This invention relates to air and gas cleaners.

The main objects of this invention are to provide a simple and reliable means for feeding foam-producing compound to the water or other liquid of an air or gas cleaner, and to provide such a means which is automatically controlled by the height or thickness of the layer of foam produced and carried on the liquid of the cleaner.

An illustrative embodiment of this invention is shown in the accompanying drawing in which

Fig. 1 is a vertical, sectional view taken transversely of an air or gas cleaner embodying the present invention and showing the foam-producing reagent or compound being fed to the fluid body of the cleaner.

Fig. 2 is a similar view of the same but showing a sufficient body of foam within the cleaner to stop the flow of foam-producing compound.

Fig. 3 is a fragmentary, sectional view taken on the line 3—3 of Fig. 1.

This application is related to the application of Frederick P. Bingman, Serial No. 494,607, filed on even date herewith and assigned to the same assignee.

In the construction shown in the drawing a covered or enclosed tank 4, of generally rectangular shape, is provided for holding a body of water or other suitable liquid against which is directed the air or gas to be cleaned. The tank 4 is provided with a baffie 8 that covers the opening of a horizontal duct 10 which leads to an overflow chamber 12. Water or other liquid is supplied to the chamber 12 from a pipe 14 through a valve 16 and a restricted orifice 18 which regulates and determines the amount of water being supplied to the tank 4. Handle 17 of the valve 16 is connected to a shield 19 which swines to cover an electric starter control button 21 when the valve is closed. Thus the valve 16 must be open before the apparatus is started in operation and remains open during the operating period.

Chamber 12 is provided with a vertically disposed, externally threaded, overflow pipe 22, the upper end 24 of which is positioned very slightly below the desired liquid level to be maintained within the tank 4. The lower end 26 of the pipe 22 is submerged in a small tank 25 having an overflow pipe 23 communicating therewith at a point above the lower end 24. There is thus provided an air-sealed outlet for the overflow through the pipe 23. A lock nut 23 is provided on pipe 20 for fixing it in vertical adjusted position.

The air to be cleaned is drawn through a series of horizontally spaced, generally V-shaped, open-bottomed, troughs 30, the lower ends of which are spaced only slightly above the normal water level within the tank 4. The air passes downwardly through the troughs, as shown in Fig. 3, and impinges on the water surface so that all the heavier pieces of dirt and dust are entrained by the water at this point. The action at this point is such as to agitate the water to a considerable extent, not only to aid in the cleaning action and separation of dirt particles from the air, but also for the purpose of churning up and creating a foam from a foam-producing compound or reagent supplied to the tank. The supply of compound is automatically controlled by the depth of the foam layer on the water surface.

A supply of liquid reagent or foam-producing compound 32 is carried in a small tank 34 and withdrawn therefrom by a pump 36 driven by an electric motor 38. The discharge of the pump 36 passes through a pipe 40 and is supplied to a reservoir 42. Reservoir 42 is provided with an externally threaded, vertically adjustable overflow pipe 44, the upper end 46 of which is positioned very slightly above the level of the top 48 of a feeding duct 50. The duct 50 communicates with the reservoir 42 at a point substantially below the normal reagent level therein, and its discharge end 48 is located within the tank 4. The overflow pipe 44 is threaded through the lower end of the reservoir 42 and is provided with a lock nut 52 for securing it in adjusted position.

Air passing through the cleaner tank has the liquid separated therefrom by a series of vertical, cylindrical separator tubes 54 whose details, including the separation and functioning thereof, are fully disclosed in Bingman Patent No. 2,191,187, issued February 20, 1940. The upper ends of the separator tubes 54 terminate in a header 55 which is connected to an exhaust fan (not shown) in the customary manner.

Means are provided for controlling the feeding of foam-producing reagent from the reservoir 42 into the tank 4 and comprise a vertically positioned, vacuum control pipe 56 having its lower end 58 extending within the tank 4 and spaced a predetermined distance, such as four or six inches, above the normal liquid level therein. The upper end of the pipe 58 is attached to and communicates with the header 55, and the communication therewith is through a restricted orifice 62. A conduit 64 is connected to and provides communication between the pipe 58 and the top of the reagent reservoir 42, the top of the reservoir being closed by a cap 66. Communication is thus provided between the air space above the reagent in the reservoir 42 and the space within the tank 4.
above the liquid therein through the lower end 60 of the pipe 58 so that the air pressure within the reservoir 42 and within the top of the tank 4 are substantially the same as long as the lower end 60 of the pipe 58 remains open.

Automatic control and regulation of the flow of foam-producing reagent is accomplished in the following manner. It is an inherent characteristic of this structure that the air pressure within the header 56 is at all times, during operation, less than the air pressure within the upper part of the tank 4. However, as long as the lower end 60 of the pipe 58 remains uncovered, the air pressure within the reservoir 42 and the top of the tank 4 will be the same due to the connection and communication through the pipe 64. When the foam carried on the liquid within the tank 4 has been generated by the agitation of the water by the incoming air to be cleaned to such an extent as to build up a layer sufficiently thick or high as to close the lower end 60 of the pipe 58, as shown in Fig. 2 of the drawing, the air pressure within the reservoir 42 is lowered by withdrawal through the orifice 62, thereby raising the reagent liquid level within the reservoir 42 and causing all the reagent supplied by the pump 38 to pass into the top 46 of the overflow pipe 44 and lower the level of the reagent below the top 48 of the feeding duct 50.

As soon as the foam level within the tank 4 has been lowered sufficiently to uncover the lower end 60 of the vacuum control pipe 58, the air pressure within the reservoir 42 is raised to the same as that within the top of the tank 4, and feeding of the foam-producing reagent through the duct 50 is again resumed. In this way any desired foam level is automatically maintained within the tank 4, and the thickness thereof depends upon the spacing of the lower end 60 of the vacuum control pipe 58 above the liquid level within the tank.

It is to be understood that the term “air” as used herein and in the appended claims is intended to include all gases and the like, as it is evident that the invention herein disclosed is equally well adapted for gas cleaners.

What is claimed is:

1. An air cleaner, an enclosed tank for containing a body of liquid to be contacted by the air to be cleaned, an air inlet duct for said tank arranged to direct the air to be cleaned against the surface of the liquid, a reagent feeder for said tank comprising a reservoir, means for supplying a foam-producing liquid reagent to the reservoir, an overflow duct communicating with said reservoir, a feeding duct communicating with said reservoir below the liquid level therein and having an outlet within said tank at a slightly lower level than the upper end of the overflow duct in said reservoir, a duct providing communication between the air space in said reservoir and the interior of said tank, the tank end of said duct being located in spaced relation above the liquid therein, a restricted duct providing communication between said last-mentioned duct and a source of air pressure normally lower than that within said tank, the arrangement being such that the air pressure within said tank and reservoir are substantially the same until foam upon the liquid within the tank attains sufficient depth or height to restrict the duct end spaced thereof, whereupon the source of relatively lower air pressure reduces the air pressure within the reservoir and thereby controls the flow of reagent through said feeding duct.

2. In an air cleaner, an enclosed tank for containing a body of liquid to be contacted by the air to be cleaned, an air inlet duct for said tank arranged to direct the air to be cleaned against the surface of the liquid, a reagent feeder for said tank comprising a reservoir, means for supplying a foam-producing liquid reagent to the reservoir, means for maintaining a predetermined normal liquid level therein, a feeding duct having an inlet communicating with said reservoir below the liquid level therein and having an outlet within said tank at a slightly lower level than the normal liquid level in said reservoir, a duct providing communication between the air space in said reservoir and the interior of said tank, the tank end of said duct being located in spaced relation above the liquid therein, a restricted duct providing communication between said last-mentioned duct and a source of air pressure normally lower than that within said tank, the arrangement being such that the air pressure within said tank and reservoir are substantially the same until foam upon the liquid within the tank attains sufficient depth or height to restrict the duct end spaced thereof, whereupon the source of relatively lower air pressure reduces the air pressure within the reservoir and thereby controls the flow of reagent through said feeding duct.

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