

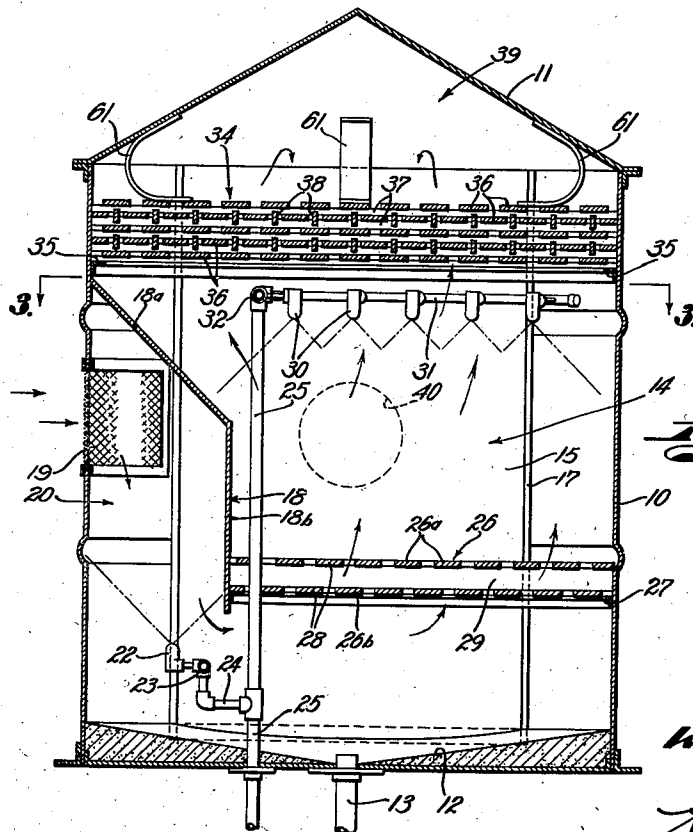
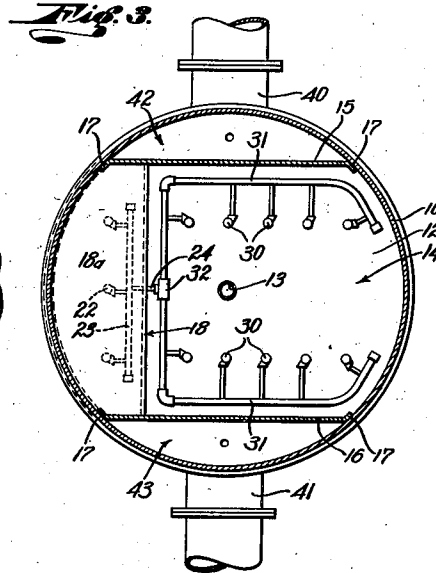
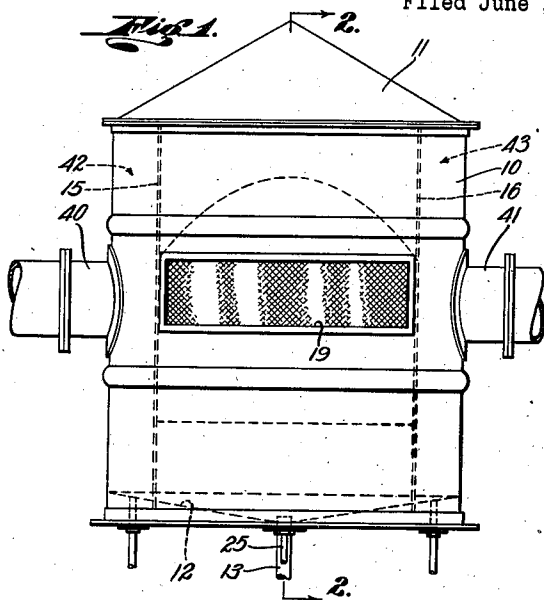
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AIR WASHER

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## UNITED STATES PATENT OFFICE

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## AIR WASHER

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5 Claims. (Cl. 183—21)

This invention has to do with improvements in washers for cleaning and conditioning air. While it is to be understood that the invention may be adapted to the cleaning and conditioning of air for various specific purposes and in different particular installations, it has been developed primarily for the dual purpose of washing the air fed to internal combustion engines, and for cooling the engine jacket water by using it as the air washing liquid. Accordingly, the invention will be described as applied to that particular and typical purpose.

One of my primary objects is to provide an apparatus by means of which the air may be washed in one or more stages and brought into thorough and intimate contact with the washing water, then freed of any liquid entrainment for final discharge to the engine, all in a manner permitting extended and reversed flow of the air during its treatment, within a shell of minimum size and dimensions. Also important is the maintenance of conditions whereby the water (e. g. engine jacket water) is contacted with the air to cause partial vaporization of the water to an extent resulting in its cooling.

The invention may be described generally as comprising in its preferred form, a vertically extending and preferably cylindric shell, containing an air washing chamber of smaller cross-sectional area than the shell and formed by walls contained within and spaced from the outer shell to permit passage of air taken through an inlet in the side of the shell, downwardly within a space outside the washing chamber, and to then flow upwardly through the chamber in contact with downwardly directed water. If desired the air may be first contacted with water by counter-directed sprays of water within the space outside the working chamber, and then passed upwardly through an apertured deck at the bottom of the latter and upon which water is showered in falling within the washing chamber. After passing from the chamber through a suitable arrangement of baffles to remove liquid entrainment, the washed air then flows downwardly at the outside of the chamber walls to one or more outlets in the side of the shell, from which the air may be drawn to one or more engines. Cooled water collecting in the base of the cleaner is withdrawn for further disposition, as recirculation to the engine jacket.

All the various features and objects of the invention, as well as the structural details of a typical and illustrative embodiment thereof, will be understood to better advantage from the description to follow, throughout which reference is had to the accompanying drawing in which:

Fig. 1 is an elevation of the washer at the air inlet side;

Fig. 2 is an enlarged vertical section on line 2—2 of Fig. 1; and

Fig. 3 is a reduced scale cross section on line 3—3 of Fig. 2.

In its preferred form, the apparatus comprises a vertically extending, substantially cylindrical shell 10 having a suitable top closure 11 and a conical bottom 12 from which water drains through an outlet 13. Shell 10 contains a washing chamber 14 of smaller cross-sectional area than the corresponding cross-section of the shell, formed by a pair of spaced vertically extending walls 15 and 16, welded or otherwise held against the shell at 17, and interconnected by a transverse end wall 18. As shown in Fig. 2, wall 18 is disposed opposite an arcuate screened air inlet 19 in the shell 10, and has an upper inclined air deflecting portion 18a and a lower vertical portion 18b, both spaced at 20 from the shell.

Air drawn through inlet 19 into space 20 flows downwardly therethrough and then, as indicated by the arrows, reverses its flow in passing upwardly through a washing chamber 14. The down-flowing stream of air in space 20 is intimately contacted with multiple water sprays being discharged upwardly within the space from nozzles 22 carried on a header 23 to which water is supplied through line 24 and a pipe 25 extending upwardly through the bottom plate 12. The air enters the bottom of chamber 14 through an apertured deck 26 supported on flange 27 and comprising spaced rows 26a, 26b, of relatively offset slats or battens 28 nailed to transverse spacing members 29.

In flowing upwardly through chamber 14, the air stream is met by a plurality of downwardly directed water sprays discharged from nozzles 30 carried on headers 31, see Fig. 3, leading at 32 from the supply pipe 25. The water sprayed from nozzles 30 intimately contacts the upwardly flowing air and subjects it to final washing, and the water then deposits on the deck 26, filming the slats 28 and thereby causing the air rising through the deck apertures to directly impinge the water-filmed surfaces. As previously mentioned, the apparatus may serve not only to wash the air being taken through it, but also to cool the washing water. An instance of such use of the apparatus is described in my copending application entitled System for conditioning air for engines, Ser. No. 340,723 filed on even date herewith, wherein the present type of washer may be used for conditioning air being taken to internal combustion engines, and also to cool the engine jacket water. As will be apparent, warm water may be subjected to effective cooling in being sprayed in finely divided form from nozzles 22 and 30, countercurrent to the air streams in space 20 and chamber 14, resulting in heat transference to the air and partial though limited

evaporization of the water. Deck 26 further aids in cooling the water by causing extensive filming of the water on the slats 28 and direct exposure of the water films to the rising air stream.

Entrained water particles carried by the washed air stream leaving the chamber 14 are removed by an assembly of baffles, generally indicated at 34, supported on flange 35 within the upper interior of the shell above the washing chamber walls, and held against upward displacement by resilient stops 61 attached to the cover 11. Baffles 34 may be of any suitable type and arrangement, although I prefer to use a multiple deck arrangement of relatively offset elongated slats 36 spaced apart by transverse members 37, with interposed, right angle deflector strips 38 located between the slats of alternate rows as illustrated. In flowing through the tortuous paths imposed by the deck assembly 34, the washed air loses its moisture by impingement against the deck slats and deflector strips, and the separated moisture drains back into the washing chamber 14.

The washed, entrainment-free air passes from the baffle assembly 34 into the upper interior 39 of the shell and then reverses its flow in moving downwardly in separate streams to the outlets 40 and 41 through spaces 42 and 43 between shell 10 and the inner chamber side walls 15 and 16. The air may be taken through outlets 40 and 41 for any suitable use, as for example to internal combustion engines, the suction of which operates to draw the air through the washer.

As previously mentioned, the construction of the apparatus permits a high rate of air throughput to be maintained within the washer in an extended and reversing path of flow sufficient to allow complete and thorough washing of the air and elimination of liquid entrainment, all within a shell of minimum height. This is made possible, as illustrated in Fig. 2, by arranging and spacing the walls of chamber 14 within the shell so as to permit multiple reversals of the air flow between the inlet 19 and outlets 40 and 41, and to permit the inlet and outlets to be located in substantially the same horizontal plane of the shell.

I claim:

1. An air washer of the character described comprising a vertically extending circular cross-section shell, spaced vertically extending walls interconnected by a transverse wall, all within and spaced from said shell to form a washing chamber, an inlet in the side of the shell from which air flows downwardly within a space at the outside of said transverse wall and then passes upwardly through said chamber, the upper portion of said chamber overlying said space, means for washing the air in said chamber, separating means above said chamber for removing liquid entrainment from the air, and air outlets in the sides of said shell to which the washed air flows downwardly from said separating means within spaces at the outside of said spaced vertically extending walls.

2. An air washer of the character described comprising a vertically extending circular cross-section shell, spaced vertically extending walls interconnected by a transverse wall, all within and spaced from said shell to form a washing chamber, an inlet in the side of the shell from

which air flows downwardly within a space at the outside of said transverse wall and then passes upwardly through said chamber, the upper portion of said chamber overlying said space, spray nozzles for discharging water into the air within said space and chamber, separating means above said chamber for removing liquid entrainment from the air, and air outlets in the sides of said shell to which the washed air flows downwardly from said separating means within spaces at the outside of said spaced vertically extending walls.

3. An air washer of the character described comprising a vertically extending circular cross-section shell, spaced vertically extending walls interconnected by a transverse wall, all within and spaced from said shell to form a washing chamber, an inlet in the side of the shell from which air flows downwardly within a space at the outside of said transverse wall and then passes upwardly through said chamber, the upper portion of said chamber overlying said space, means for washing the air in said chamber, means for introducing water to the air stream flowing downwardly within said space, spaced rows of elongated relatively offset strips above said chamber for removing liquid entrainment from the air, and air outlets in the sides of said shell to which the washed air flows downwardly from said chamber within spaces at the outside of said spaced vertically extending walls.

4. An air washer of the character described comprising a vertically extending circular cross-section shell, spaced vertically extending walls interconnected by a transverse wall, all within and spaced from said shell to form a washing chamber, an inlet in the side of the shell from which air flows downwardly within a space at the outside of said transverse wall and then passes upwardly through said chamber, the upper portion of said chamber overlying said space, means for washing the air in said chamber, separating means above said chamber for removing liquid entrainment from the air, a horizontally extending apertured wall through which the air rises within the lower portion of said chamber, and an air outlet in the side of the shell to which the washed air flows downwardly from said separating means within a space at the outside of one of said vertically extending walls.

5. An air washer of the character described comprising a vertically extending circular cross-section shell, spaced vertically extending walls interconnected by a transverse wall, all within and spaced from said shell to form a washing chamber, an inlet in the side of the shell from which air flows downwardly within a space at the outside of said transverse wall and then passes upwardly through said chamber, the upper portion of said chamber overlying said space, means for washing the air in said chamber, separating means above said chamber for removing liquid entrainment from the air, a horizontally extending apertured wall comprising relatively offset strips supported by said vertically extending and transverse walls and through which the air rises within the lower portion of said chamber, and an air outlet in the side of the shell to which the washed air flows downwardly from said separating means within a space at the outside of one of said vertically extending walls.

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