

No. 698,013.

Patented Apr. 22, 1902.

W. H. A. HALSALL & S. LAPHAM.

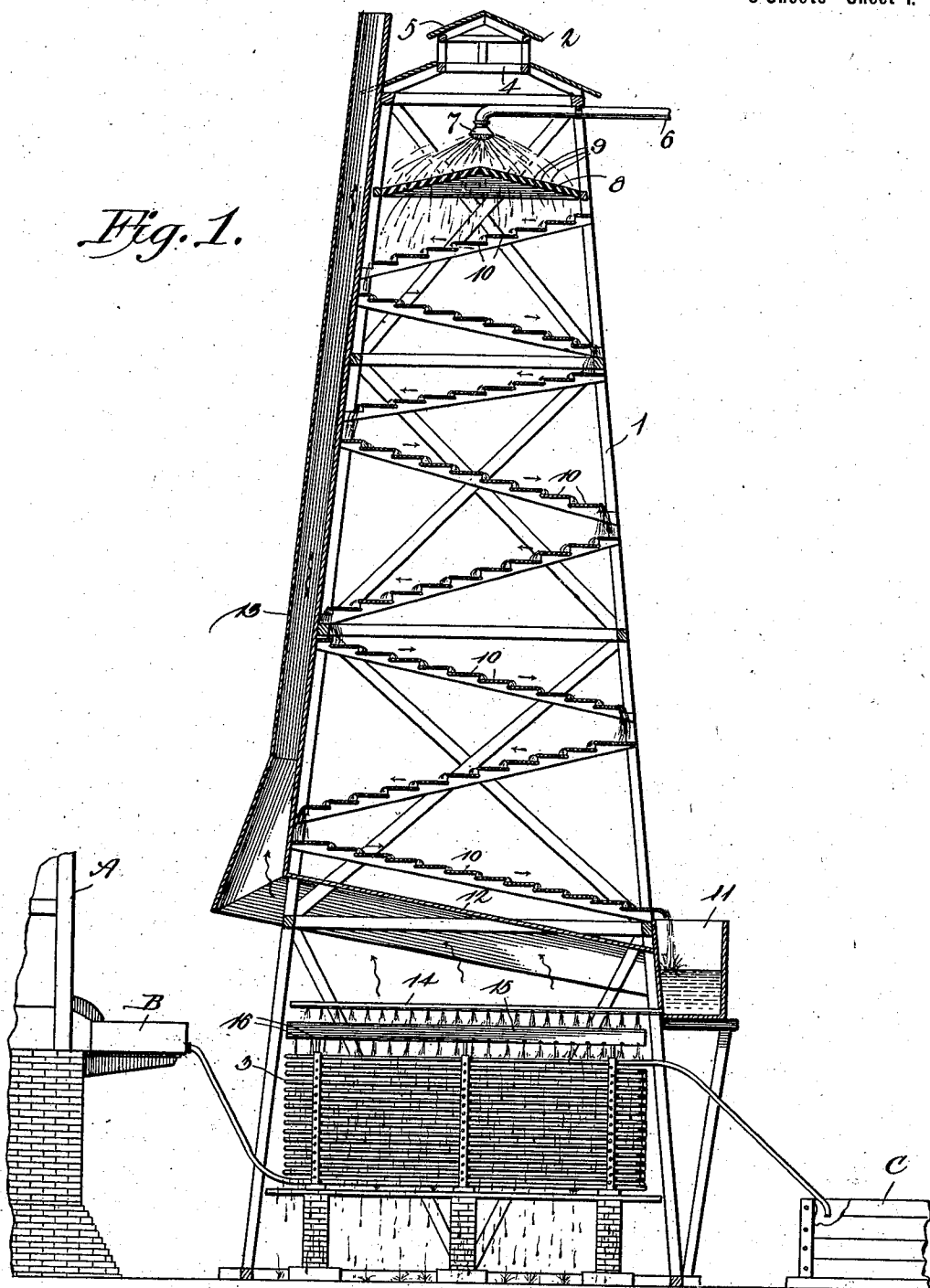
COOLING TOWER.

(Application filed Oct. 15, 1901.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



Witnesses

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Fig. 2.

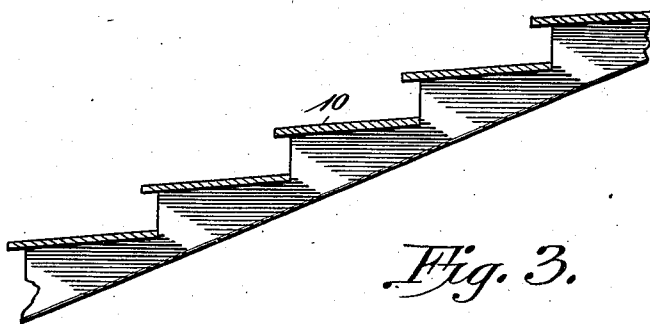
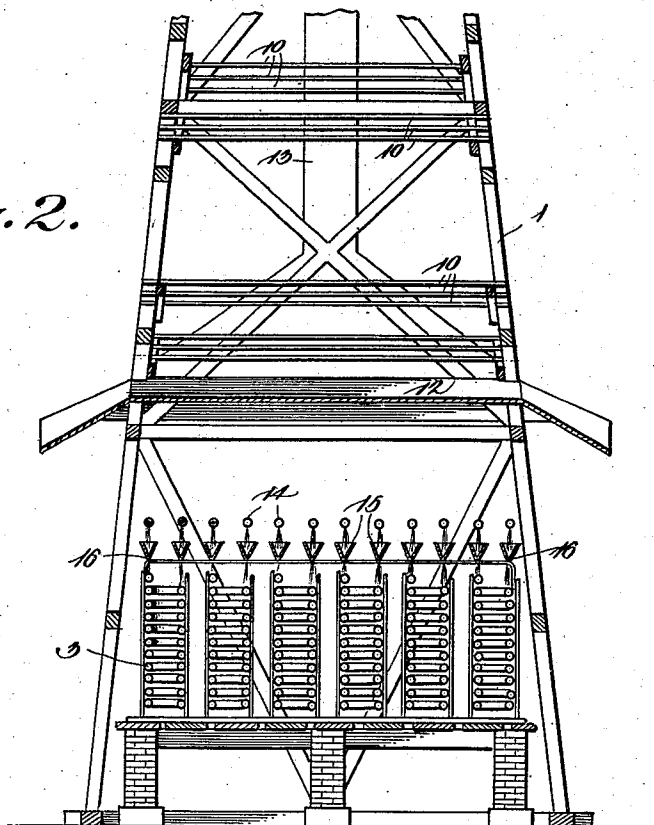


Fig. 3.

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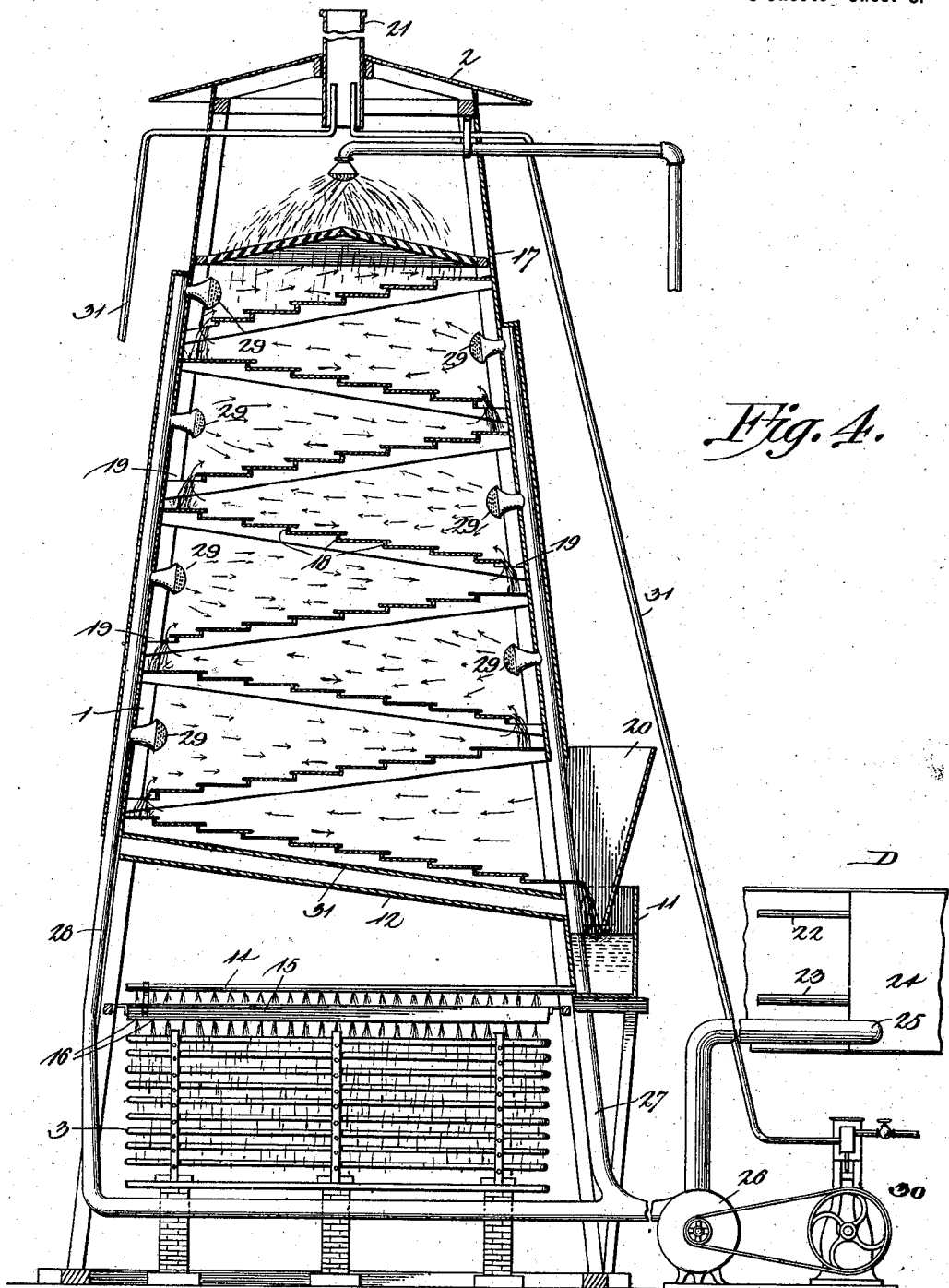


Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM H. A. HALSALL AND SAMUEL LAPHAM, OF CHARLESTON, SOUTH CAROLINA.

COOLING-TOWER.

SPECIFICATION forming part of Letters Patent No. 698,013, dated April 22, 1902.

Application filed October 15, 1901. Serial No. 78,752. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. A. HALSALL and SAMUEL LAPHAM, citizens of the United States, residing at Charleston, in the county of Charleston and State of South Carolina, have invented a new and useful Cooling-Tower, of which the following is a specification.

This invention is an improved cooling-tower, especially designed for lowering the temperature of the cooling-coils of an ice-making plant for cooling an acid or liquefying ammonia or other gases; and it consists in the peculiar construction and combination of devices hereinafter fully set forth and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view of a cooling-tower constructed in accordance with this invention, showing the same in connection with a Glover tower from which acid is discharged through the cooling-coils in the base of the cooling-tower for lowering the temperature of the acid and showing also a portion of an acid-tank into which the cooled acid is discharged from the cooling-coils. Fig. 2 is a vertical sectional view taken on a plane at right angles to that of Fig. 1. Fig. 3 is a detail sectional view showing the construction of the evaporating-steps. Fig. 4 is a vertical sectional view of a modified form of the improved cooling-tower, showing the same in connection with a refrigerating-tank, a blower, and an engine for operating the same.

This improved cooling-tower is adapted for use for a variety of purposes; but the same is here shown and will be described as a feature in an ice-making plant, wherein the cooling-tower is employed specifically for the purpose of lowering the temperature of cooling-coils for cooling an acid or liquefying ammonia or other gases. Referring specifically to the form of the invention shown in Figs. 1 and 2, the tower 1 is an open structure comprising a suitable framework and open on all sides to the atmosphere, so that air can pass freely through the same. The top of the tower is covered by a roof 2. In the base of the tower are located the cooling-coils 3. For the purposes of illustration a portion of a Glover tower is indicated at A in Fig. 1, and the coil shown in the said figure is connected

to the mud-pit B of said Glover tower and discharges into an acid-tank C. In the roof of the tower is an opening 4, over which is disposed a hood 5. A water-pipe 6, which leads from a suitable source of water, as a pump or the like, (not here shown,) enters the tower near the top thereof and is provided with a spraying-nozzle 7, which is adapted to discharge a shower of water downwardly in the tower, as will be understood. Below the said nozzle is a spreader 8, which is of pyramidal form and the sides of which are formed by transversely-disposed slats 9, spaced in practice about an inch apart and disposed at an angle of about forty-five degrees. This spreader serves to break up and spray the water toward the four sides of the tower and to distribute the spray evenly across the tower. Below the said spreader are a series of flights of evaporating-steps 10, which extend to within a suitable distance from the lower end of the tower. The said flights are disposed alternately in opposite directions and traverse the tower and are disposed under each other, so that the water discharged upon the steps of the upper flight from the spreader flows downwardly from step to step of the said upper flight onto the uppermost step of the next lower flight, and so on, being finally discharged from the lowest step of the lowest flight into a tank 11, which is disposed on one side of the tower at a suitable elevation. The spaces corresponding to the risers between the steps or treads of the various flights are open, so that the air is permitted to circulate freely between the said steps and in contact with the exceedingly thin films of water which pass over the said steps and descend throughout the series thereof, and it will be observed by reference to Fig. 1 of the drawings that the films and sprays of water on the steps and between the same and exposed to the direct contact of the air, so that the water is evaporated by the air to such an extent that only a very slight quantity or small proportion of the water discharged from the nozzle 7 reaches the tank 11, and such water as reaches the said tank is, owing to the extent of the evaporation, greatly lowered in temperature.

The tower is provided at a point a suitable

distance above the cooling-coils with a transversely-disposed inclined deflecting-hood 12, which divides the lower side of the tower from the upper portion thereof that contains
 5 the evaporating-steps, and the said hood at its upper side communicates with a flue 13, which leads upwardly on one side of the tower.

Perforated pipes 14 lead from the water-tank 11 and are disposed above the cooling-coils. A series of troughs 15 are also provided, which are preferably V-shaped in cross-section, are disposed above the respective coils 3 and below the pipes 14, and are provided in their bottoms throughout their longitudinal extent with series of perforations 16, through which the water discharged into said troughs by the perforated pipes 14 is conducted directly to and upon the cooling-coils,
 20 so that the latter are wetted exteriorly throughout their entire extent and protected from corrosion.

The deflecting-hood 12 deflects such heated air as rises from the cooling-coils and prevents
 25 the same from passing upwardly through the water films and sprays and raising the temperature thereof, and the cold water discharged onto the cooling-coils effectually reduces the temperature of the acid and gases
 30 which pass therethrough, as will be understood. All of the evaporating-steps are slightly inclined downwardly in the direction taken by the water in descending in the tower, so that the water drops from the lower side
 35 of each step onto the upper side of the next step below throughout the series, thus exposing the water films, drops, and sprays to the evaporating action of the air to the maximum extent and atomizing the drops.

In the form of the invention shown in Fig. 4 the sides of the upper portion of the tower in which the evaporating-steps are disposed are incased, as at 17, and risers 18 are provided, which connect the steps of the respective flights. Each of the latter has an opening 19 at its lower side over the upper side of the next flight below, and hence air taken in through a funnel or duct 20 on one side of the tower is caused to describe a tortuous
 50 course upwardly back and forth across the tower between the flights of the evaporating-steps before reaching an eduction-pipe 21, which is provided in the roof of the tower.

The refrigerating-tank D, shown in connection with this modified form of the tower, has an inlet-pipe 22 and an outlet-pipe 23 communicating therewith in the usual manner, and said pipes, which conduct liquid at a low temperature, pass through a duct 24, to which
 60 air is admitted, the air in the said duct being cooled by the said pipe, as will be understood. A pipe 25 leads from the air-duct 24 to the casing of a fan 26, and branch pipes 27 28 lead from the said casing upwardly on opposite
 65 sides of the tower and are provided with discharge-nozzles 29, respectively, which dis-

charge-nozzles are disposed alternately between the flights of the evaporating-steps. This fan is driven by an engine, (indicated at 30,) which may be of any suitable construction, and it will be understood that the cold air blown by the said fan 26 is discharged
 70 by the nozzles 29 into the tower in such manner that a blast of cold air is caused to pass upwardly over each flight of the evaporating-steps, so that the sprays and films of water which descend over and from the said steps are exposed throughout their passage downwardly in the tower directly to the evaporating action of the said cold blasts of air, and
 75 hence the water is evaporated to the maximum extent and its temperature lowered not only by the evaporation, but also by the effect of the cold-air blast.

Suitable exhaust-pipes 31, which connect
 85 with the engine and pumps forming elements of the ice-making plant, discharge upwardly in the lower end of the eduction-tube 21. In this form of the invention the flue 13 is omitted, the hood 12, owing to the fact that the upper portion of the tower is incased, being effective to divert the heated air that rises from the coils from the upper portion of the tower. A diaphragm 31 is disposed above the hood 12, thereby forming an air-space which is open
 95 at its sides between the said hood and the said diaphragm. The lower portion of the tower, in which the cooling-coils are disposed, is open to the external atmosphere.

What is claimed is—

1. A cooling-tower having cooling-coils in the base thereof, means to evaporate water in the upper portion of the tower, and to discharge cooled water onto said coils, and a deflector above the latter, to prevent air heated
 100 by said coils from passing into the upper, evaporating portion of said tower, substantially as described.

2. A cooling-tower having means to evaporate water in the upper portion thereof, cooling-coils in the base thereof, means to apply the water cooled in the evaporating portion of the tower to the coils and a deflector above the said coils to prevent heated air from passing into the upper, evaporating portion of the
 110 tower, substantially as described.

3. A cooling-tower to which air is admitted, having means to shower water downwardly in the upper portion thereof, a series of descending steps to retard the descent of the water
 120 and promote the evaporation thereof, means to collect the cooled water discharged from the steps, cooling-coils in the base of the tower, means to discharge the cooled water onto the coils, and a deflector above the coils to prevent heated air from passing into the upper, evaporating portion of the tower, substantially as described.

4. A cooling-tower to which air is admitted, having means to shower water downwardly in
 130 the upper portion thereof, a series of descending steps to retard the descent of the water

and promote the evaporation thereof, cooling-coils in the base of the tower, a deflector above the coils to prevent heated air from passing into the upper evaporating portion of the tower, and means to discharge the cooled water from the steps onto the coils, substantially as described.

In testimony that we claim the foregoing as

our own we have hereto affixed our signatures in the presence of two witnesses.

WILLIAM H. A. HALSALL.
SAML. LAPHAM.

Witnesses:

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E. T. WITHINGTON.