

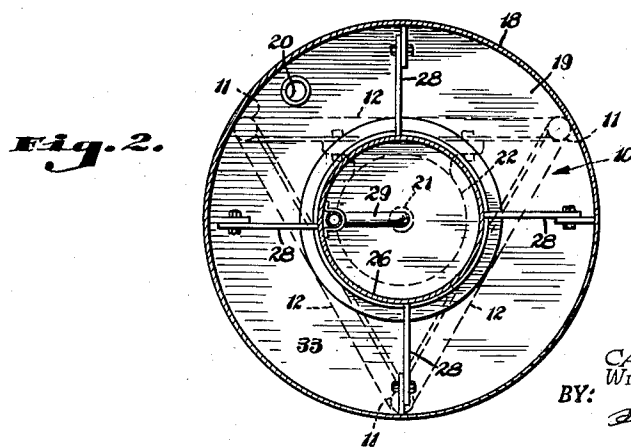
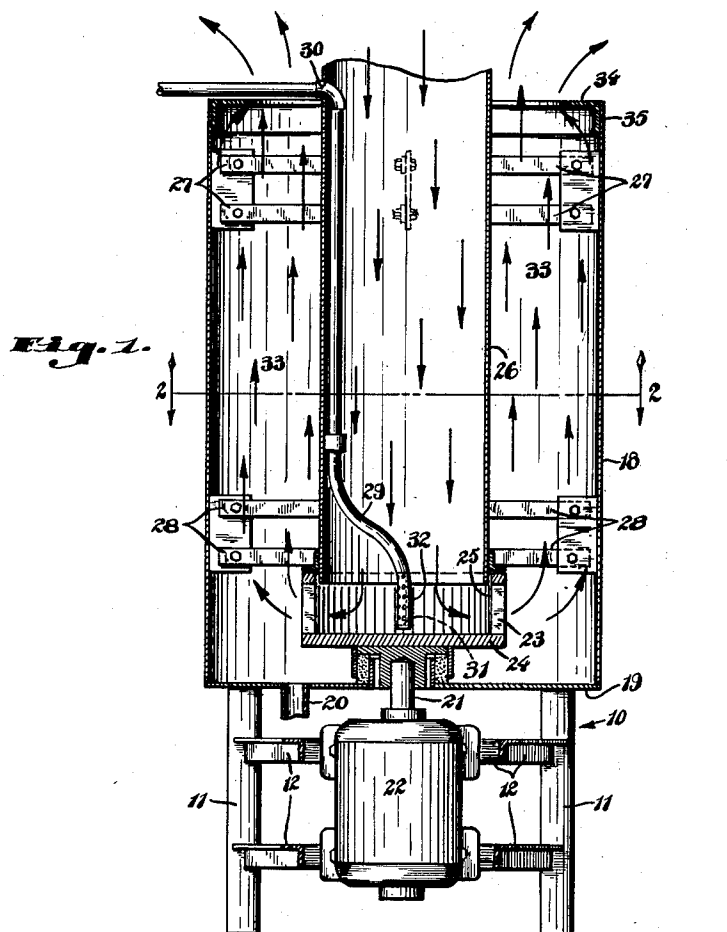
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AIR WASHER

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AIR WASHER

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The present invention relates to a device for cleansing contaminated air in which an impeller fan, rotating at high speed, atomizes a stream of washing liquid to produce a fog of tiny liquid particles, sets up a high-speed rotation of that fog, and simultaneously forces the gaseous fluid to be washed, to flow through that fog.

It is a primary object of the present invention to cleanse contaminated air before allowing it to escape into the atmosphere. A further object of the invention is to effect centrifugal separation of relatively heavy materials entrained in the atmosphere; and a still further object is to provide mechanism embodying certain novel features of construction, to carry out most effectively the above-mentioned objects.

The disclosed embodiment of this invention is particularly adaptable as an exhaust apparatus for electroplating baths from which emanate various gases and finely-divided solids which have a deleterious effect on machinery, personnel, and materials in the immediate vicinity. When utilized in this particular manner, the various gases and suspended solids are substantially completely separated from the air and carried to waste, or to a suitable collecting station, the cleansed air being exhausted to the atmosphere.

To the accomplishment of the above and related objects, our invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a vertical section of the disclosed embodiment of the present invention; and

Fig. 2 is a sectional view of the same embodiment taken substantially on line 2-2 of Fig. 1.

Referring more particularly to Fig. 1 of the drawings, it will be seen that a suitable frame 10, having three legs 11 held in fixed relation by the horizontally disposed rigid braces 12, supports a drum or tank 18 having a closed bottom 19 through which opens a discharge conduit 20, and through which extends a vertical shaft 21 of electric motor 22 bolted to said braces upon which is mounted a centrifugal fan 23 closed at its bottom 24 and centrally open at its top 25. An air intake conduit 26, centrally supported within drum or tank 18 by means of a pair of vertically spaced horizontal spiders 27 and 28, registers with the open end 25 of the fan 23; and a water inlet conduit 29, suitably

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supported within conduit 26 and projecting through said conduit 26 at any suitable point 30, projects centrally into the body of fan 23. The bottom end 31 of said water conduit is closed and the portion disposed within said fan is provided with a plurality of perforations 32 through which a washing liquid can flow.

In operation, the air intake conduit 26 is connected with a suitable length of conduit which may lead to a plating station, or the like, or which may open into any space where contamination arises. The fan 23 rotates at extremely high speed, atomizing the washing liquid which flows through perforations 32 in conduit 29 and filling the lower portion of chamber 33 with a fog of tiny droplets. The contaminated air, drawn by fan 23 through the conduit 26 and discharged with a swirling motion into the chamber 33, must pass through that fog before escaping past the inwardly projecting peripheral flange 34 secured to the top 35 of drum 18. The high speed rotating motion of the fan induces a similar movement of the atmosphere within the chamber 33, causing a mechanical centrifugal separation of the washing fluid and contaminating particles from the air. Concurrently, the droplets of washing liquid are brought into intimate contact with gases and solids dissolved or suspended in the air, and gases soluble in such liquid, as well as dust particles and the like are absorbed or centrifugally separated from the air.

We have found in practice that a substantial degree of cleansing can be effected through the use of the disclosed mechanism even when no washing liquid is supplied through the conduit 29, because of the centrifugal action above-described.

An important feature of our invention is embodied in the flange 34 which serves to prevent the fog from escaping with the washed air. Condensate formed on the underside of this flange and on the inner wall of chamber 33 flows down such wall and is collected in the bottom 19 and drained out through conduit 20.

The collection of liquid on the side walls of the chamber 33 is largely caused by centrifugal separation of moisture particles due to the high-speed rotation of the atmosphere within said chamber set up by the action of the fan. In operation, it is found that a considerable quantity of liquid gathers, at the periphery of the bottom 19 of the chamber 33, in the form of an annulus having a concave inner surface, and ex-

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tending a substantial distance up the side walls of the chamber.

The flange 34 provides a space of negligible air flow immediately beneath it which prevents the discharging air from carrying condensed condensate up the chamber walls and out into the atmosphere.

Of further substantial importance is our discovery that the internal surfaces of the upstanding walls of the chamber 33 must be formed of material which is wettable by the selected washing liquid. We have found that certain coatings; when applied to those walls, will result in the creation of droplets of liquid standing separately upon the coatings and subject to entrainment in the rapidly flowing stream of cleansed air moving toward the discharge end of the mechanism. A very decided reduction in the efficiency of the unit was found to result from the application of such coatings; and the optimum efficiency was found to be restored only when materials wettable by the selected washing liquid were used to form the inner surfaces of said upstanding chamber walls. Illustrative, but not exclusive, examples of such materials for use when water is selected for the washing liquid, are bare steel, stainless steel, wood, or any of those materials when covered with coatings which are, themselves, wettable by water. Such coatings, however, provide little advantage since, by their very characters, they are subject to gradual destruction and removal by the flowing washing liquid.

If desired, the conduit 20 may lead to an auxiliary sump tank, whence liquid drained from the chamber 33 may be passed through suitable purifying processes and then recirculated to the conduit 29. In case valuable materials are dissolved or entrained in the washing liquid, such materials may thus be recovered in one or more of such purifying processes.

We claim as our invention:

1. An air cleansing device comprising a vertically arranged casing having an annularly open top and a closed bottom, a conduit having open ends concentrically fixedly secured in said casing with one end of said conduit disposed near the bottom of said casing and the other end of said conduit projecting through and beyond said casing open top, said conduit being spaced from the perimeter of said casing to define therewith a vertically-extending chamber open at its top, a shaft journaled for rotation upon a vertical axis

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and centrally projecting through said casing bottom, means for driving said shaft at high speed, a centrifugal fan carried on said shaft within said casing and registering with said one end of said conduit, said fan being arranged and adapted to draw air downwardly through said conduit and to discharge air radially into said chamber for upward flow to and through said open top of said casing to the atmosphere, and means disposed adjacent the center of rotation of said fan for continuously delivering liquid to said fan for discharge therefrom with such air.

2. The device of claim 1 in which said fan comprises a flat plate normal to, and coaxially mounted upon, said shaft, a series of blades arranged about the periphery of said plate, radially spaced from said shaft axis, projecting in a common direction from said plate in parallelism with said shaft axis, and annularly-continuous means secured to and joining said blades at their ends remote from said plate.

3. The device of claim 2 in which said liquid-delivering means extends into proximity with said plate in the region enclosed by said blade series and between said plate and the plane of the joined remote ends of said blades.

4. The device of claim 3 in which said liquid-delivering means includes a nozzle located in said region, closed at its end adjacent said plate, and provided with a plurality of minute, radially-directed openings through which liquid is delivered in a spray directed toward said blades.

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