

March 23, 1937.

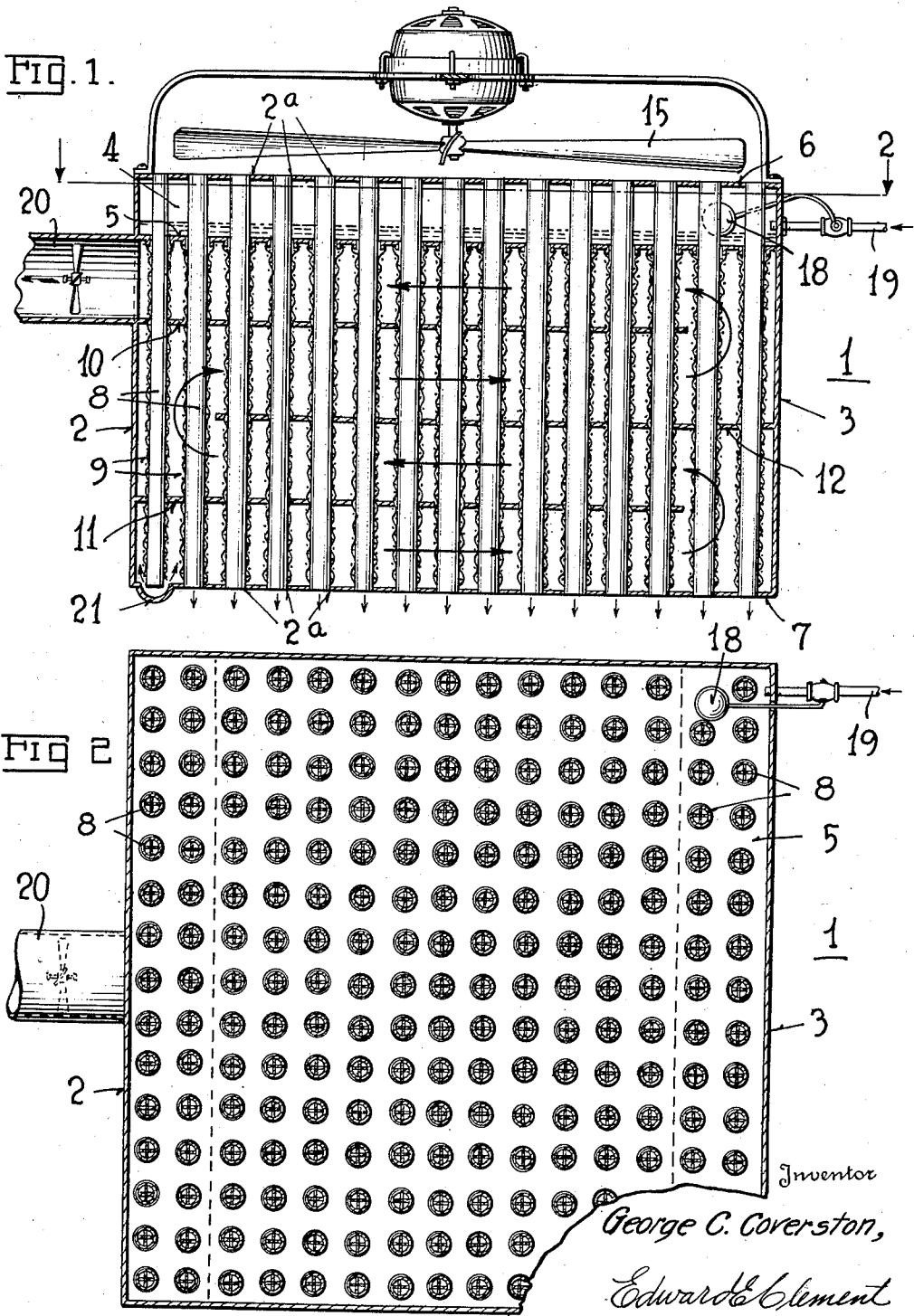
G. C. COVERSTON

2,074,642

COOLING APPARATUS

Filed May 15, 1935

3 Sheets-Sheet 1



March 23, 1937.

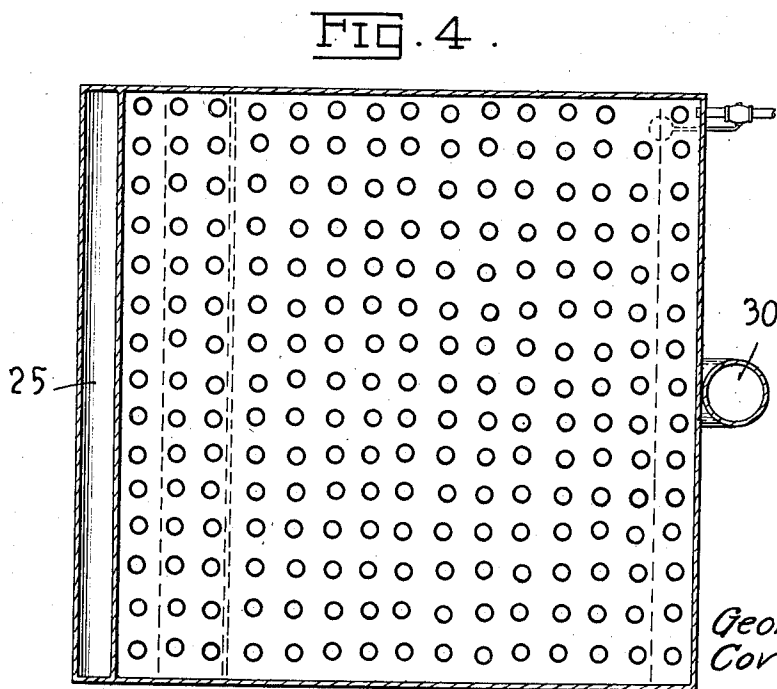
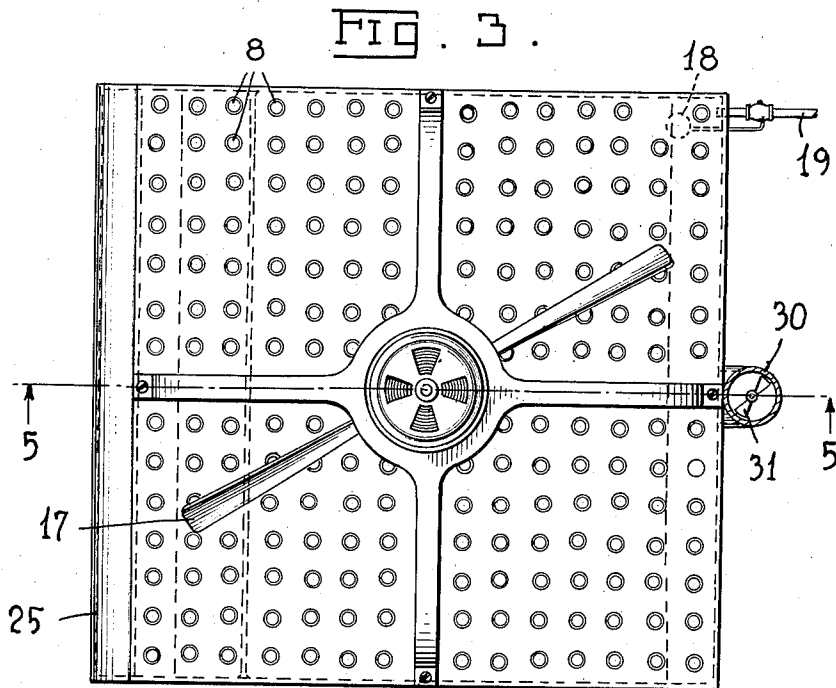
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3 Sheets-Sheet 2



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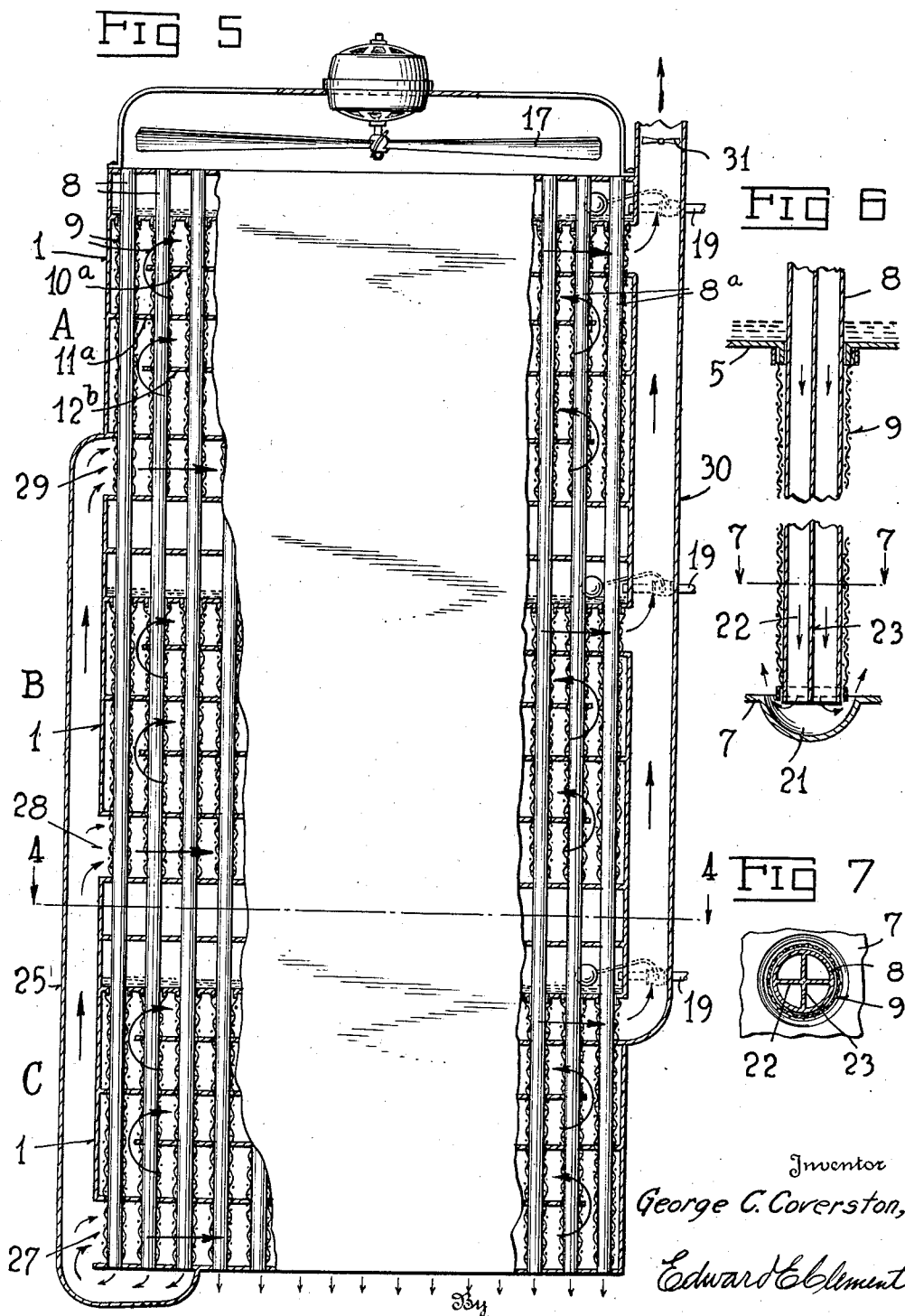
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UNITED STATES PATENT OFFICE

2,074,642

COOLING APPARATUS

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Application May 15, 1935, Serial No. 21,652

5 Claims. (Cl. 62—139)

This invention relates to cooling apparatus and especially to such as employ water or an equivalent fluid as the cooling medium. It has for its objects to increase the comparative difference between the wet point and the dry point temperatures of the refrigerant as well as to increase the general efficiency of such a system.

I attain my objects by causing relatively dry air to circulate into and out of thermic relation with the cooling medium, and by taking off the dry air from the bottom of the system and carrying it to the top and causing it to be re-exposed to fractional cooling so as to produce a cumulative or additive effect, which may be repeated as often as desired, also feeding coldest air produced to an evaporating chamber, since cooling is relative, and lower temperatures are now obtained.

While I shall show and describe herein the use of dry air and water as the refrigerant and the cooling medium respectively, I wish it understood that I may substitute other cooling mediums, other refrigerants and other forms of mechanical devices without departing from the invention. Primarily, however, I employ the elements described.

In the accompanying drawings:

Figure 1 is a cross sectional view of an apparatus such as may be used in my system.

Figure 2 is a cross sectional view of Figure 1 taken along the line 2—2.

Figure 3 is a top plan view of the embodiment shown in Figure 5.

Figure 4 is a cross sectional view taken along line 4—4 of Figure 5.

Figure 5 is a part sectional view of a modified form of apparatus to be used with my method looking down from the top along the line 5—5 of Figure 3.

Figure 6 is a cross sectional view of the air tube and cooling medium feed construction.

Figure 7 is a view in transverse cross section of the air tube structure, showing the quarter sections formed in the interior of the tubes.

Referring more particularly to the drawings, Figure 1 is in the form of a single unit for cooling and feeding dry air into a space to be cooled and then returning a fraction of the dry air back for recirculation and to further cool the same. It consists of casing 1 with solid side walls 2 and 3 and aligned openings 2a formed in top wall 6 and bottom wall 7. Within the casing 1 is a water chamber 4 formed from a perforated plate 5 and the top wall 6 and uppermost portion of each side wall of casing 1.

Fastened to side wall 2 are baffles 10 and 11 with openings formed therein to permit tubes 8 to extend therethrough. The baffles 10 and 11 extend to a point short of the opposite side wall 3 from which a third baffle plate 12 extends to a point short of wall 2 so as to provide a zig-zag course, as shown in Figure 1, for the air which is directed upwardly to stack or flue 20.

The dry air initially fed downwardly through the tubes 8 emerges from the tubes below the bottom plate or wall 7 at which point a fraction of the air will go into the space or room to be cooled and another fraction thereof will be turned upwardly by cup-like members 21 formed or attached to the plate 7, and hence back around the baffles 10, 11, and 12 and ejected through stack 20.

These cup members are placed just below the lower end of a small number of the tubes 8 so as to supply the evaporating chamber with only a fraction of the downwardly fed dry air.

Extending from opening 2a formed in top plate 6 are tubes or conduits 8. The tubes 8 extend downwardly through the water chamber 4, through openings in plate 5, through baffles 10, 11, and 12 and extend through the bottom wall plate 7. The dry air fed through these tubes is cooled by contact with the inside walls of the tubes 8 and fins 22 and 23 which extend longitudinally of each tube so as to divide it into four sections. The tubes 8 which may properly be called air cooling tubes are surrounded by a porous material 9 below the water chamber 4. The air circulating around the porous material 9 causes rapid evaporation of moisture from the material and becomes partially saturated, thereby cooling the tubes 8 by evaporation. For the proper feeding of water from chamber 4, the openings formed in plate 5 are larger in diameter than the tubes 8, but only a small fraction of an inch larger so that the water fed to chamber 4 will only seep through the openings around the tubes 8, as shown in Figure 6, sufficiently to merely moisten the porous covering 9 fastened around the tubes. To regulate the water level of tank or chamber 4 a float valve 18 is connected to water pipe 19.

The foregoing form as described involves the same principle of operation as the form shown and described in Figures 3, 4 and 5. The latter differs only in that the tubes 8 are elongated so as to project through 3 sections or units A, B and C instead of one unit as shown in Figure 1. The object being to reduce the temperature of the dry air with each section, thereby making

the air of the second section colder than the first section and so on. The colder dry air having a greater density than the warmer air as first introduced into the tubes of section A will feed downward until it reaches the third and last section C. At this point the air will naturally be coldest and a fraction of dry air is then turned and fed upwardly through air duct 25 through the evaporating chambers 1 of each section A, B and C and around the baffles 10a, 11a and 12b. The dry air fed upwardly through duct 25 will fraction off into approximately three parts. One third entering section C at port 27 as indicated by the arrows and around the baffles to vent duct 30. Another one-third enters a port 28 and through section B to the vent duct 30 and the final fraction enters at port 29 and is fed through the section A to vent duct 30. The duct 30 serves as a common exit for the air from all three sections and may be provided with a suction fan 31 to speed the flow of air through the evaporation chambers A, B and C to increase evaporation and is vented outside of the space to be cooled. The air as it is fed and drawn upwardly through each of the three sections will cause very rapid evaporation of the moisture in the porous material 9 around the tubes 8a, especially rapid because it is dry air. The temperature of the air fed through my apparatus is reduced at each recirculation and hence I am enabled to produce air of a colder temperature at the end of each circulation. Inasmuch as the difference between a wet and a dry bulb is relative, the lower the temperature of the dry air used in the evaporating process, the lower will be the final temperature.

To summarize the operation of the unit shown in Figure 1, dry air is fed by fan 15 through tubes 8. The dry air so fed now emerges from the tubes below the plate 7 of casing 1 and a fraction of the said air is turned by cup member or members 21 and fed through the evaporation chamber 1 around tubes 8 and their moist coverings 9 and around the baffles 10, 11 and 12 in a zig-zag course. The air thus fed causes evaporation of the moisture in material 9 and becomes saturated to a degree, thereby cooling the dry air feeding through the tubes indirectly. The evaporation cools the tube walls and fins 22 and 23 inside the tubes, with which the dry air contacts. The major portion of the dry air discharges into the lower part of the space to be cooled and by gravity or the aid of fan 15 is returned for recirculation. The minor portion of the dry air enters the evaporating chambers and is ejected from the space to be cooled, being replaced by air seeping into or being admitted by a duct for that purpose.

The modified form of Figure 5 operates in the same way and only differs in that it has an additional air duct 25 mounted on the opposite side from the vent duct or stack 30. This is done to provide for dividing the air into thirds to equal the number of sections used and to limit the proportional amount of air fed to each evaporating section. If five sections were used instead of three as shown in the drawings, the vent 25 would have five ports opening therefrom, one into each section. The air from each section is then fed into the duct 30 for exhaust.

While I have shown and described two par-

ticular forms of apparatus for carrying out my method, it is apparent that many changes may be made without departing from the spirit of the invention.

What I claim is:

1. A cooling device comprising an evaporation chamber, a liquid compartment within the evaporation chamber, air conduits partly covered with porous material extending through the evaporation chamber and liquid compartment and means to deflect a portion of the air emerging from the conduits through the evaporation chamber and around the air conduits for ejection to the atmosphere.
2. A cooling apparatus comprising an evaporating chamber, air conduits partly covered with porous material extending through the evaporating chamber, a liquid containing compartment within the evaporating chamber adapted to feed liquid to the covered portion of said conduits and cup members formed around the ends of a portion of said air conduits to direct said air through the evaporating chamber.
3. A cooling apparatus comprising a casing, a liquid container within the casing, an evaporation chamber within the casing below the said liquid container, air conduits extending through the evaporation chamber, fins secured inside of said air conduits and longitudinally thereof, porous material surrounding and spaced from said air conduits below the said liquid container, said liquid container being adapted to dispense and maintain a thin film of fluid around the air conduits to moisten the porous material spaced from said conduits, air feeding means for forcing dry atmospheric air through the air conduits and deflecting means below a portion of said air conduits to direct a fraction of said air through the evaporation chamber to cool said air conduits.
4. An air cooling apparatus, comprising an evaporation chamber, air passages open to the atmosphere extending therethrough, air directing means mounted above the said air passages adapted to force air through the air passages, a porous medium mounted and spaced around each of said air passages within the evaporation chamber, a water feed chamber above the porous mediums, and means below a portion of said air passages adapted to turn a fraction of the air forced through the said air passages by the said first named means through the evaporation chamber for contact with the said porous mediums.
5. A cooling device comprising a series of evaporation chambers, air passages extending through the evaporation chambers and partly covered with porous material, a blower mounted at an end of the said air passages, deflecting means adapted to direct a portion of the air emerging from said air passages into each of said series of evaporation chambers and an elongated air duct extending from the top portion of the first evaporation chamber of said series adjacent each evaporation chamber with ports formed therein, whereby the air directed through the respective evaporation chambers by the said deflecting means escapes through the said air duct to the atmosphere.

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