No. 677,749.

Patented July 2, 1901.

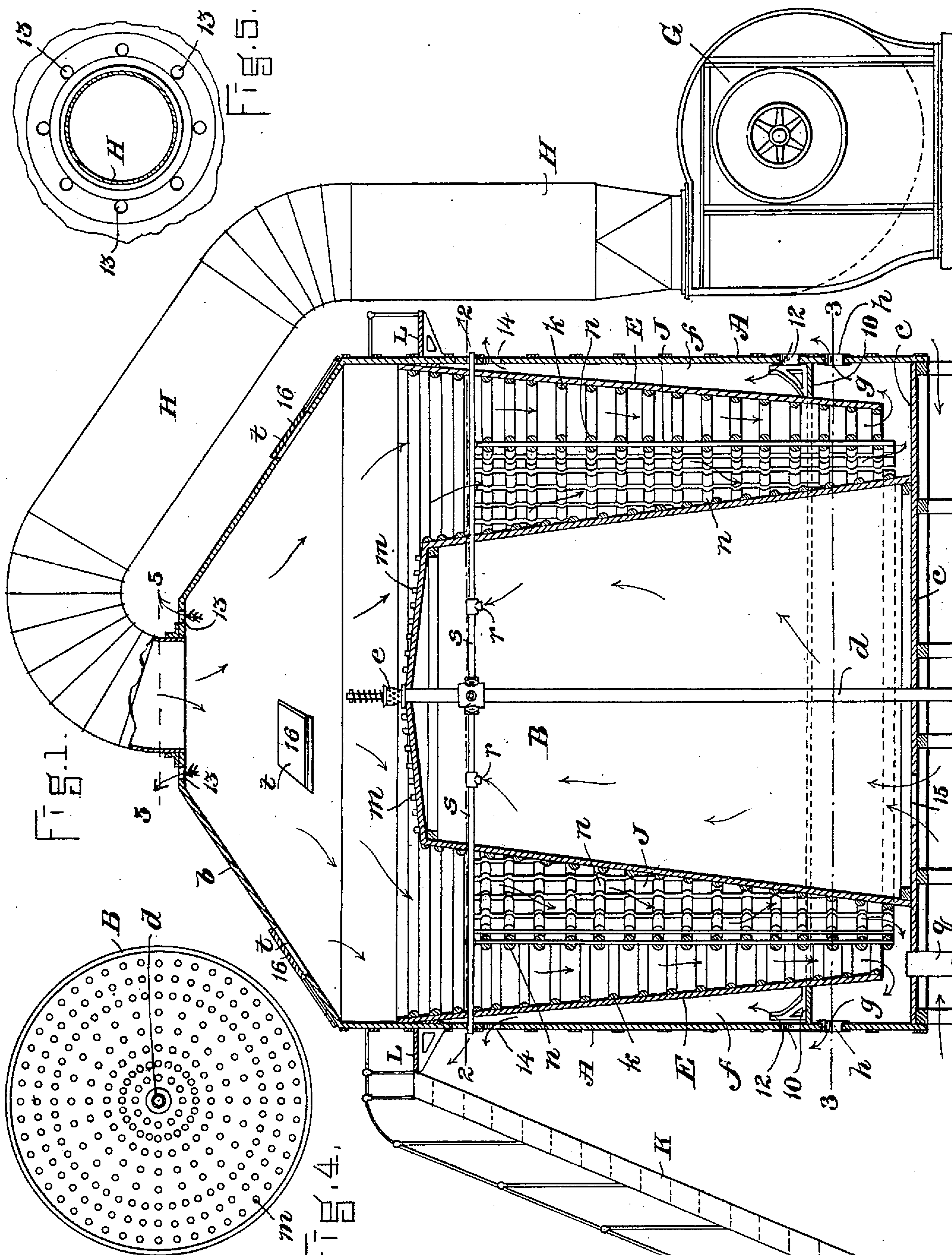
J. E. SWENDEMAN.

WATER COOLING TOWER.

(Application filed Mar. 8, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES.

R. Henry Marsh.

F. B. Spaulding.

INVENTOR.

Joseph E. Swendeman,

by R. E. Teschemacher Att'y.

No. 677,749. Patented July 2, 1901.

J. E. SWENDEMAN.

WATER COOLING TOWER.

(Application filed Mar. 8, 1901.)

(No Model.) 2 Sheets—Sheet 2.

FIG. 3.

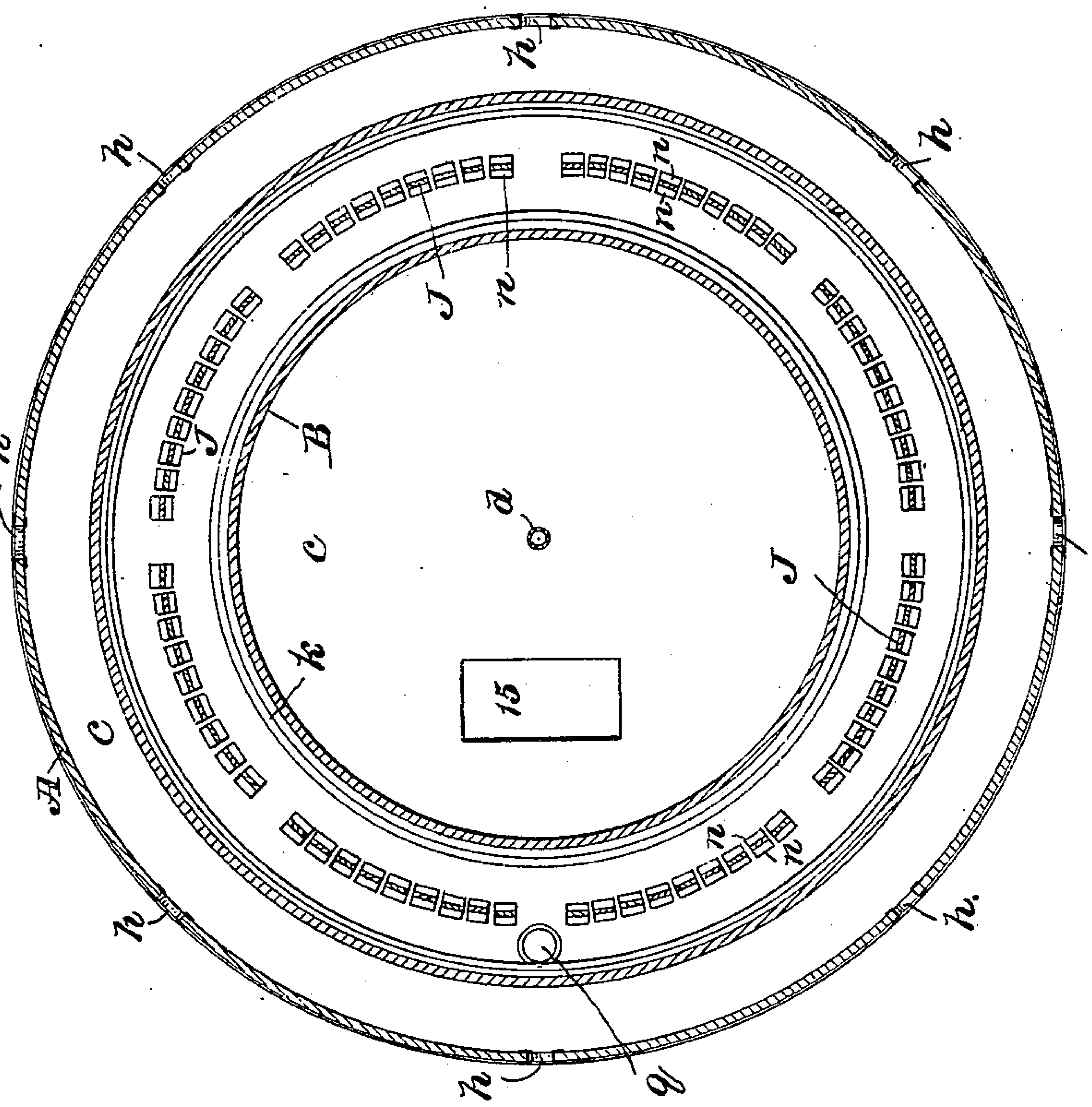
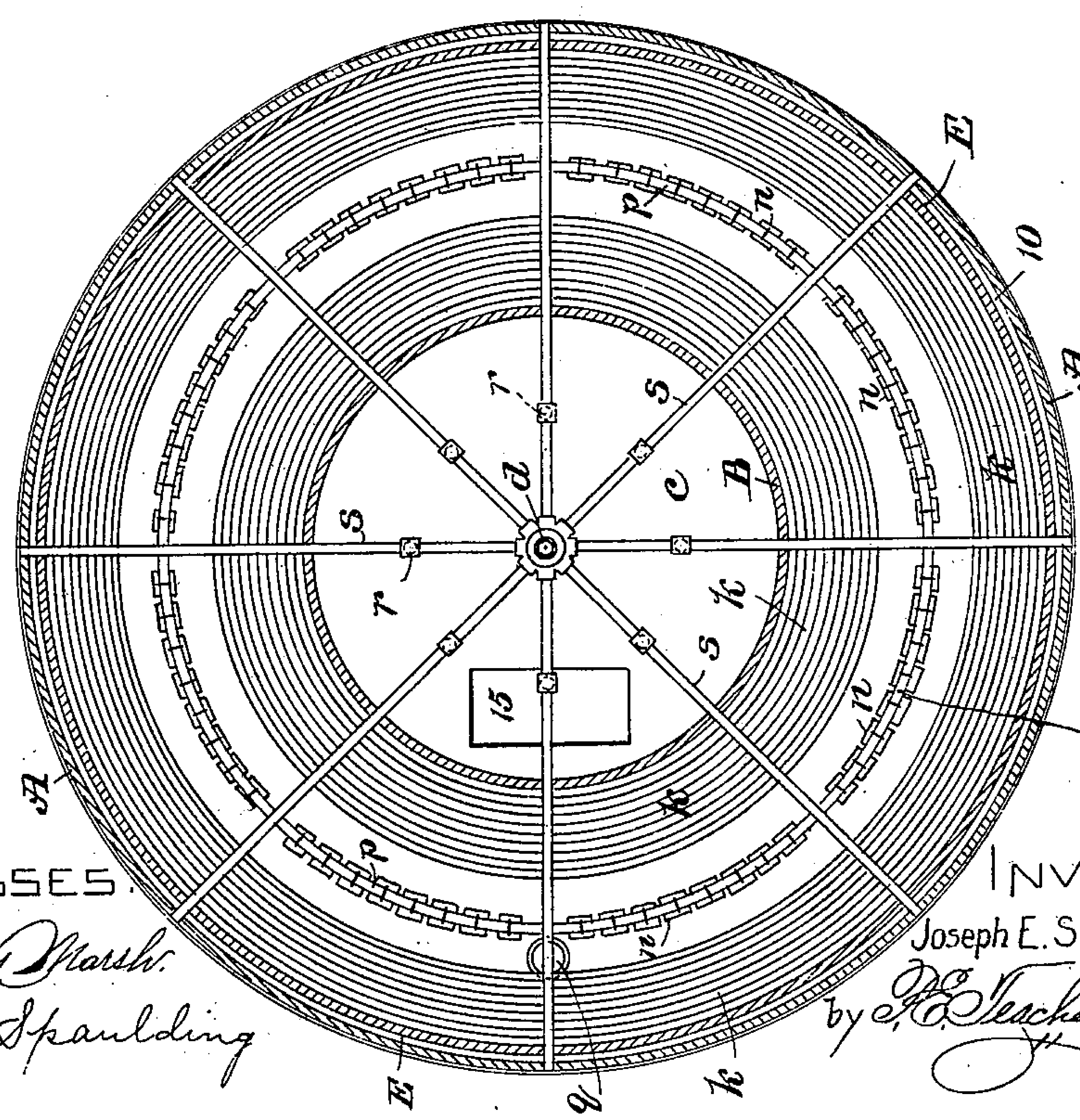


FIG. 2.



WITNESSES:

R. Henry Marsh.

F. B. Spaulding

INVENTOR.

Joseph E. Swendeman,

by F. E. Teachemacher

Atty.

UNITED STATES PATENT OFFICE.

JOSEPH E. SWENDEMAN, OF BOSTON, MASSACHUSETTS.

WATER-COOLING TOWER.

SPECIFICATION forming part of Letters Patent No. 677,749, dated July 2, 1901.

Application filed March 8, 1901. Serial No. 50,392. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. SWENDEMAN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Water-Cooling Towers, of which the following is a specification.

My invention has for its object to simplify and increase the efficiency of towers used for cooling water that has become heated by passing over the coils of ice-making or refrigerating machinery or from steam-condensers and other sources; and to this end my invention consists in a water-tower having its interior provided with a series of inclined upright surfaces having projections adapted to retard the downward flow thereover of the heated water which has been forced up and discharged into the upper portion of the tower, combined with means whereby cool air is caused to pass through the tower in contact with the water flowing over said inclined surfaces to cool the same, as hereinafter set forth; and my invention also consists of certain other novel features of construction and combinations of parts, as hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a central vertical section of a water-cooling tower constructed in accordance with my invention. Fig. 2 is a horizontal section of the same on the line 2 2 of Fig. 1. Fig. 3 is a horizontal section of the same on the line 3 3 of Fig. 1. Fig. 4 is a plan of the top of the cone-frustum within the tower. Fig. 5 is a horizontal section on the line 5 5 of Fig. 1.

In the said drawings, A represents the outer wall of a water-cooling structure or tower, preferably of cylindrical form and provided at its top with a roof or cover *b*. This tower may be placed upon the roof of a building or may be supported upon a framework or in any other suitable manner.

Centrally within the tower A is arranged a hollow cone-frustum B, secured at its lower edges to the bottom *c* of the tower, adapted to be supplied with air through an inlet-opening 15 in said bottom *c*. Passing through the center of the cone-frustum B and projected above the top of the same is a supply-pipe *d*, through which the heated water to be cooled is forced by a pump (not shown) and discharged from a spraying device *e* in fine radial streams, so as to be widely diffused within the upper portion of the tower, and by thus discharging the water from a central point it is evenly and uniformly distributed within the tower in a manner to produce the best results.

E represents the inner wall of the tower, which is inclined inward from the top toward the bottom, an air-space or chamber *f* being thus formed between the inner and outer walls for the purpose of preventing as far as possible the transmission of heat from the outer to the inner wall. The air-space *f* is closed at its bottom by a partition 10 and air is admitted to said space through inlet-openings 12 near its bottom and escapes through outlet-openings 14 near its top.

The inner wall E terminates a short distance above the bottom *c*, leaving a space *g* all around the bottom of the tower which communicates with a series of openings *h* in the outer wall A for the escape of air forced downward through the tower by means of a blower G, to which is connected an upright pipe or conduit H, which extends up outside the tower and enters the same at the center of the roof or cover *b*. Around the upper portion of the roof *b* are formed a series of small outlet-openings 13, Figs. 1 and 5, to permit of the escape of the heated air which rises to the top of the tower while the blower is in use.

To the inner wall E and also to the inclined sides of the cone-frustum B are secured a series of horizontally-arranged parallel half-round strips *k* of beading which form ledges or projections which materially increase the surface area over which the heated water has to pass in its descent, thus retarding its flow and greatly increasing the length of time during which it is exposed to the cool currents of air forced down through the tower by the blower G, as previously described, and consequently causing the water to be much more rapidly cooled than would be the case if it passed over smooth unbroken surfaces in its descent to the bottom of the tower.

The top of the cone-frustum B is provided with a series of dowel-pins *m*, Figs. 1 and 4, which also tend to obstruct the flow of the water and cause it to be exposed as long as possible to the cool downward currents of air. To still further increase the surface area over which the water may flow, I provide a series of narrow boards J, having horizontally-arranged half-round strips or projections n, secured to their opposite sides, down which the water impinging thereagainst will flow while exposed to the air-currents. These boards are arranged vertically around the space between the wall E and the cone-frustum B, and are suspended from a suitable frame or support p, carried by radial pipes s, to be presently described.

The water cooled, as above described, flows to the bottom of the tower and is discharged through an outlet-pipe q, leading to a tank or other receptacle. (Not shown.)

The air within the cone-frustum B as it becomes heated by the passage thereover of the water being cooled escapes through openings r in a series of horizontal radially-arranged pipes s, which extend outward through the outer walls of the tower, where the heated air is discharged to be replaced by fresh cool air entering at the bottom of the cone-frustum B through the inlet-opening 15.

The cone-frustum B is kept cool by the circulation of air within the same, as is also the wall E by the circulation of air within the air-space f, as previously described.

In cold weather the cost of running the blower may be saved, if desired, as the water may be cooled by a natural upward draft of air through the tower, produced by removing the covers 16 of the openings t in the roof b, the air entering the openings h around the bottom of the tower and escaping through the said openings t. To afford convenient access to these openings t, I provide a stairway K, leading to a gallery L, extending around the tower, from which the said openings t can be reached to cover or uncover the same.

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

1. A water-cooling tower comprising an outer casing, a hollow inner casing closed to the interior of the outer casing and having external baffles or ribs, means for cooling the said inner casing from its interior, a water-discharging device above the inner casing, air-outlets in the outer casing and means for supplying said outer casing with air-currents.

2. A water-cooling tower comprising an outer casing, a hollow inner casing arranged centrally within the outer casing and provided with baffles or ribs to impede the downward flow of the water, means for discharging the water on top of said inner casing and an air-supply pipe discharging downward through the top of the outer casing above said water-supply; the outer casing having air-outlets near its lower end; substantially as described.

3. The combination with a water-cooling tower having its inner wall inclined, of a cone-frustum, arranged centrally within the same, said cone-frustum and the inclined wall of the tower encircling the same, being provided with ledges or projections adapted to retard the flow of the water thereover, substantially as described.

4. A water-cooling tower, comprising the outer casing, an inner hollow casing closed to the interior of the outer casing and having air-inlets at its bottom, pipes leading outwardly from the upper part of the inner casing through the outer casing, and means for discharging water upon the upper end of said inner casing; substantially as described.

5. A water-cooling tower comprising an outer casing having openings in its top provided with means for closing them and also having openings at its bottom, an inner hollow casing closed to the interior of the outer casing, provided with means for directing cooling air-currents through it and having parallel ribs or baffles to retard the flow of water and means for spraying water on top of the inner casing; substantially as described.

6. In a water-cooling tower, the combination with the outer wall, of the inwardly-inclined inner wall, provided with ledges or projections to retard the flow of the water thereover, and arranged to form an air-space between said walls, said air-space having inlet and outlet openings, substantially as described.

7. In a water-cooling tower, the combination with the inner wall and the cone-frustum arranged centrally within the same, of the suspended vertical boards having horizontal projections or ledges on their opposite sides, substantially as described.

8. A water-cooling tower comprising an outer casing, having an air-supply at its top, an inner closed casing having air-inlets at its bottom, a water-supply pipe extending up through the inner casing and having a sprayer discharging upon the top of said inner casing, horizontal air-outlet pipes supported at their inner ends on the water-pipe and extending outwardly through both casings, the vertically-disposed annular series of boards in the space between said two casings and means for suspending said boards from the said air-outlet pipes; substantially as described.

Witness my hand this 5th day of March, A. D. 1901.

JOSEPH E. SWENDEMAN.

In presence of—
P. E. TESCHEMACHER,
F. B. SPAULDING.