

June 19, 1923.

1,459,442

S. C. CUTLER

AIR WASHING APPARATUS

Filed Nov. 1, 1919

2 Sheets-Sheet 1

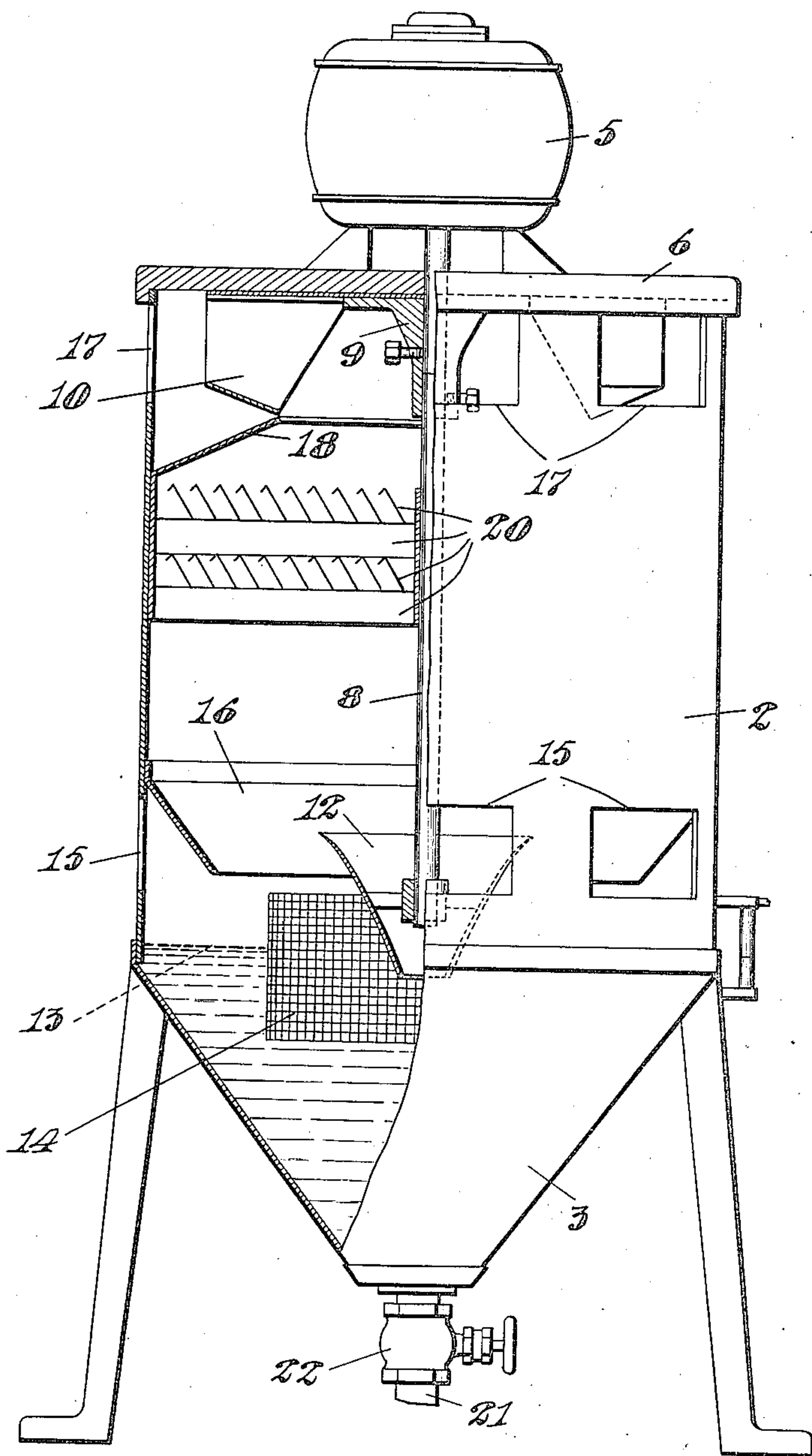


Fig. 1.

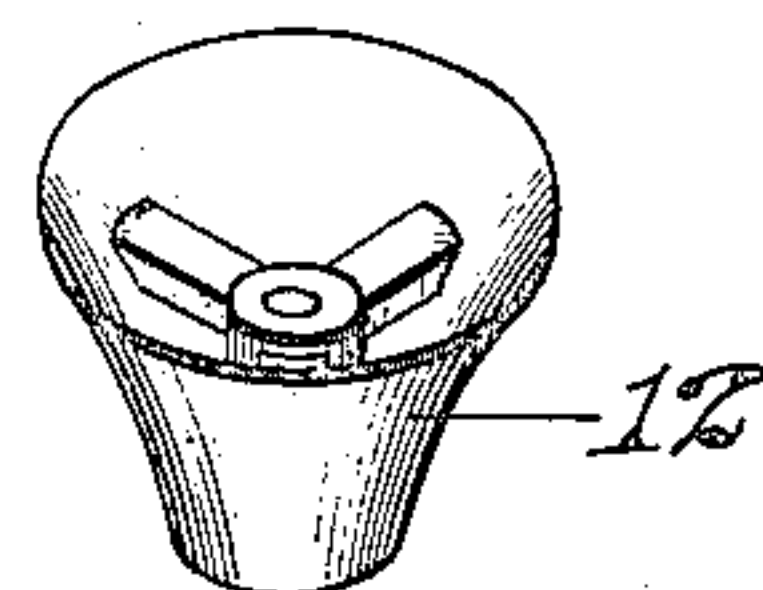


Fig. 3.

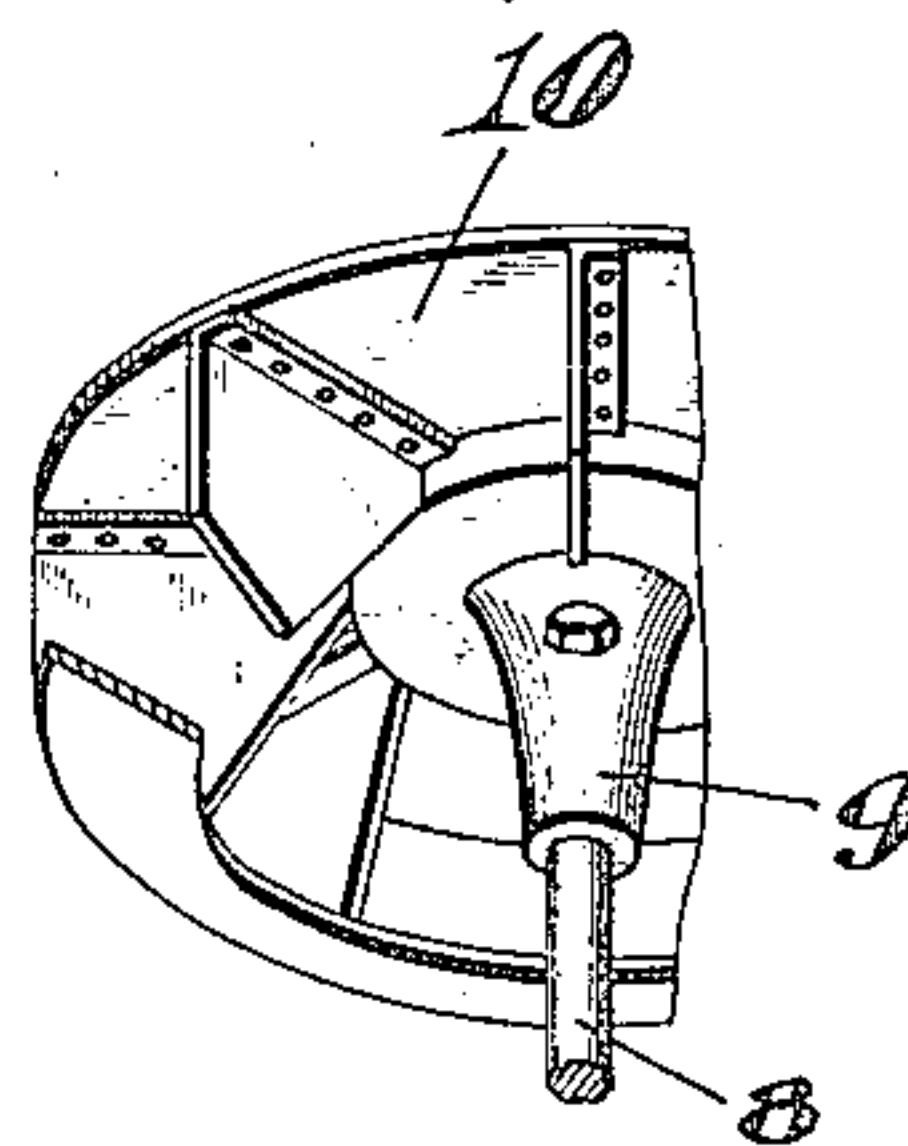


Fig. 2.

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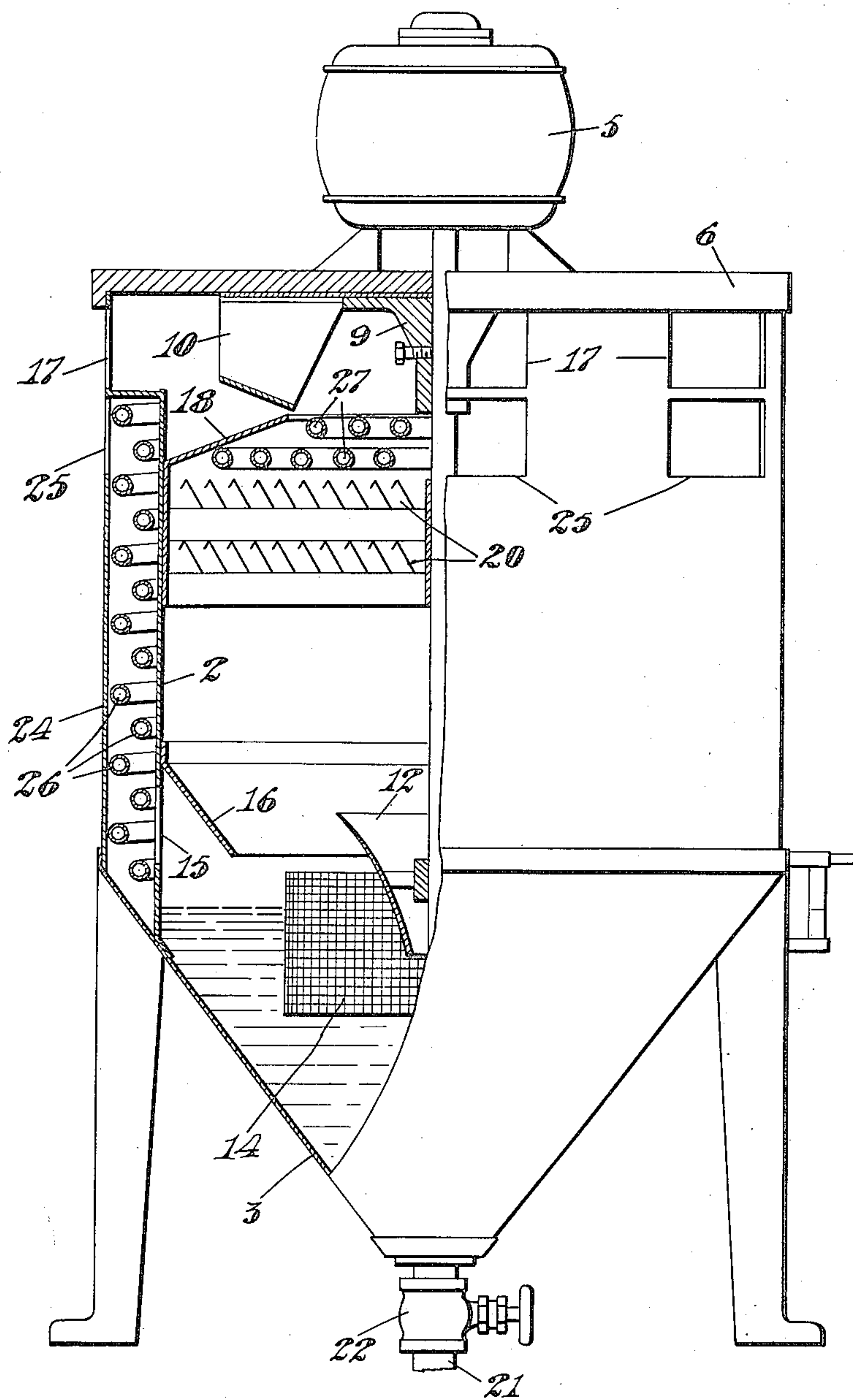


Fig. 4.

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UNITED STATES PATENT OFFICE.

SAMUEL C. CUTLER, OF BROOKLINE, MASSACHUSETTS.

AIR-WASHING APPARATUS.

Application filed November 1, 1919. Serial No. 334,973.

To all whom it may concern:

Be it known that I, SAMUEL C. CUTLER, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented certain Improvements in an Air-Washing Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to apparatus for washing, purifying and humidifying air and other gases. The present commercial types of apparatus for performing these functions involve relatively large installations entirely too expensive for many purposes. The present invention aims to devise an apparatus of this character which can be economically manufactured, and which will be suited particularly to those classes of service where relatively small or portable types of apparatus are required. The term "gas" is used herein in its broad sense to include not only air but various gases and fumes to which the present invention is applicable.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a side elevation, partly in cross section, of an apparatus embodying the invention in the form at present preferred;

Fig. 2 is an angular view showing the construction of the fan used in the apparatus shown in Fig. 1;

Fig. 3 is an angular view of the pump forming part of the apparatus shown in Fig. 1; and

Fig. 4 is a view similar to Fig. 1 of a modified construction.

Referring first to Figs. 1, 2 and 3, the apparatus there shown comprises an upright container 2, preferably of cylindrical form, having a tapered bottom 3 which forms a reservoir for water or other liquid. The apparatus is supported in an upright position by legs 4, or by any other suitable means depending upon the conditions under which it is used. An electric motor 5 is mounted on the top 6 of the container and drives a vertical shaft which preferably is formed in

two sections, an upper section 7 and a lower section 8, these two sections being secured together by set screws threaded through the hub 9 of a fan 10 so that the hub of this fan forms a coupling for the shaft. Secured to the lower end of the shaft 8 is a simple form of pump 12 consisting of a hollow inverted cone provided with a suitable hub, the base of the cone being flared. If desired the inner surface of this hollow cone may be provided with suitable ribs to assist in lifting the water.

Normally the reservoir in the bottom of the container is filled with water to substantially the height indicated by the dotted line 13 so that the lower end of the pump is submerged. A basket strainer 14 surrounds the pump and strains out foreign material that otherwise would find its way to the pump. When the apparatus is in operation the rapid rotation of the pump causes water to flow upwardly along the tapered surfaces of the pump and to be thrown from its upper peripheral edge in the form of a sheet or spray, this spray being directed laterally against the sides of the casing. A series of air inlet ports 15 are formed in the casing substantially opposite the level of the pump and just below a deflector plate 16 and the rapid rotation of the fan creates an inward flow of air through these ports, this current of air flowing downwardly around the lower edge of the deflector plate and then upwardly through the spray created by the pump 12 and through the body of the container to the fan where it is expelled from the casing through a series of outlet ports 17. An upper deflector plate 18 directs this current of air to the central portion of the fan. It will be seen from an inspection of the drawings that the pump 12 and deflector plate 16 are so placed with reference to each other that the spray created by the pump will be directed on to or above the deflector plate or in the event the deflector plate is dispensed with will be directed against the side of the container and the liquid falling from the deflector plate or the side of the container will form a curtain of liquid through which the incoming air through the ports 15, for example, must pass.

It is obvious that as the air passes through the spray it will pick up or entrain a great quantity of water. There appears to be an affinity between the particles of water and

particles of dust or other foreign material present in the air, as is well understood by those skilled in this art. The small droplets of water form about the particles of dust so that if the water is separated from the air apparently all of the foreign material will be eliminated from the air. For this purpose a series of eliminators 20 are located between the pump and the fan where the current of air must pass through them. These eliminators are of the common well known type consisting of blades or vanes having downwardly curved edges, the successive sets of vanes being differently directed so that they guide the air in a zigzag path. The particles of water are caught by the projecting lips or margins of the vanes where they collect and drop back into the reservoir 3. A drain pipe 21, controlled by a valve 22, affords a convenient means for emptying the reservoir whenever desired. It is obvious that if desired the reservoir could be equipped with means for maintaining a constant circulation of water through the reservoir, and for some classes of service this arrangement is desirable.

It will now be clear that when the apparatus is in operation a rapid steady current of air will be drawn in through the intake ports 15 and will be directed upwardly through the spray created by the pump where it will pick up a considerable quantity of water, the greater part of this water being separated from the air by the eliminators 20. Practically all of the dust, lint or other foreign material carried by the air thus is washed out and the clean air is expelled from the apparatus through the ports 17. This operation will take place continuously thus effecting a rapid and efficient cleaning, purification and humidifying of the air. Obviously some of the moisture will remain in the air but this usually is desirable and in any event the quantity of moisture so retained can be controlled within reasonable limits by suitably designing the apparatus. It will be appreciated that the apparatus is very simple in construction and is especially suited to those locations and classes of service where a simple and relatively inexpensive apparatus of this character is required or where a portable type of apparatus is necessary.

In some cases it is desirable not only to wash and humidify the air but also to change its temperature and this object may be conveniently realized with the apparatus shown in Fig. 4. In this figure the parts corresponding to those shown in Fig. 1 are designated by the same numerals as those used in the latter figure. Referring to Fig. 4 it will be seen that the container 2 is surrounded by an outer shell 24 through which a series of air intake openings 25

are formed and that a coil 26 of pipe is located in the space between the walls 2 and 24. A suitable heating or cooling medium is circulated through this coil 26, the temperature of the medium depending upon the change which it is desired to effect in the temperature of the air being treated. The circulating medium, for instance, may consist of steam, hot water, chilled brine, gas, or the like. Another coil of pipe 27 is located just above the eliminators 20 where a suitable heating or cooling medium may be circulated through it to modify the temperature of the air just before it is expelled from the container. The operation of this apparatus is exactly like that shown in Fig. 1 except that the temperature of the incoming current of air is modified by contact with the coil 26 and that the temperature of the air treated is further modified by the coil 27. It is obvious that only one of these coils need be used if desired.

It will be understood that while air has been mentioned particularly as the gas treated, that the apparatus is also applicable to the treatment of other gases. In some cases also it will be found desirable to use a liquid other than water in the apparatus but it is obvious that the use of such a liquid does not involve a departure from the present invention.

It will also be understood that the apparatus may be used either in the form shown where the device, or a series of them, may be employed to remove dust, lint, or the like from the air, or it may be connected up by suitable conduits with an enclosure or with other apparatus from which air laden with foreign material is taken, washed, and humidified in this apparatus with or without the temperature being changed, as desired, and the air finally returned again to the place from which it was taken.

What is claimed as new is:

1. The method of washing gas comprising the creating of a laterally directed spray of liquid, a downwardly extending curtain of liquid through which spray and curtain the gas to be washed is passed, creating a flow of gas through said curtain and said laterally directed spray and separating the liquid from the gas above said laterally directed spray.

2. A gas washing apparatus comprising in combination a container having a liquid reservoir therein, said container provided with gas inlet and outlet ports, means for creating a laterally directed spray above said incoming gas, means for creating a downwardly extending curtain of liquid through which the incoming gas must pass, means for creating a flow of said incoming gas through said curtain and said laterally directed spray, and means above the spray for separating the liquid from the gas on its

way to the outlet ports, said separated liquid falling through the container to said liquid reservoir, and through which liquid the gas flowing to said outlet ports must pass.

3. An apparatus of the character described, comprising, in combination, an upright container having a water reservoir in the bottom thereof and provided with air intake ports above said reservoir, and air outlet ports near the upper part of said container, a horizontally disposed centrifugal fan in the upper part of said container operative to create a flow of air through said ports and through the container, a pump in the lower part of said container operative to create a laterally directed spray in said container, means for operating said pump, a downwardly directed annular deflector plate within said container against which said spray is directed and below which the incoming air must pass, a plate in the upper part of said container for directing the air toward the central part of said fan, and a series of eliminators between said fan and pump operative to remove a substantial part of the water entrained by the air before it is expelled from the container by said fan.

4. An apparatus of the character described, comprising, in combination, a double walled container, a fan in said container operative to create a flow of air there-through, said container having ports in its walls located to cause said air to flow through the longitudinal space between the walls, means in said space for changing substantially the temperature of the air during its flow through said space, means for creat-

ing a spray in said container through which said current of air must flow, and means for removing a substantial part of the water entrained by the air before the air is expelled from said container by said fan.

5. An apparatus of the character described, comprising, in combination, an upright container of substantially circular cross section having a water reservoir in the bottom thereof and provided with air intake ports immediately above said reservoir and air outlet ports near the upper part of said container, a horizontally disposed centrifugal fan in the upper part of said container operative to create a flow of air through said ports and through the container, a rotary pump in the lower part of said container comprising an inverted conical member dipping into the water in said reservoir and operative to create a laterally directed spray in said container, a vertical shaft on which said pump and motor are mounted, a motor for driving said shaft, a downwardly and inwardly directed annular deflector plate within said container immediately above said intake ports and against which said spray is directed, a tapered deflector plate in the upper part of said container for directing the air toward the central part of said fan, and a series of eliminators between said fan and pump operative to remove a substantial part of the water entrained by the air before it is expelled from the container by said fan.

In testimony whereof I have signed my name to this specification.

SAMUEL C. CUTLER.