May 30, 1933. C. A. WINSLOW 1,912,235

AIR CLEANER

Filed Sept. 10, 1928 2 Sheets-Sheet 1

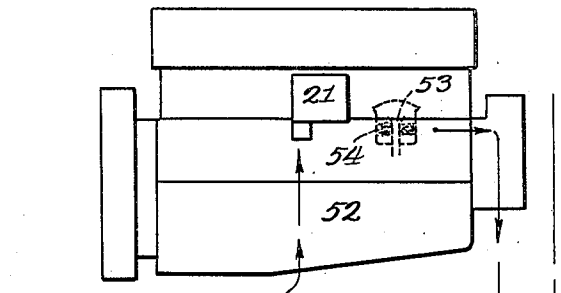


Fig. 1

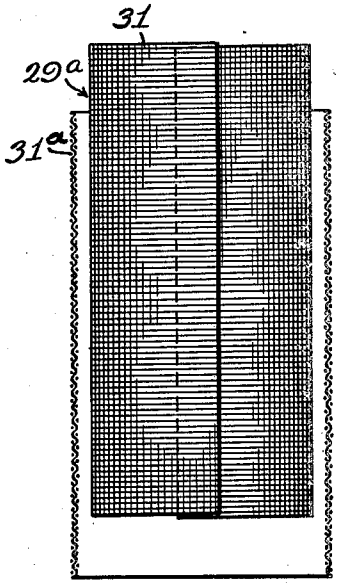
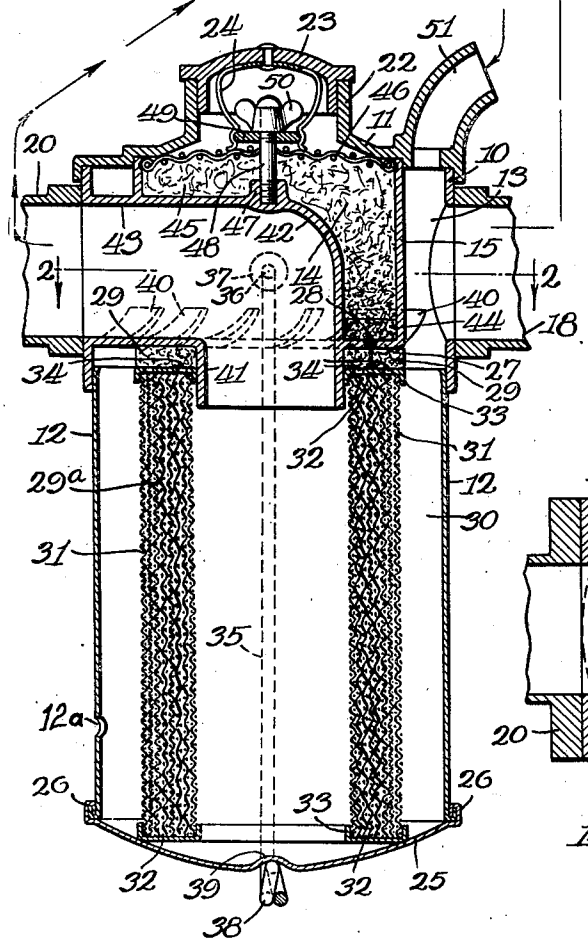


Fig. 3



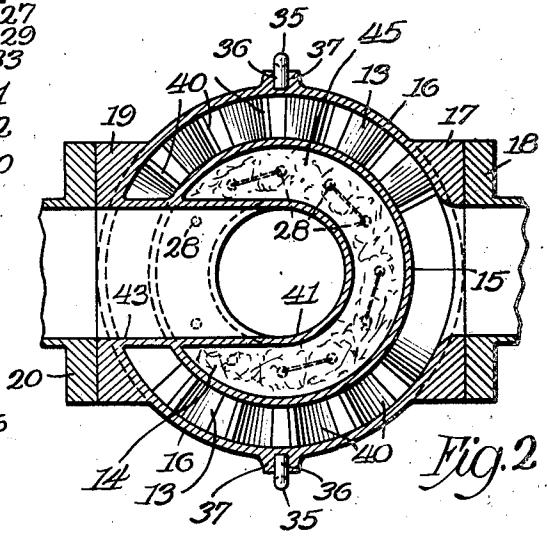


Fig. 2

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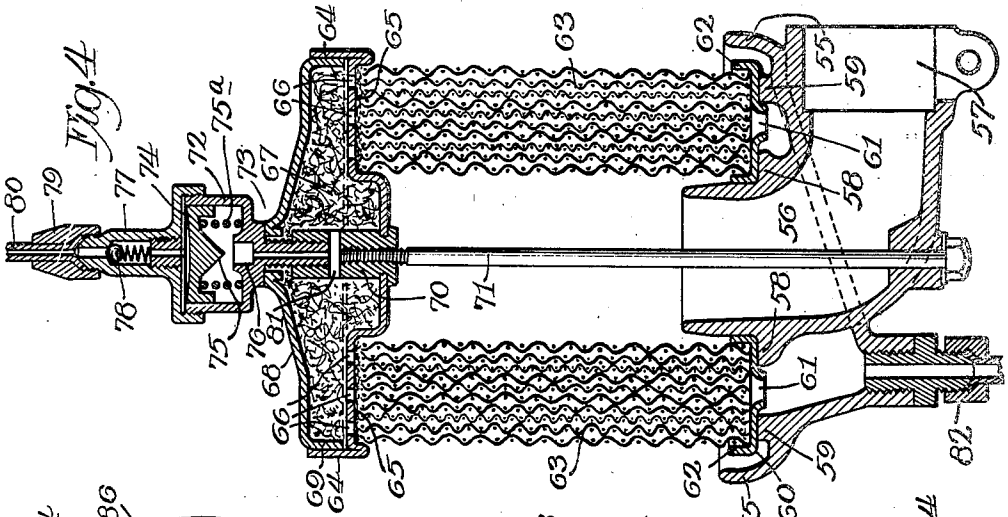


Fig. 4

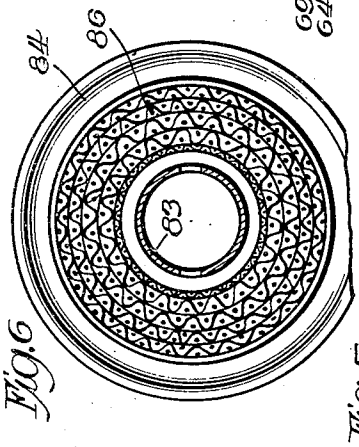


Fig. 6

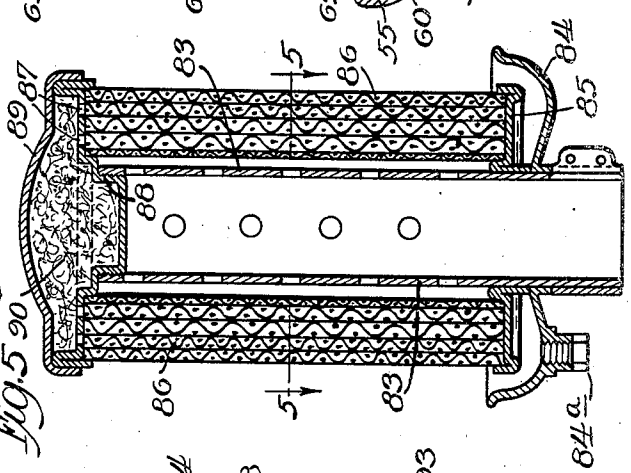


Fig. 5

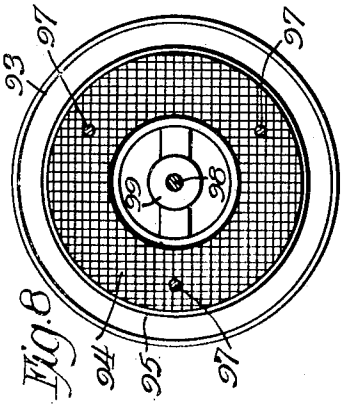


Fig. 8

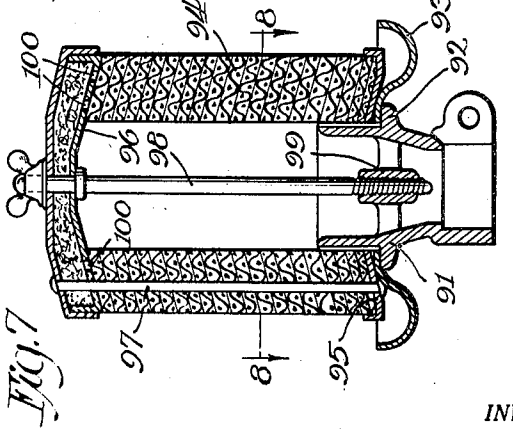


Fig. 7

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Patented May 30, 1933 1,912,235

UNITED STATES PATENT OFFICE

CHARLES A. WINSLOW, OF VALLEJO, CALIFORNIA

AIR CLEANER

Application filed September 10, 1928. Serial No. 305,106.

This invention relates to air cleaners for internal combustion engines, air compressors, and the like, and has for its principal objects to provide a simple compact structure that will remove all solid matter from the air passing through it and will be efficient through a long period of service without attention; that can be easily taken apart for removing collected foreign matter; and that can be manufactured at small cost.

Further objects and advantages of the invention will become apparent as the disclosure proceeds and the description is read in connection with the accompanying drawings in which

Fig. 1 is a vertical section through an air cleaner embodying the invention, appropriate connections with an engine being diagrammatically indicated;

Fig. 2 is a transverse section taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevation illustrating a step in the process of making the filter;

Fig. 4 is a vertical section of another form embodying some of the features of the invention;

Figs. 5 and 7 are similar sectional views, illustrating still other forms embodying certain features of the invention, and

Figs. 6 and 8 are transverse sections taken on the line 6—6 of Fig. 5 and line 8—8 of Fig. 7, respectively.

But neither the specific illustration nor the correspondingly specific description is to be taken as a limitation for it is realized that the substance of the invention may be embodied in a variety of forms.

The air cleaner shown in Figs. 1 and 2 includes a casing composed of a cast body portion 10 having a cover 11 on top and a sheet metal shell 12 depending at the bottom. In the body portion there is an annular inlet space 13 surrounding and separated from an oil chamber 14 by an inner wall 15. The outer wall 16 is circular and provided at one side (Fig. 2) with a hollow boss 17 for connection with a tube 18 leading to any point from which the air is to be taken and at the other side with a similar boss 19 for connection with a tube 20 leading to the intake of the carburetor 21, or an air compressor, or the like.

The cover 11 has flanges telescoping with the inner and outer walls 15 and 16, and is provided with a tubular central portion 22 extending upwardly and fitted with a cap 23 held in place by the spring clip 24. The shell 12 is composed of a cylindrical body portion and a convex bottom 25 joined by crimped edges 26.

The bottom 27 of the oil chamber is perforated at 28 and a distributing pad of felt 29 is secured to its underside by a wire or cord sewed through the pad and perforations 28. A filter generally indicated by 29^a is seated against the pad 29 at one end and against the bottom 25 of the shell at the other, and is spaced from the body portion of the shell to leave an inlet chamber 30.

The filter is composed of woven wire laminæ 31, preferably of several different mesh, in substantially cylindrical form and rings 32 having flanges 33 telescoping with and secured to the inner and outer laminæ. The upper ring 32 is provided with numerous perforations 34 to permit oil in the pad to pass to the various laminæ.

The filter is held in place by the shell which, in turn, is made fast and urged upwardly by a resilient bail 35 having its end portions 36 seated in perforated bosses 37 on the body portion of the casing and its intermediate portion coiled at 38 to cooperate with a depression 39 in the bottom 25.

The inlet passage 13 near the bottom is provided with inclined blades or louvers 40 which cause the air to whirl in the inlet chamber 30.

The body of the casing is provided with an outlet passage comprising a centrally disposed tube 41 telescoping with the upper end of the filter, an intermediate curved portion 42 forming a sort of elbow and a laterally directed portion 43 communicating with the tube 20.

The oil chamber 14 is provided with a layer of asbestos 44 near the bottom and above that is packed with mineral wool, or the like, 45 held in place by a screen 46.

The curved portion 42 of the outlet is

provided with a boss 47 receiving a stud 48, protruding through a strut 49, and a wing nut 50. The strut 49 is attached to the tubular wall 22 and cooperates with the spring clip 24, to hold the cap 23 in place.

The cover 11 is provided with an additional inlet passage 51 leading into the passage 13 at the top and adapted to be connected with the interior of the crank case above the oil, as indicated in Fig. 1. This connection should be made at a point removed from the breather, which is conceived to be on the opposite side of the engine 52 (Fig. 1), and is indicated in dotted lines at 53 as being equipped with a filter 54.

In operation air is drawn through the tube 18 into the inlet passage 13 and the louvers 40 direct it into a whirl as it enters the inlet chamber 30. Thus, by centrifugal force heavier solid matter is thrown against the inner wall of the shell and settles to the bottom along that wall. The air passes through the laminated screen and escapes through the outlet and passes through the tube 20 to the carburetor 21.

Oil in the oil chamber flows slowly through the asbestos at the bottom, through the perforations 28 and is distributed by the pad 29 to the laminæ at the upper end of the filter and thence travels downwardly serving to assist the laminæ in catching solid matter and also to wash the accumulated solid matter downwardly.

Air is also drawn from the crank case and includes, in addition to the volatiles, some oil in the form of mist, which assists in separating out the solid matter and in keeping the outer portion of the filter and the inner wall of the shell covered with a thin layer of oil, which tends to travel downwardly.

The draft through the crank case, in addition to moving objectionable volatiles, tends to cool the oil and divert the objectionable odors to the carbureter, and finally to the exhaust instead of allowing them to escape into the car.

By swinging the bail 35 aside the shell with the filter may be quickly removed and cleaned by dipping in oil, or first in kerosene and then in oil.

The shell is closed at its lower end for providing a sump for receiving sludge and excess oil flowing downwardly from the filter material. This shell may have an outlet 12^a to prevent excess accumulation of dirty oil when cleaning is neglected.

The pressure of the bail on the shell is communicated through the filter to the pad 29, which thereby functions as a valve to control the flow of oil from the chamber to the filter. This pressure can be adjusted by bending the bail. The flow of oil to the filter element will be greater during the operation of the engine, due to the resiliency of the bail and the vibration of the motor. The motor vibration will tend to cause the filter element 31 to vibrate vertically and this will cause a variable pressure on the pad. Any temporary release on the pressure will permit the oil to temporarily flow into the pad, and during the compression of the pad while the engine is operating the oil will be partially forced out of the pad on to the filter element.

The filter may be made in a number of ways, but preferably the outer layer is woven in the form of a cylinder and the inner layers are formed into a roll of smaller diameter which is inserted in the cylinder and then allowed to expand against the inner surface thereof. In this way the mesh of the various laminæ automatically is placed out of register.

In the form shown in Fig. 4, the base casting includes a basin 55 draining to the left in that figure, an elbow-shaped tubular outlet 56, and a split socket 57 for receiving a tube upon which the air cleaner is to be mounted. Surrounding the upper end of the outlet 56 is a shoulder 58 which, together with projections 59 extending from the bottom of the base, form a seat for a ring 60, perforated at 61 and having flanges 62 telescoping with the filter 63 formed of a plurality of woven wire laminæ, as before described.

At the top of the filter is a sheet metal oil chamber 64 having an annular seat 65 on its underside receiving the upper end of the filter and provided with perforations 66 to permit oil from the packing 67 to feed slowly to the upper end of the filter.

The cover 68 of the oil chamber is also of sheet metal and is provided with a depending flange 69 telescoping with the wall of the oil chamber. At the center the oil chamber is provided with a threaded fitting 70 cooperating with the bolt 71 to secure the parts together.

An oil cup 72 is provided with a threaded stem 73 engaging corresponding bores in the cover 68 and the upper end of the fitting 70. A piston 74 loosely mounted in the cup has a conical valve 75 adapted to cooperate with the seat 76 in the bottom of the cup. When the spring 75^a is compressed a cover 77 closes the cup and is equipped with a check valve 78, and a nipple 79 connects the cover with the pipe 80 leading to the force feed lubricating system. The valve 75 controls a passage through the stem 73 and a transverse bore 81 in the fitting 70.

In operation air is drawn through the filter and passes through the outlet 56 to the engine, compressor, or the like. Oil in the chamber 64 flows out through the perforation 66 and down the laminæ of the filter and either passes out through the perfora-

tions 61 or over the flange 62 into the basin 55, and carries the dust washed from the filter 63 out through the tube 82 leading to a suitable container or to the ground, as desired.

Each time the machine is operated oil pressure in the lubricating system opens the check valve 78, fills the cup 72, overcomes the spring 75[a] and closes the valve 75. When the machine is stopped, the pressure is relieved, the check valve 78 closes, the spring urges the loose fitting piston 74 upward, and the oil escapes around the piston and passes into the chamber 64, from whence it is distributed to the filter, which is thereby washed after each operation.

In the form shown in Fig 5 there is a centrally located perforated tube 83 to which is spot-welded a sheet metal basin 84, equipped with a removable plug to permit collected oil and dirt to be drawn off. Above the basin is a ring 85 receiving the lower end of the filter 86 composed of woven wire laminæ.

A sheet metal oil chamber 87 is provided with a threaded projection 88 connected with the upper end of the tube. The removable cover 89 closes the oil chamber but permits access for replenishing the oil in the packing 90. The operation of this form is substantially the same as that shown in Fig. 4 except as to the supply of oil to the chamber.

In Fig. 7 the base of the air cleaner is a hollow casting 91 having a shoulder 92 against which rests a catch basin 93. Above the basin is a filter 94 composed of conical laminæ of woven wire, which are secured between a ring 95 and an oil chamber 96 by long rivets 97. A rod 98 swiveled in the oil chamber is threaded into a strut 99 extending across the hollow of the base casting.

In this form the air passes inwardly through the filter and out through the hollow base. The oil in the chamber 96 seeps through the perforations 100 and passes down through the filter. The device is cleaned by unscrewing the rod 98 and dipping it in oil which, operation incidentally fills the oil chamber 96.

I claim as my invention:—

1. In an air cleaner, a hollow filter generally circular in horizontal section and composed of woven wire laminæ with the mesh of adjacent laminæ out of register and having an outlet for clean air communicating with the interior, a casing enclosing the filter and separated from its periphery by an annular space and having an air inlet passage communicating with the annular space and an air outlet passage leading from the outlet of the filter and means for feeding oil to the upper end of the filter.

2. In an air cleaner, a hollow filter generally circular in horizontal section and composed of woven wire laminæ with the mesh of adjacent laminæ out of register and having an outlet for clean air communicating with the interior, a casing comprising a body portion above the filter and a depending shell closed at the bottom and cooperating with the periphery of the filter to enclose an inlet chamber, said body portion having an inlet passage supplying air to the inlet chamber, and means for feeding oil slowly to the top of the filter.

3. In an air cleaner, a hollow filter generally circular in horizontal section and composed of woven wire laminæ with the mesh with adjacent laminæ out of register and having an outlet for clean air communication with the interior, a casing comprising a body portion above the filter and a depending shell closed at the bottom and cooperating with the periphery of the filter to enclose an inlet chamber, said body portion having an inlet passage supplying air to the inlet chamber, and means for feeding oil slowly to the top of the filter comprising an absorbent pad carried by the body portion.

4. In an air cleaner, a casing having an oil chamber, an inlet passage around the oil chamber open at the bottom and an outlet passage, a hollow filter composed of woven wire laminæ depending from the casing and having its interior communicating with the outlet, a shell depending from the casing and cooperating with the filter to form an inlet chamber communicating with the inlet passage, and means to distribute oil to the upper end of the filter.

5. In an air cleaner, a casing having an oil chamber, an inlet passage around the oil chamber open at the bottom and an outlet passage, a hollow filter composed of woven wire laminæ depending from the casing and having its interior communicating with the outlet, a shell depending from the casing and cooperating with the filter to form an inlet chamber communicating with the inlet passage, means to distribute oil to the upper end of the filter, and a pivoted bail on the casing detachably securing the shell thereto.

6. In an air cleaner, a casing having an oil chamber open at the top and perforated at the bottom, an inlet passage surrounding the oil chamber and open at the bottom and a centrally located outlet, a distributing pad receiving oil from said oil chamber, a hollow filter composed of woven wire laminæ receiving oil from said pad, a cup-shaped shell enclosing the filter and telescoping with the inlet passage and a bail pivoted to the casing and securing the shell in place.

7. In an air filter device for an internal combustion engine, a casting having an air discharge passage, a hollow filter member having its interior in communication with said discharge passage, a pad for conducting oil to said filter, means for supplying oil

to said pad, a casing surrounding said filter member, and means for clamping said casing against said pad, said means being resilient, whereby the running of said engine will cause said pad to feed oil to said filter more freely than when said engine is at rest.

8. In an air cleaner, a hollow filter, generally circular in horizontal section and composed of woven wire closely wound in cylindrical form with the mesh of adjacent laminæ out of register and having an outlet for clean air communicating with the interior thereof and means for feeding oil slowly to the top of the filter, whereby it flows downwardly along the outer laminæ by gravity.

9. In an air cleaner, a hollow filter, generally circular in horizontal section and composed of woven wire closely wound in cylindrical form with the mesh of adjacent laminæ out of register and having an outlet for clean air communicating with the interior thereof and means for feeding oil slowly to the top of the filter comprising an absorbent pad superposed on the filter whereby it flows downwardly along the laminæ by gravity.

10. In an air cleaner, a hollow filter, generally circular in horizontal section and composed of a plurality of contacting turns of woven wire with the mesh of adjacent laminæ out of register and having an outlet for clean air communicating with the interior, a casing comprising a body portion above the filter and a depending shell closed at the bottom and cooperating with the periphery of the filter to enclose an inlet chamber, said body portion having an inlet passage supplying air to the inlet chamber, and means for continuously moistening said filter.

11. In an air cleaning system for an internal combustion engine provided with an intake passage, a casing in communication with said intake passage, a filter within said casing, means for causing air to enter said casing, rotate about a vertical axis in contact with said filter, and flow downwardly, an outlet for said filter connecting with the interior thereof, means for oiling said filter, and an oil sump below said filter member for receiving excess oil from said member.

12. In an air cleaning system for an internal combustion engine provided with an intake passage, a filter member, means for directing a current of air from the crankcase of said engine to said casing adjacent the top thereof, means for causing a current of air entering said casing to gyrate about said filter member in contact therewith and flow downward about and through the same to said intake passage.

13. In an air cleaning system for internal combustion engines having a carburetor, a casing provided with a conduit for communicating with said carburetor, a filter member within said casing, an inlet for supplying air directly from the atmosphere to said casing, means for supplying oil to said filter member, an oil sump beneath said filter member and means for causing the air supplied to said carburetor to flow downwardly in said casing in contact with said filter member for assisting in causing the sludge and foreign matter collecting on said filter member to flow downwardly into said sump.

14. In an air cleaning system for internal combustion engines having a carburetor, a casing, an oil sump in the lower portion of said casing, said casing having an opening above its lower end for permitting excess oil collecting in said sump to flow from said casing, a filter element extending downwardly in said casing, said element being hollow and providing an unobstructed air passage through the same, means for introducing atmospheric air into said casing at the upper portion thereof and causing the same to flow downwardly longitudinally of said filter and through the same, a conduit in the upper portion of said casing for conducting the air passing through said filter element to said carburetor and means for maintaining oil on said filter element during the operation of said engine for collecting dust from the air while the latter is passing through said filter material.

In testimony whereof I affix my signature.

CHARLES A. WINSLOW.