No. 677,750. Patented July 2, 1901.

C. H. WHEELER.

COOLING TOWER.

(Application filed Feb. 16, 1901.)

(No Model.) 2 Sheets—Sheet 1.

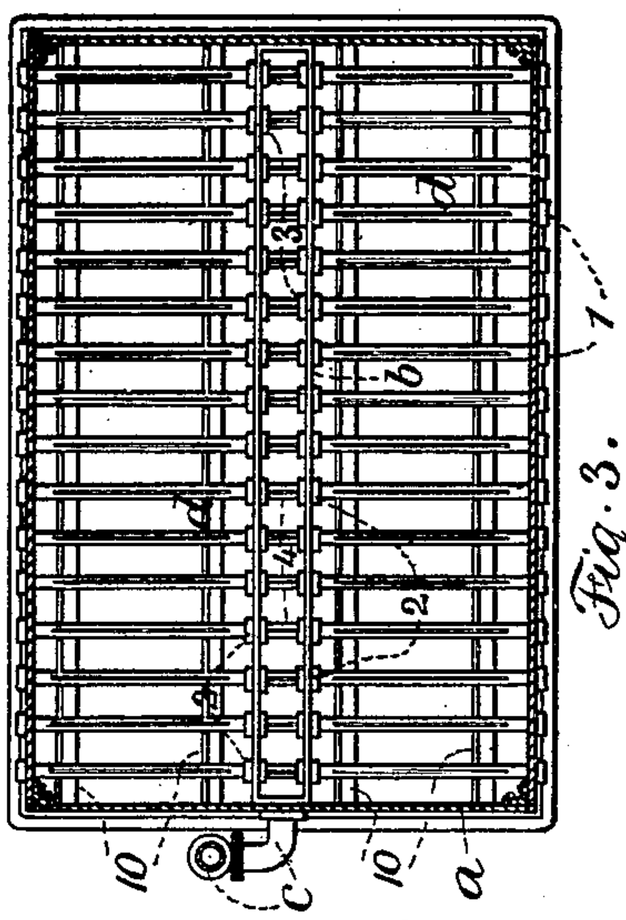

Fig. 3.

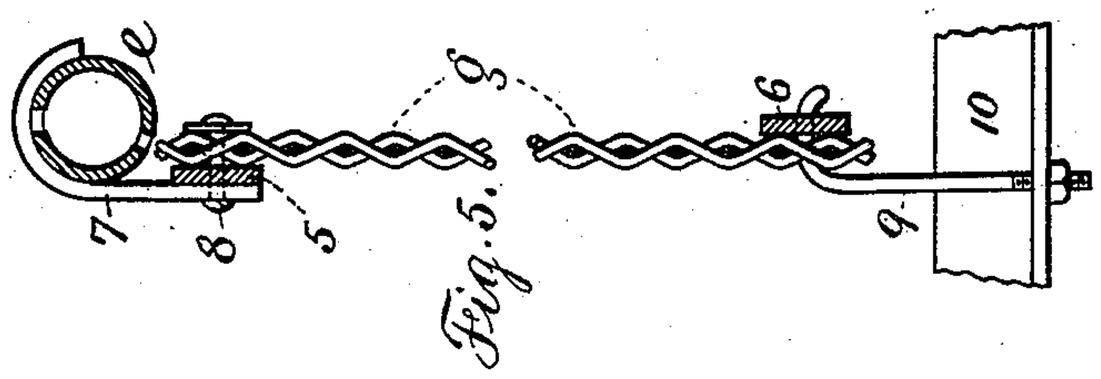

Fig. 5.

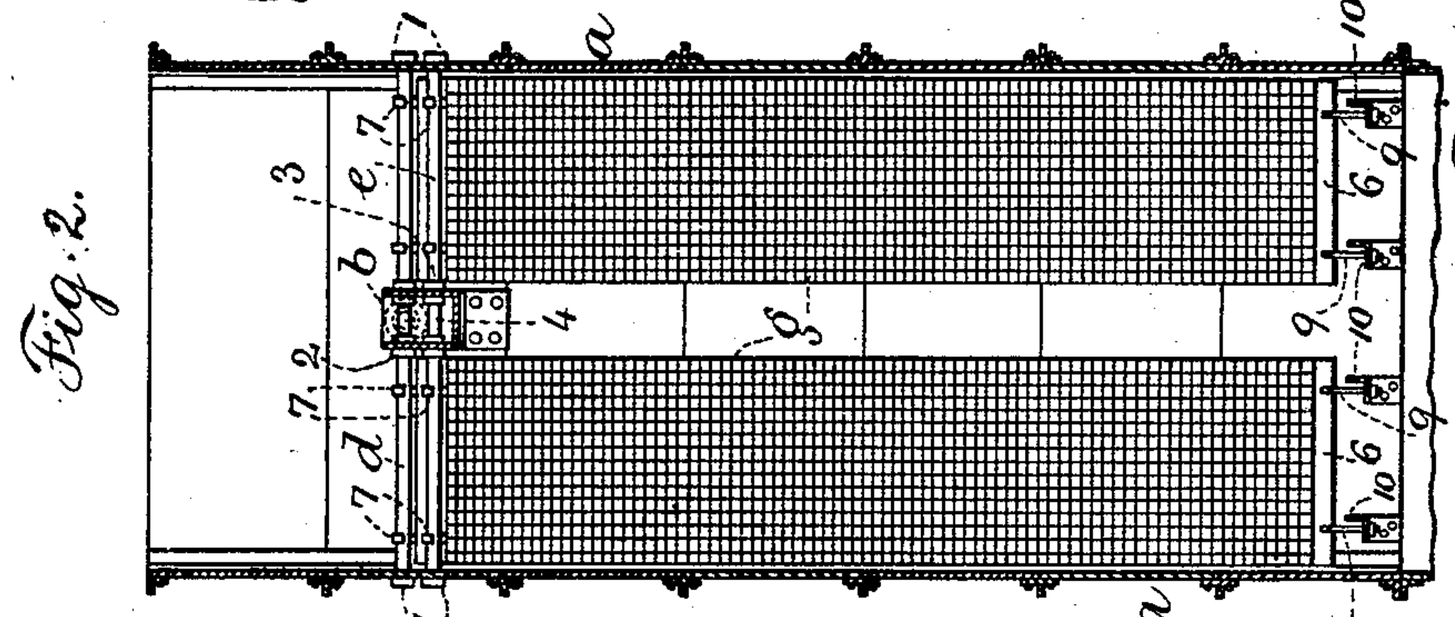

Fig. 2.

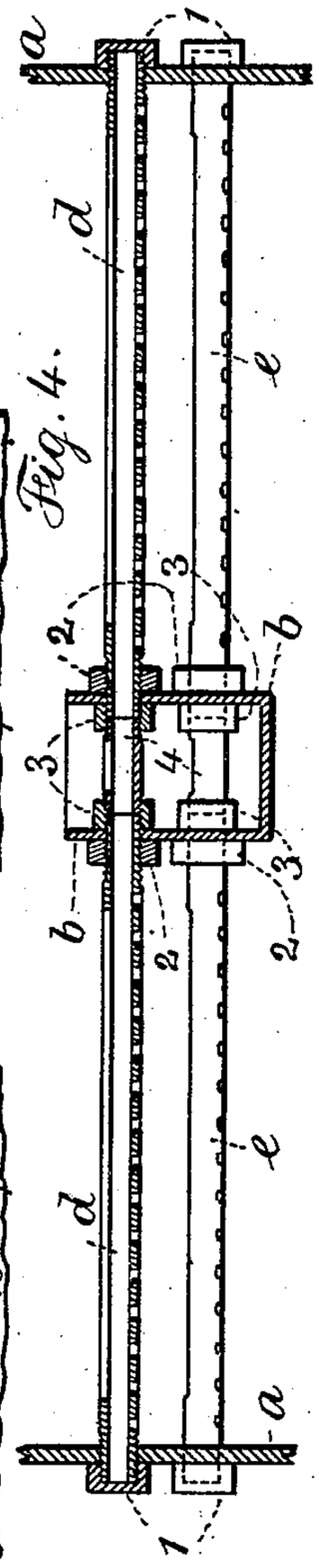

Fig. 4.

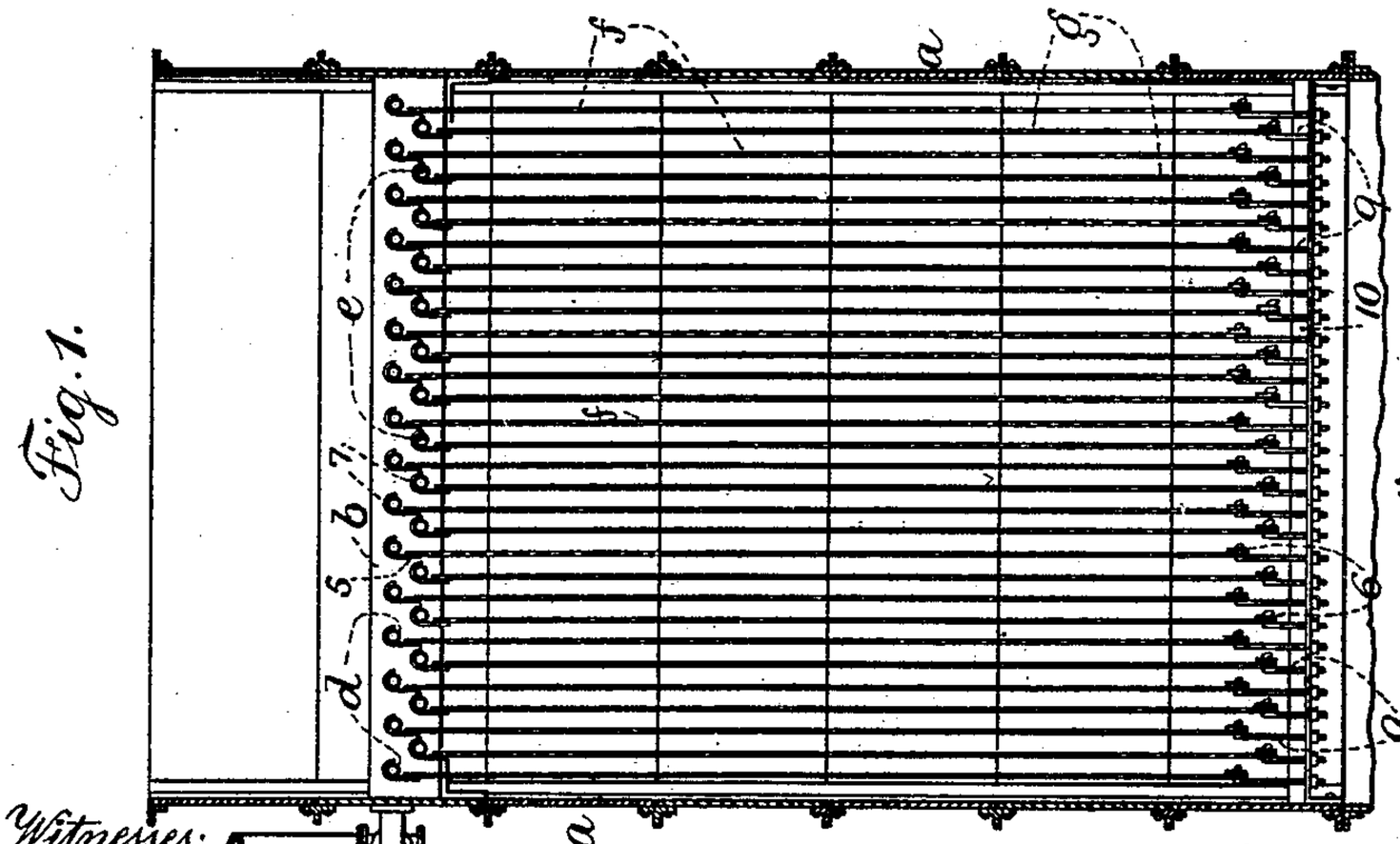

Fig. 1.

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Fig. 7.

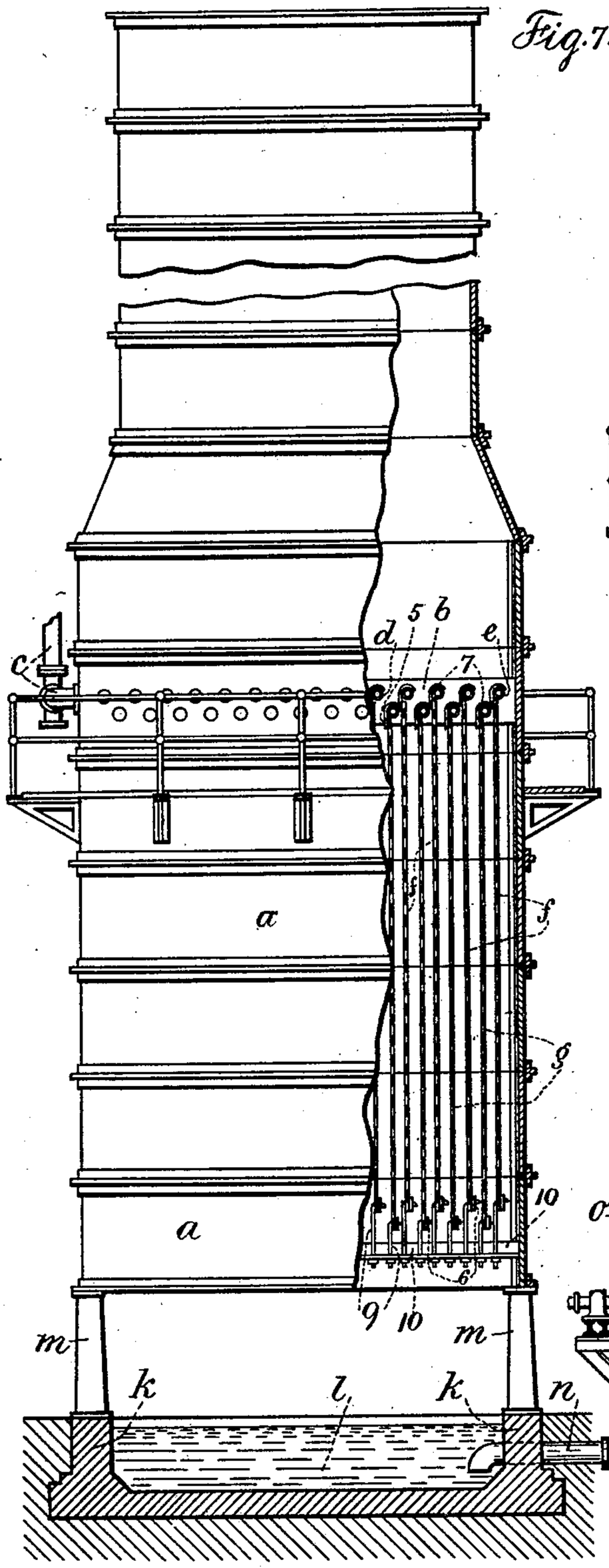
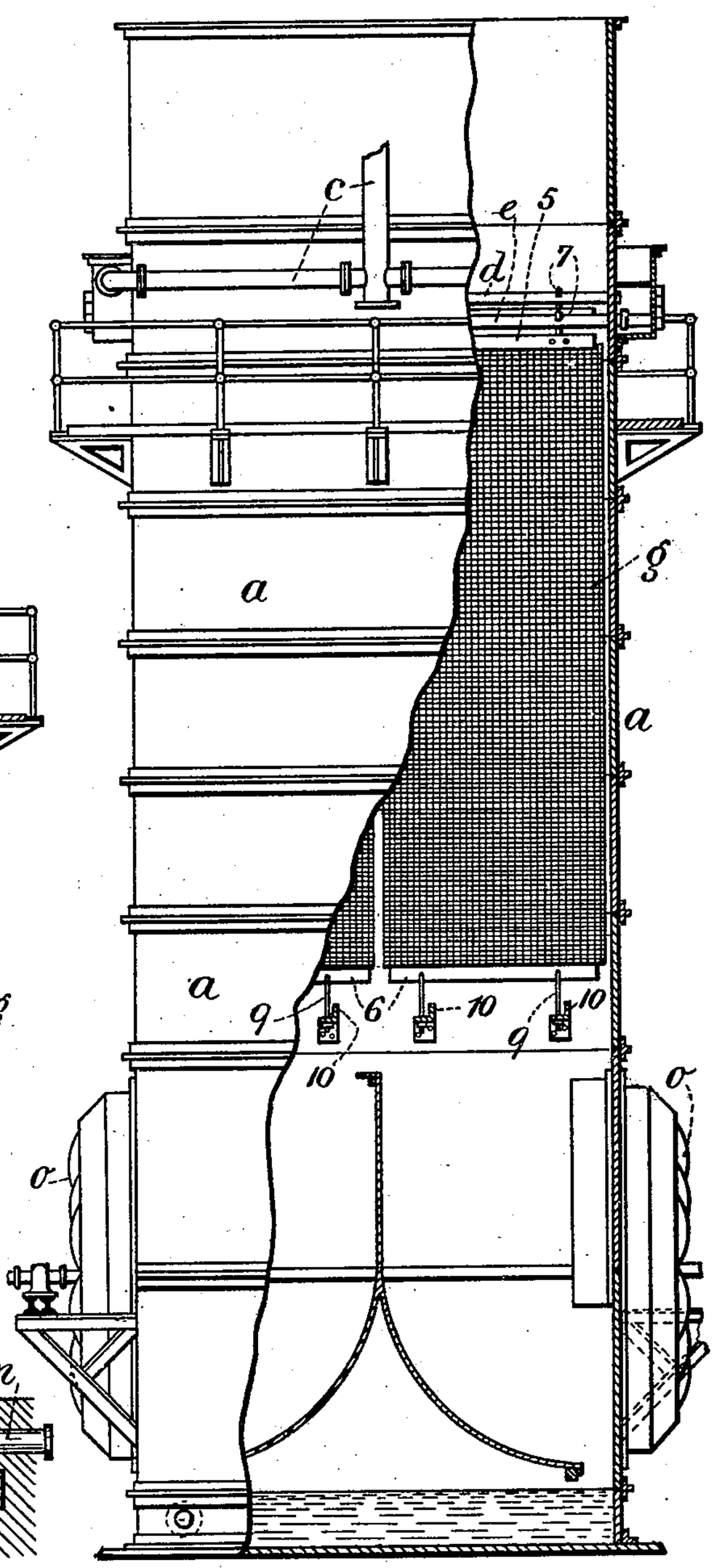


Fig. 6.



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UNITED STATES PATENT OFFICE.

CLIFTON H. WHEELER, OF SHORTHILLS, NEW JERSEY, ASSIGNOR TO THE WHEELER CONDENSER AND ENGINEERING COMPANY, OF NEW YORK, N. Y.

COOLING-TOWER.

SPECIFICATION forming part of Letters Patent No. 677,750, dated July 2, 1901.

Application filed February 16, 1901. Serial No. 47,554. (No model.)

To all whom it may concern:

Be it known that I, CLIFTON HAROLD WHEELER, mechanical engineer, residing at Shorthills, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Cooling-Towers, of which the following is a specification.

My invention relates to cooling-towers employing suspended mats in series for the fluid to trickle down while being cooled. Mats for this purpose have heretofore been employed. In these instances it has been usual to suspend the mats by devices at their upper ends and to leave the lower ends unheld. These mats have been arranged at spaced-apart intervals and the rising currents of air under natural or forced draft were liable to keep the lower ends of the mats moving to a greater or less extent and so interfere with their full efficiency.

In carrying out my invention I positively hold the mats at both ends so that they are maintained vertical and parallel to one another in spaced-apart series, so that the ascending currents of air can pass upward through the tower freely and unimpeded between the mats for cooling the fluid trickling down the same. The mats are preferably of wire mesh and the holding devices of such a character that the mats are suspended from pipes perforated to discharge the fluid to be cooled directly upon the mats, and the devices at the lower ends of the mats for holding the same can be drawn upon to apply tension to the mats to hold them taut.

The mat construction forming the subject of the present invention is equally applicable to towers having forced or natural draft. Where a forced draft is employed, I prefer to employ rotating fans driven by power, and where a natural draft is employed the tower is raised above a foundation, and I prefer to employ with such a tower a chimney rising to an appreciable height above the series of mats, so as to insure a draft upward through the tower.

In the drawings, Figure 1 is a vertical longitudinal section through a portion of a tower representing my improvements. Fig. 2 is a vertical transverse section; Fig. 3, a sectional plan above the supply-pipes; Fig. 4, a vertical section through the supply-pipes of one series. Fig. 5 is a vertical transverse section through the ends of a mat and the supports therefor. Fig. 6 is an elevation and partial section of a tower constructed to employ a forced draft, and Fig. 7 is a vertical section and partial elevation of a tower constructed to employ natural draft. Figs. 1, 2, 3, 6, and 7 are on approximately the same scale, and Figs. 4 and 5 are on different and larger scales than the other figures.

a represents the shell of the tower, of rectangular cross-section and built up of sections and connected by angle-irons around the outside and at the corners inside. While I have shown this construction, I do not limit myself thereto, as the shell may be constructed in any desired manner.

b represents a central trough placed longitudinally of the shell, and *c* a pipe connected therewith for supplying thereto fluid to be cooled.

d e represent pipes in series passing across the tower through the shell and walls of the trough. These pipes are shown as advantageously made with slots in and along the upper surface and perforations in the under surface, and I prefer to employ caps 1 upon the ends of the pipes outside the shell *a* and clamping-nuts 2 3 upon the pipes at the respective sides of the metal of the trough to firmly connect the parts, and which nuts 3 may also serve to connect to and between the ends of the pipes *d e* short lengths or sections of pipe 4, thus forming of the pipes *d* and sections 4 or the pipes *e* and sections 4 continuous lengths of pipe between the sides of the tower. I do not limit myself to employing the sections 4 to either or both of the series of pipes *d e*.

The mats *f g* are arranged across the shell of the tower in longitudinally-arranged series. They are parallel to one another and are placed vertically and at suitable spaced-apart intervals, so that between the mats there are substantially equal spaces for the ascending currents of air. To the upper and lower ends of the mats are preferably connected long narrow metal plates or strips 5 6. These are connected in any desired manner. Hooks 7, having substantially semicircular ends, are

connected to the upper ends of the mats and metal strips 5, preferably by rivets 8, with washers against one face of the mats, and the mats *f g* of the series are suspended by these hooks from the pipes *d e*. (See especially Figs. 5, 6, and 7.)

The perforations in the under surfaces of the pipes *d e* are preferably slightly at one side of the vertical center, and the mats are so hung from said pipes that the perforations come directly over the edge of the mats, and the escaping fluid passes directly to and trickles down the mats. The slots in the upper surface of the pipes *d e* serve for the overflow if the holes become stopped up, and the short sections of pipe 4 are slotted to deliver the water from the trough to the pipes of the series. I do not limit myself to the use of the trough through the center of the tower, as I may employ a trough upon the outside discharging fluid directly into the pipes of the series at the ends thereof, as illustrated with the tower of forced draft, Fig. 6.

I employ angle-irons 10, placed through the tower in any desired number or arrangement and at a short distance below the mats. These angle-irons are secured to the inner surface of the shell, and I employ hooks 9, with threaded lower ends, which hooks engage the lower ends of the mats by passing through holes in the strips of metal 6, and the threaded ends of the hooks pass through the angle-irons and carry nuts, the tightening of which draws down and applies tension to the mats to hold the same taut and to hold the mats of the series vertical and also at regular spaced-apart intervals. These nuts are also adapted to take up any slack in the mats occurring from time to time from various causes.

In the tower constructions shown in Figs. 6 and 7 portions of the mats *f g* are shown in elevation and section. The tower employing forced draft and the tower employing natural draft are both preferably of rectangular form. The tower employing forced draft is preferably provided with rotating fans *o*, driven by suitable power. One or more fans may be employed, the rotation of the fans forcing the air from without into the lower part of the tower, causing the same to rise through the tower and between the mats of the series for cooling the fluid trickling down the mats. The tower is elevated above the surface of the ground, floor, or roof of a building and supported on columns or piers *m* of any desired character or construction, which rest, preferably, upon a foundation *k*, which foundation encompasses a reservoir *l* to receive the fluid cooled in its passage down through the tower. I have shown the foundation *k* with an integral connecting-bottom of the same materials forming the fluid-tight reservoir, from which extends a discharge-pipe *n*, by which the cooled liquid may be withdrawn. The tower is to be elevated above the foundation to such an extent that the open space around below the lower edge and between the same and the foundation is of considerably larger area than the cross-sectional area of the tower, so as to give ample facilities for the inlet or natural draft of air. These are confined by the chimney for a considerable period, and the height of the chimney offers every opportunity for them to condense, so that the water of condensation falling with the cooling fluid may be caught and stored in the receptacle below the tower.

I am aware that heretofore an endless blanket was stretched over beams held to fixed supports and the blankets kept moist for the purpose of keeping air employed in heating and ventilating schools and other buildings in a clean moist state; but I do not claim any such device.

I claim as my invention—

1. In a cooling-tower, the combination with devices for supplying fluid to be cooled, mats placed vertically and spaced apart and devices for suspending the mats at their upper ends, of supports extending through the tower below the mats, strips of metal secured to and along the lower ends of the mats and hooks passing through and engaging the mats at the strips of metal with the stems of the hooks passing through the said supports and means connected to the stems of the hooks below the supports for drawing down the mats and applying a tension thereto and taking up the slack, substantially as set forth.

2. In a cooling-tower, the combination with devices for supplying fluid to be cooled, mats placed vertically and spaced apart, and devices for suspending the mats at their upper ends, of angle-irons extending through the tower below the mats, strips of metal secured to and along the lower ends of the mats, and hooks with threaded stems engaging the mats at the strips of metal and passing through the angle-irons and nuts upon the stems of the hooks below the angle-irons for drawing down the mats and applying a tension thereto and taking up the slack, substantially as set forth.

3. In a cooling-tower, the combination with devices for supplying fluid to be cooled, of pipes in series receiving such fluid and having perforations along their under surfaces, mats of suitable material placed vertically and at spaced-apart intervals, plates secured along the upper edges of the mats and hooks connected to the said plates and passing over the supply-pipes for suspending the mats from the pipes, and angle-irons extending through the tower below the mats, strips of metal secured to and along the lower ends of the mats, and hooks with threaded stems engaging the mats at the strips of metal and passing through the angle-irons and nuts upon the stems of the hooks below the angle-irons for drawing down the mats, and applying tension thereto and taking up the slack, substantially as specified.

4. In a cooling-tower, the combination with devices for supplying fluid to be cooled, of

pipes in series receiving such fluid, extending across within the tower and having perforations along their under surfaces at one side of the vertical center, angle-iron bars extending across within the tower near the lower end, series of mats placed vertically and at spaced-apart intervals, stiffening strips or plates of metal along their top and bottom edges and means for securing the same in place and hooks at the upper and lower ends of the mats for suspending them from the pipes and connecting them to the angle-iron bars, the mats being so hung that the perforations of the pipes come directly over the upper edges of the mats for the fluid to discharge upon the mats, substantially as specified.

Signed by me this 11th day of February, 1901.

CLIFTON H. WHEELER.

Witnesses:
GEO. T. PINCKNEY,
A. H. SERRELL.