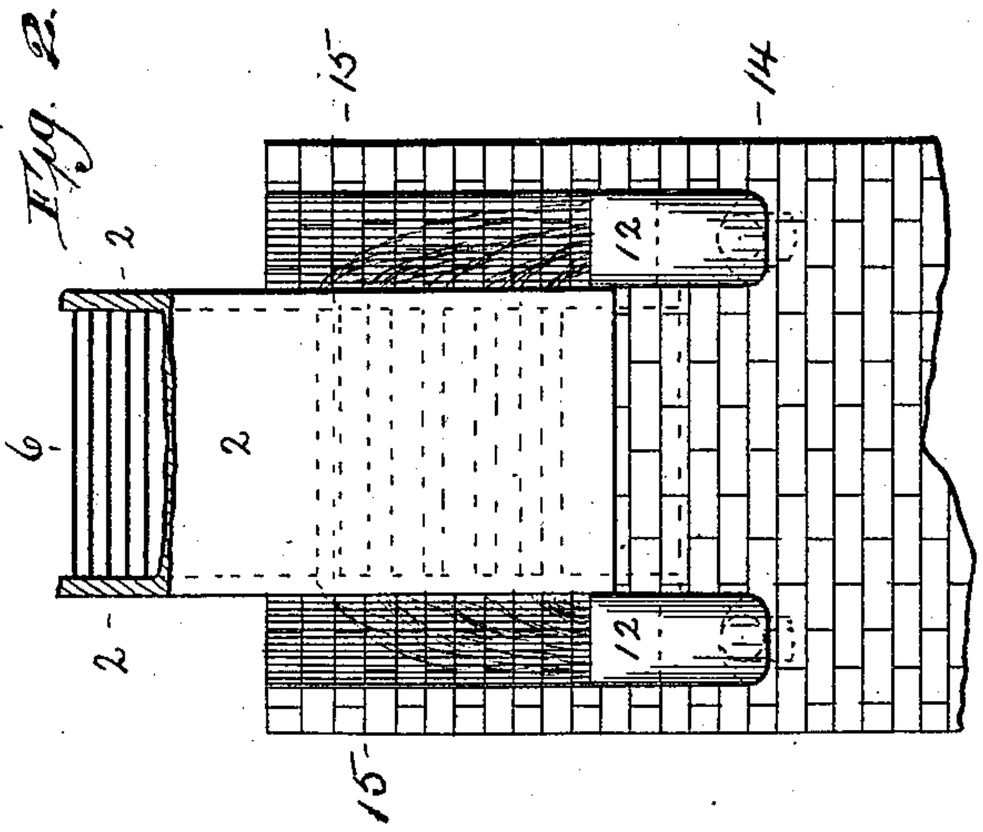
(No Model.) 2 Sheets—Sheet 1.

W. J. FLETCHER.

LIQUID COOLER.

No. 491,964. Patented Feb. 14, 1893.

Fig. 2.



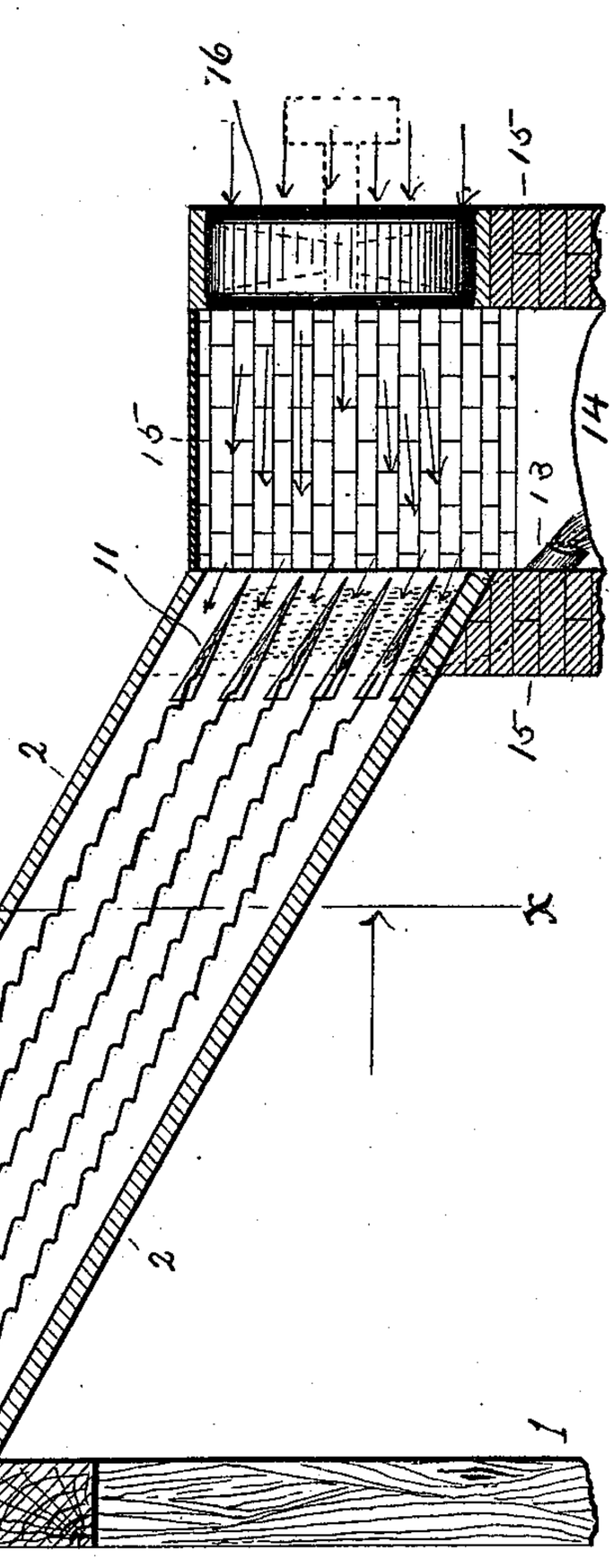
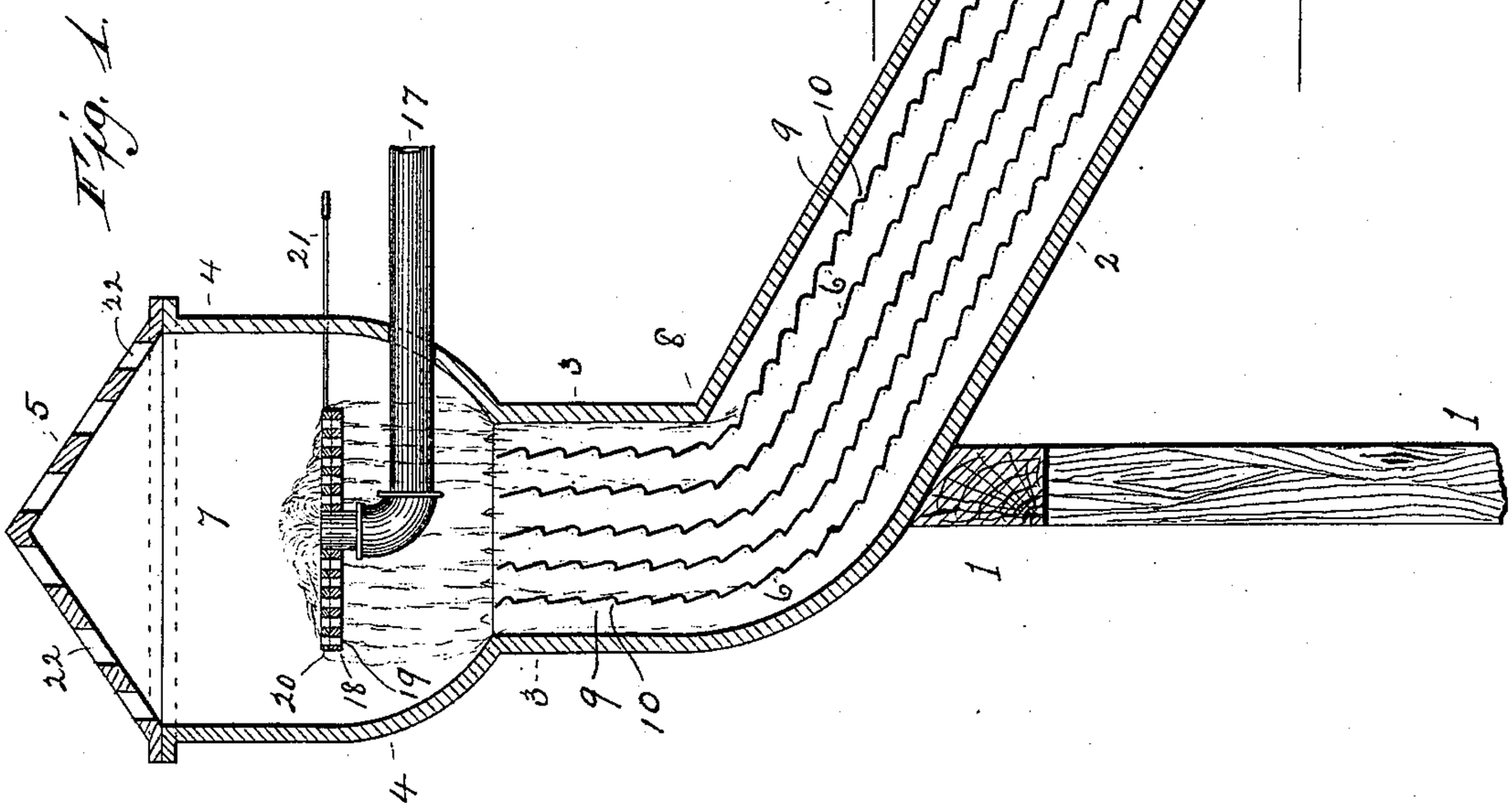


Fig. 1.



Witnesses:
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R. Blume.

Inventor:
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By. P. H. Gunckel Atty.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

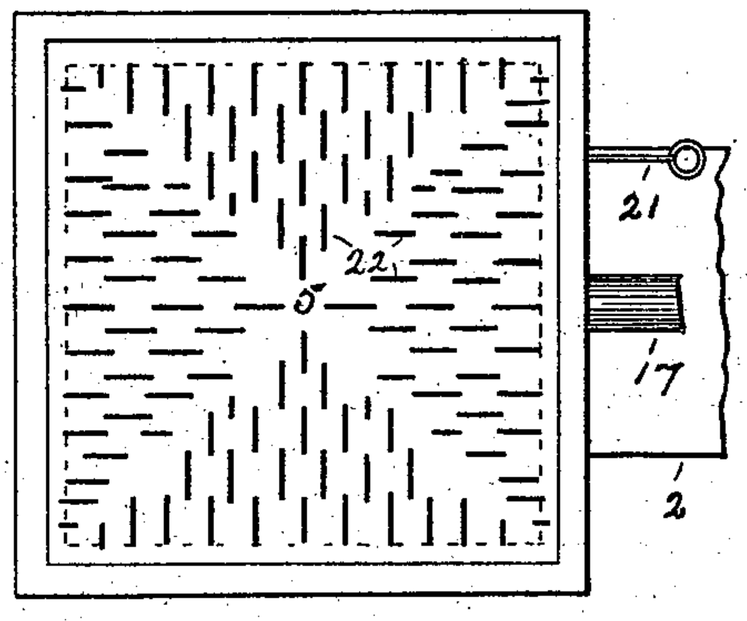


Fig. 4.

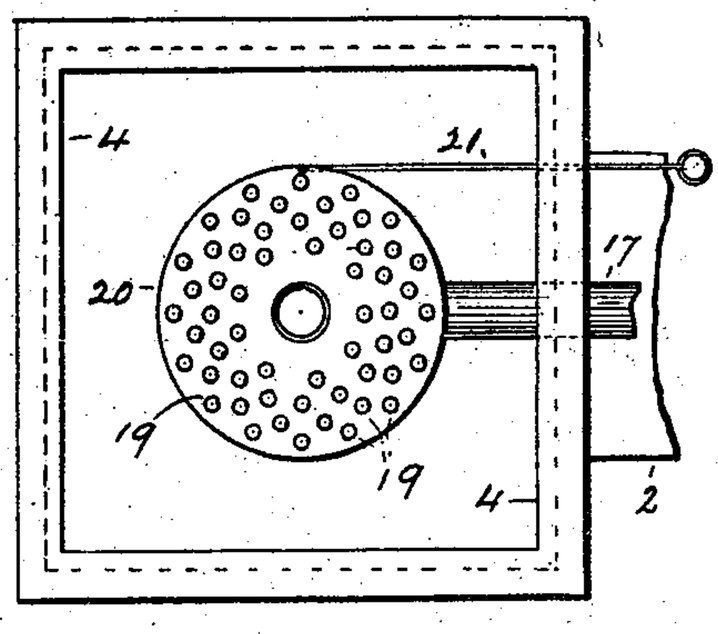


Fig. 5.

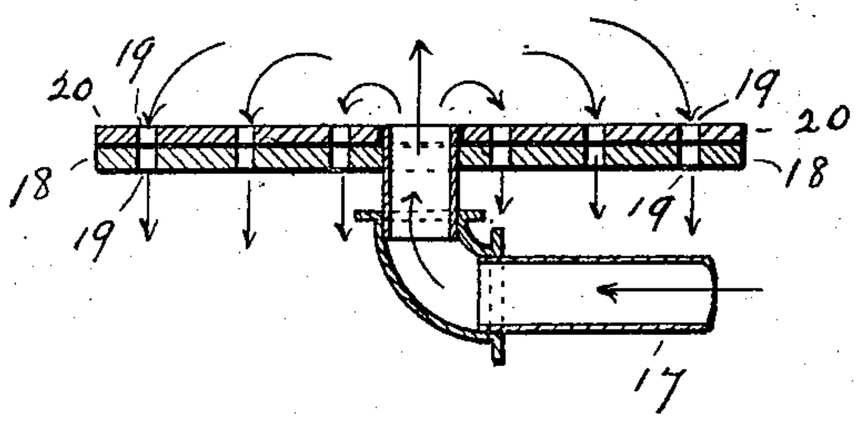
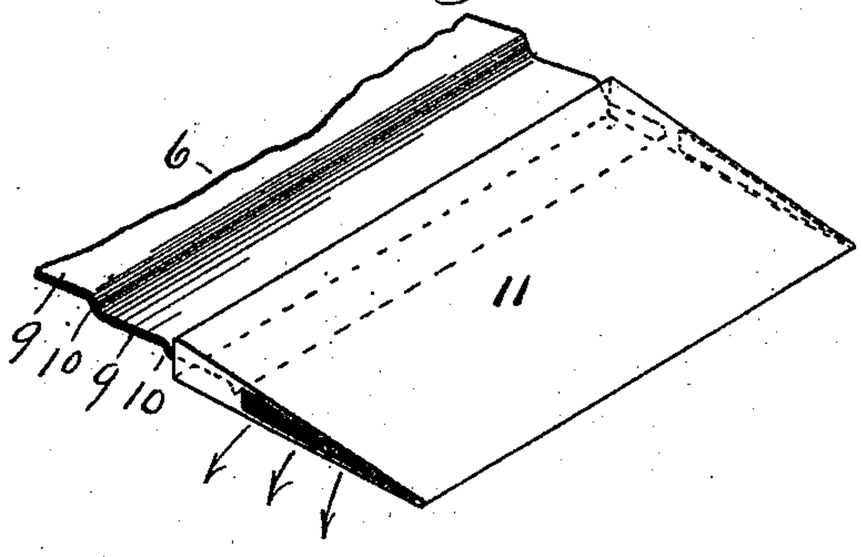


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM J. FLETCHER, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO TWIN CITY IRON WORKS, OF SAME PLACE.

LIQUID-COOLER.

SPECIFICATION forming part of Letters Patent No. 491,964, dated February 14, 1893.

Application filed August 20, 1892. Serial No. 443,605. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. FLETCHER, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Liquid-Coolers, of which the following is a specification.

The primary object of my invention is the devising of an efficient apparatus for cooling the condensing water used in connection with engine condensers; but, obviously, similar means may be employed for cooling water for other purposes, and for cooling beer or other liquids.

The improvements relate to apparatus in which the liquid to be cooled is divided into small portions and distributed to separate shallow chambers through which it flows and is subjected to the cooling effect of air-currents and is thence discharged by suitable means into a common receptacle. It is desirable in an apparatus of this character that the liquid be spread into as thin sheets as practicable and subjected to cooling air currents in a manner that will avoid spraying the water. This is accomplished by the devices illustrated in the accompanying drawings, in which—

Figure 1, is a vertical longitudinal section of the apparatus; Fig. 2, an elevation of the lower portion on the line *x*—*x* of Fig. 1, viewed from the left; Fig. 3, is a plan view of the top of the apparatus; Fig. 4, a plan view with the hood removed; Fig. 5, a vertical sectional view of the liquid-distributing devices; and Fig. 6, a perspective view of one of the catch-basins.

In the drawings 1 designates the frame or posts for supporting the elevated portion of the apparatus; 2 an inclined and 3 a vertical portion of the casing, which is preferably of rectangular shape; 4 an enlarged head formed over the vertical portion 3, and 5 a hood or cover for the head 4. Within the casing are suitably spaced partitions 6, formed preferably of corrugated galvanized iron, and these extend in vertical courses from the bottom of the chamber, 7, formed by the head 4, downward to the bend or angle 8 of the casing where they are bent to correspond with the casing and extend thence in inclined courses to its bottom. The corrugations of these partitions should be so formed that the liquid flowing over them will be prevented from lodging and will flow in a rolling or undulating manner so that all portions may be successively brought to the surface. And for this purpose a desirable form for the corrugations is that shown in the drawings in which a comparatively long inclined surface 9 is succeeded by a shorter and more abrupt surface 10. At the bottom of each partition 6 is a catch-basin 11 for receiving the liquid discharged by the partition. This basin is preferably made of two thin plates joined at one edge and the opposite edges sufficiently separated to loosely embrace the end of the partition plate, and the sides are open to permit the lateral discharge of the liquid. They may be made to slope slightly from the middle to the sides to cause a freer discharge.

At the sides are funnels 12, connected to pipes 13, for catching the liquid delivered from the basins and conducting it to a cistern 14, or other receptacle. Over the cistern is a tight housing 15 and a blast fan 16 is located opposite the lower ends of the catch-basins for forcing a current of air through the apparatus. Obviously a suction fan at the opposite end might be used instead, but the arrangement suggested is preferable.

A pipe 17, communicating with a source of liquid supply, terminates in the center of the chamber 7, and, for the purpose of properly distributing the liquid to the several cooling compartments formed by the partitions, a disk or plate 18 having perforations 19 is attached at or near its end. On this plate is a revoluble disk or plate 20 provided with coincident perforations. This upper plate is arranged to be controlled by a rod 21 connected thereto and extending without the casing 4, and adapted to partially turn it, either by reciprocating or turning the rod, for the purpose of regulating the coincidence of the perforations of the two plates. Thus the amount of liquid permitted to flow through the perforations can be regulated at will and a proper distribution of the liquid to the several cooling compartments effected in a simple manner.

The hood 5 is provided with suitable slots or perforations 22 for the escape of the air current, and it is made sloping so that the liquid of condensation on its inner surface

will drip or flow into the upper chamber and descend thence into the cooling compartments.

In operation, liquid being forced through the pipe 17 so as to be discharged upon the plate 20 flows thence partly over the edges of the plate and partly through its perforations into the various vertical compartments formed by the partitions, whence it continues onward over the corrugated surfaces of the sloping portion of the apparatus to the catch-basins and flows thence through the funnels and pipes to the cistern. During its entire course to the catch-basins the liquid is subjected to the cooling effect of the direct air-blast and also to the cooling effect of the metal partitions over which it flows the latter being cooled by the passage of the air current over their under surfaces. The arrangement of catch-basins suggested avoids the spraying of the liquid at the discharging point and also avoids interference with the direct flow of the air current from the fan to the cooling compartments. The air in its passage through the narrow compartments becomes moisture-laden and as its only escape is through the perforations of the hood, a large portion of the moisture is condensed on the under surface of the hood and returned to the cooling compartments and is thus saved. As is apparent from the drawings and description the liquid to be cooled is by these means divided and spread into thin sheets and caused to roll or tumble in its course over the corrugations so as to expose constantly changing surfaces to the action of the air-current and the metal partitions and so a maximum amount of cooling of the liquid within a relatively small and compact apparatus is effected.

Having described my invention, what I claim is—

1. In a liquid cooler, a casing, a series of connected vertical and inclined partitions having corrugated surfaces, means for supplying and distributing liquid at the head, means for accumulating it at the foot and means for passing an air-current through the compartments formed by the partitions.

2. In a liquid-cooler a casing having its lower portion at an angle to the upper portion, suitable partitions for conducting liquid through both portions, means for supplying liquid to the upper portion and means for causing an air-current to pass upward through the apparatus.

3. In a liquid cooler, a casing having upper and lower portions at angles to each other, means for supplying liquid to the upper portion, means for producing an air-current through both portions, and partitions for conducting the liquid through the apparatus, the same consisting of thin metal plates having suitable corrugations.

4. In a liquid cooler, a casing having upper and lower portions, the latter being inclined from the former, means for supplying liquid at the head and for causing an air-current to enter at the foot of the casing, a series of partitions in the casing, and a corresponding series of suitable catch-basins at the foot thereof, for the purpose set forth.

5. In a liquid cooler, a series of communicating vertical and inclined liquid conductors having corrugated surfaces, a liquid supplying and distributing device at the head thereof, a separate and comparatively flat catch-basin for each conductor at the foot thereof, and means for causing an air-current to pass through the spaces between said conductors.

6. In a liquid-cooler, a casing having a vertical portion provided with a perforated hood, an inclined portion, suitable partitions in both portions, means for supplying and distributing liquid at the head, means for conducting it away laterally from the foot of the partitions, and a fan for producing an upward air-current through the apparatus, substantially as set forth.

7. In a liquid-cooler, the combination with the partitions forming the separate compartments, of catch-basins tapering from their mouths at the foot of the partitions to narrow edges beyond, for the purpose set forth.

8. In a liquid cooler, the combination with a casing and cooling compartments, of an induction pipe, a liquid distributer consisting of horizontal plates having coincident perforations, and means for partially rotating one of them to regulate the passage of liquid through the perforations, substantially as set forth.

WILLIAM J. FLETCHER.

Witnesses:
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