-inclined deflecting-strips upon opposite sides of each shelf to deflect the air against and through the thinly-divided jets or sprays of water falling from one shelf to the other, distributing-tanks supported above the upper shelf to distribute the water to be cooled in thin streams thereon, wings such as described for conveying the water to be cooled to the distributer, substantially as shown and described.

3. The combination of the reservoir, the cooling-tower erected therein, said tower being provided with a series of shelves formed of boards having interstices or open spaces between their adjacent edges, the boards in each shelf being arranged substantially at right angles to the boards in the shelf or shelves adjacent to it, inwardly-inclined deflecting-strips arranged upon the opposite sides of each shelf to deflect the air downward against and through the finely-divided jets or sprays of water in its passage through the tower, distributing-tanks supported above the upper shelf to distribute the water in thin streams or jets thereon, means such as described for supplying said tank or tanks with the water to be cooled, and means for withdrawing the water from the reservoir when cooled, substantially as shown and described.

HERMAN B. SCHMIDT.

Witnesses:
GEO. J. MURRAY,
SHERWOOD R. TAYLOR.