

Feb. 4, 1930.

F. S. OREM

1,745,950

AIR CLEANER

Filed March 24, 1927

2 Sheets-Sheet 1

Fig. 2.

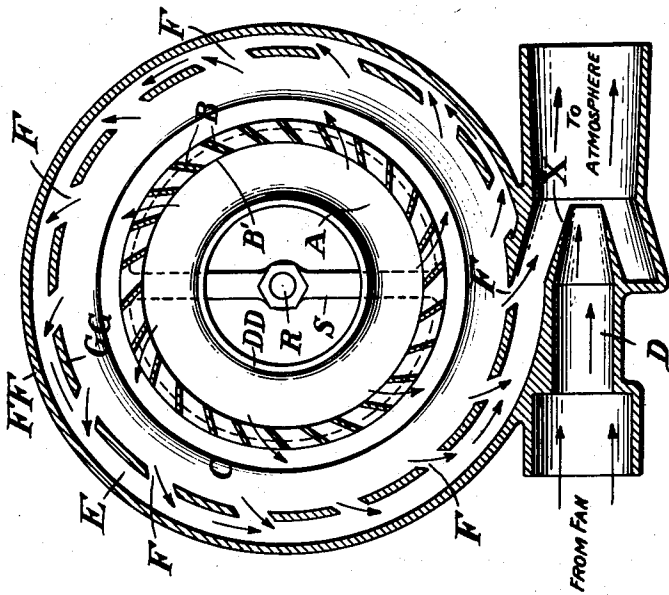
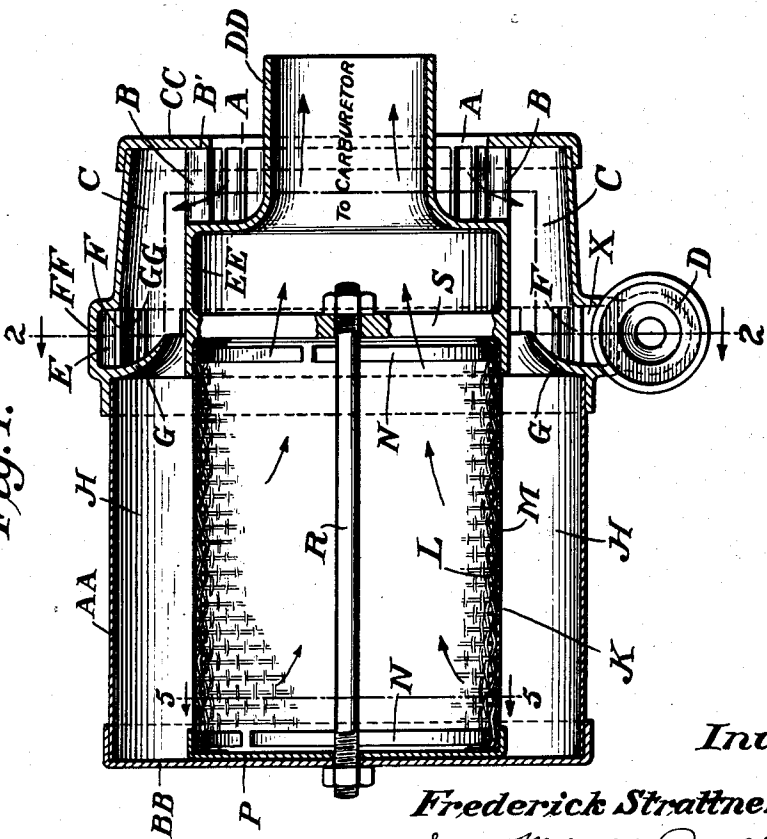


Fig. 1.



Inventor:

Frederick Strattnor Orem,
by Spew, Middleton, Donaldson & Hall
Attys.

Feb. 4, 1930.

F. S. OREM
AIR CLEANER

1,745,950

Filed March 24, 1927

2 Sheets-Sheet 2

Fig. 3.

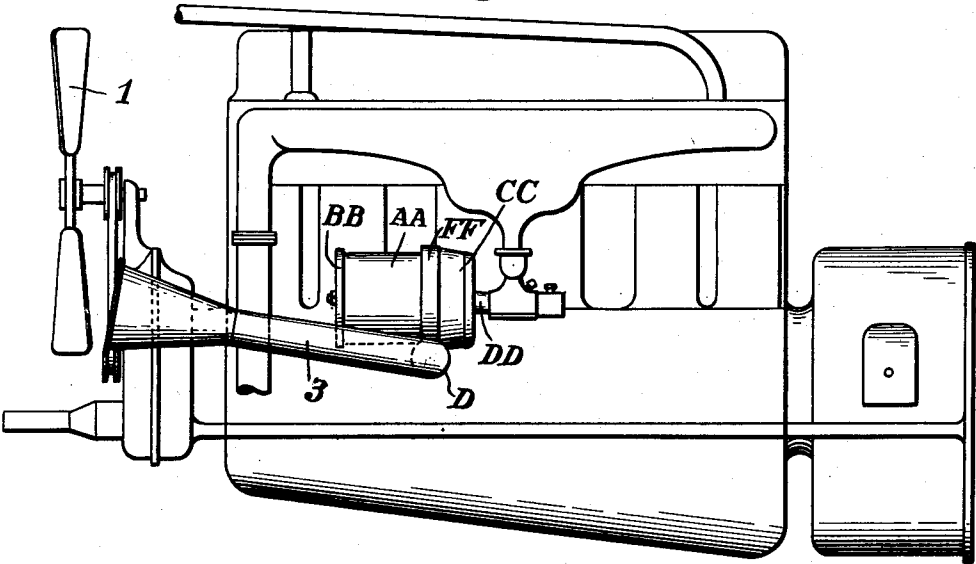


Fig. 4.

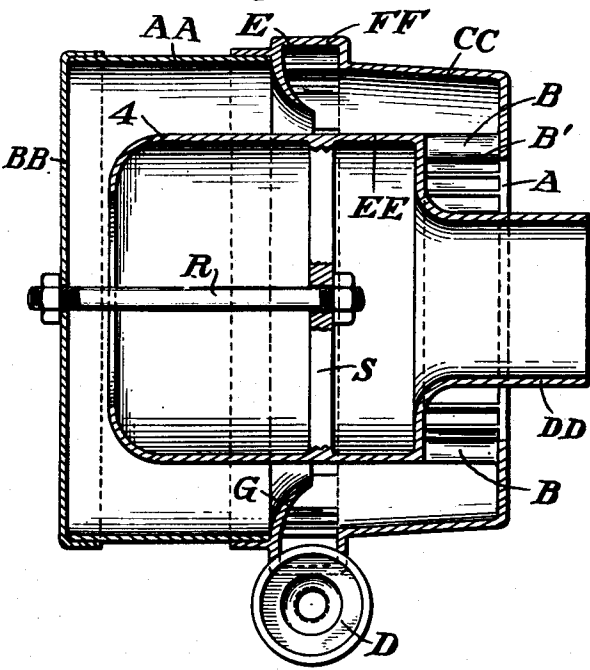
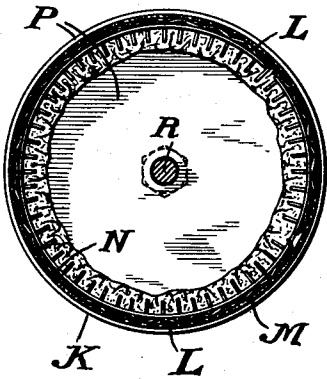


Fig. 5.



Inventor:

Frederick Strattner Orem,
by Spear, Middleton, Donaldson & Hall
Attys.

UNITED STATES PATENT OFFICE

FREDERICK STRATTNER OREM, OF BALTIMORE, MARYLAND

AIR CLEANER

Application filed March 24, 1927. Serial No. 178,038.

The invention relates to improvements in air cleaners.

More particularly it relates to air cleaners adapted to supply clean air to engines.

5 An object of the invention is to provide a device for removing all dust at all speeds of the motor from the air entering the carbureter without affecting the air supply to the carbureter.

10 A further object is to take advantage of the air which is drawn through the radiator by the fan for cooling the motor, to operate the ejector of the air cleaner.

15 These as well as other objects will be pointed out in the drawings, specification and claims.

In the drawings

Figure 1 is a longitudinal vertical sectional view of the air cleaner.

20 Fig. 2 is a transverse vertical sectional view taken substantially on the line 2—2 of Fig. 1.

Fig. 3 shows the application of the air cleaner to an internal combustion engine with means for directing air from the cooling fan to the ejector of the cleaner.

25 Fig. 4 is a view of a modification.

Fig. 5 is a transverse sectional view of the removable filter taken on line 5—5 of Fig. 1.

Referring to the drawings, the air cleaner 30 is mounted in connection with the carbureter of the engine, as shown in Fig. 3, with the air inlet of the cleaner directed rearwardly. The fan blows air rearwardly past the cleaner and the cleaner draws in air from this supply 35 through its rear end. The deflection of the air from its rearward path laterally into the cleaner inlet and the reversal of its direction of movement has a material tendency to clean the air by ridding it of the larger particles of dust which are too heavy to follow the deflection of the current of air, but which are swept on beyond the cleaner inlet in the blast from the fan.

45 The air cleaner comprises a substantially tubular casing AA closed at its front end by a head or cover BB, the other end receiving a combined air cleaner inlet and outlet member or insert CC. The member CC has an annular air inlet channel at A bounded by an 50 annular wall B' formed by spaced vanes B,

and by the wall DD of the tubular outlet from the cleaner. The wall DD flares outwardly at its inner end to form the bottom of channel A and an enlargement EE which constitutes an extension of wall B'. An anchoring cross bar S extends diametrically 55 across the inner open end of the tubular enlargement EE. The front end of the air cleaner is closed by the head BB and the head BB and anchoring bar S are tied together by 60 bolt R. The inner side of the wall of the casing AA has an annular flange or baffle G formed thereon and the outer side of the wall of the casing has a substantially annular raised portion at FF forming a chamber E, 65 the lowermost portion of the portion FF being provided with an outlet X for the chamber E and with an ejector D operable by an air blast to reduce the air pressure in chamber E by suction produced at X. At GG is 70 shown substantially annular perforate partition bounding the chamber E at its inner side.

The partly cleaned air enters the cleaner at A as shown in Fig. 1 and passes between non 75 radial vanes or louvres B narrowly spaced apart and arranged in annular ring formation. The narrow spacing of the vanes and their non-radial disposition serves to break the entering air into a number of small 80 streams which will be directed into space C and against the inner wall of the cleaner in a non-radial inclined direction which causes the air to swirl about through the annular space C. The swirling action of the air is 85 accentuated and increased by the lessened pressure produced in the substantially annular space E by the suction of the ejector D. Annular space E is in communication with 90 annular space C through graduated non-radial ports F in the partition GG. The smallest port F is adjacent the outlet of space E to the ejector and the ports gradually increase in size around the inner wall of space E. The annular space E is tapered so that 95 it decreases in size as the ports F increase in size. The ejector D communicates with space E at X and by blowing air past the point X creates a suction and lessened pressure in space E. 100

The object of this construction is to produce a centrifugal swirling action which will draw the dust in the air into space E, the dust-laden air then being discharged by ejector D to the atmosphere. The swirling action produced by the vanes B and the swirling action induced by ejector D, ports F and the tapered form of space E cooperate with the lessened pressure induced by the ejector and incidentally with the lessened pressure caused by the suction of the engine, to produce the centrifugal dust eliminating action.

Since the dust laden air while whirling centrifugally due to the action of vanes B, is drawn to the outer wall of the spaces C and E, and is guided by curved baffle G into space E, only clean air will remain adjacent the inner wall and only clean air will pass by the annular baffle G to the space or chamber H. The suction of the engine draws the clean air past the baffle and through the filter in chamber H to the carbureter. The air on passing the baffle G is diminished in velocity due to the increased area.

In the chamber H is located the filter K which, as the air is being drawn therethrough by the suction or lessened pressure produced by the motor, will remove any dust that has not been removed by centrifugal force.

The filter preferably consists of a rectangular section of wire screening L formed or rolled into tubular shape with its opposite edges adjacent each other and held in such tubular shape by the filter material N such as flannel or the like, which is sewn into tubular form previous to the insertion of the tubular screen therein. Spring bands N are placed within the screen at its ends to stress it against the filter material M to hold the screen and filter material securely together. The tubular filter thus formed is closed at one end by a cover plate P which is engaged by the bolt R which removably secures the cover BB and the filter to the bar S. The open end of the filter is thus removably held in communication with the outlet of the cleaner leading to the carbureter as shown in Fig. 1. A filter such as described is readily and cheaply manufactured, and may readily be replaced by a new filter after use.

There will be little, if any, dust in the air when it reaches the filter. Any dust which does remain in the air so as to reach the filter will be removed from the air by the filter, regardless of the fineness of the dust.

By employing this construction of air cleaner, oil and water in the air will be carried off by the ejector and will not reach the filter.

Referring to Fig. 3, air blast is conducted from the fan 1 to the ejector D of the air cleaner by a curved conduit or pipe 3, the ejector being transverse to the direction of the blast of the fan.

Centrifugal force is generated by the air forced by the fan to the ejector augmented by

the lessened pressure produced by the suction of the motor. Since air pressure generated by the fan is employed greater velocity of air can be obtained and likewise increase of centrifugal force than when only the lessened pressure produced by the motor is depended upon to create centrifugal force. This applies especially when the motor is running slowly, the suction of the engine not being strong then.

It is also obvious that the more the pressure is lessened the greater will be the centrifugal force and the more efficient will be the device. Lessened pressure obtained in this way, as distinguished from that produced by suction of the motor, will permit a greater velocity of air, a greater efficiency in cleaning the air, and will not restrict the air supply to the carbureter. The dust is discharged to the atmosphere, no receptacle being necessary to catch or hold dust.

Fig. 4 is a view of a modification in which the filter is dispensed with. This device depends on the centrifugal force of the ejector to eliminate all dust. The structure of the cleaner is substantially the same as the form shown in Figs. 1 and 2, except that in place of the filter, there is a metal housing 4 open at the rear end and forming an extension of the air cleaner outlet leading to the carburetor.

A cleaner of the type herein described may be employed in connection with the air cage of a steam cylinder to clean the air, it being adapted to clean air for any purpose and not limited to use with an internal combustion engine. In this case where a fan is not employed the cleaner may be used with a jet of steam or air in place of the fan.

I claim:

1. An air cleaner comprising a substantially tubular casing closed at one end and having its inlet and outlet in its other end, said inlet being formed by an annular series of spaced horizontally disposed non-radial vanes forming an annular ring, said outlet being formed by a tube concentrically disposed within said ring but spaced therefrom, said tube having its inner end flared outwardly to meet the inner ends of the vanes forming the annular ring, said casing having centrifugal dust removing means and filtering means between said inlet and outlet.

2. An air cleaner comprising a substantially tubular casing closed at one end and having its inlet and outlet in its other end, centrifugal dust removing means and filtering means between said inlet and outlet, said cleaner being adapted to be placed in longitudinal alignment with the direction of an air blast with its inlet and outlet facing in the direction of the blast away from the blast, said centrifugal means comprising a substantially annular chamber having an outlet and an ejector mounted adjacent said out-

let and disposed transversely to the longitudinal axis of the cleaner and to the direction of the air blast, and conducting means in the form of a curved conduit for directing some of the air from the blast to the ejector.

3. In combination in an air cleaner, a substantially tubular casing having a substantially annular raised portion providing an internal substantially annular chamber between itself and a substantially annular perforated partition secured to the wall of the casing, said casing having an annular baffle rising from the inner side of the wall of the casing at the forward edge of said chamber, a cover member closing the front end of said casing, a combined inlet and outlet insert mounted in the rear end of said casing, a filter member disposed between said insert and said cover member, means for holding the insert, cover, and filter, securely in place in the casing, said annular chamber having an outlet in its outer wall and an ejector mounted adjacent said outlet.

4. An air cleaner, comprising a substantially tubular casing closed at one end and having its inlet and outlet at its other end, centrifugal dust removing means between said inlet and outlet comprising perforated annular partitions and a baffle for directing the dust laden air from the inlet centrifugally against the inner side of the wall of the casing, said wall having an outlet to the atmosphere, and an ejector mounted on said wall in communication with said outlet to the atmosphere.

5. An air cleaner comprising a substantially tubular casing having a substantially annular raised portion, intermediate its length, providing an internal annular chamber between itself and a substantially annular perforated partition secured to the wall of the casing, said casing having an annular baffle rising from the inner side of the wall of the casing at the forward edge of said chamber, said raised portion having an opening in its wall providing an outlet from said chamber, an ejector mounted on said raised portion in communication with said outlet, a cover member closing the front end of said casing, a combined inlet and outlet insert mounted in the rear end of said casing, said insert being so formed as to provide a tubular outlet extending therefrom and an annular inlet channel surrounding the outlet tube, the outer wall of said channel being perforated non-radially to form a series of annular spaced non-radial vanes for directing the air in small streams non-radially against the wall of the casing, the outer annular wall of said channel being extended inwardly of the casing to a point beyond said baffle to form a tubular extension having a cross bar extending diametrically across it adjacent its inner end, a filter disposed between said cover member and said insert, and means cooperating

with said cross bar to hold the insert, filter and cover securely in position with respect to the casing, said chamber being tapered so that it is largest at its outlet end and smallest at its other end, and said partition having its smallest perforation at its end adjacent the outlet and its largest perforation at its other end.

6. In combination in an air cleaner for carbureters, a fan, a substantially tubular casing having a closed end facing the fan with an air inlet arranged axially at its opposite end directed away from the fan, an inlet for clean air to the carbureter arranged at the axis of the casing concentrically with said air inlet and an ejector arranged transversely and substantially tangential to the casing and operated by the blast from the fan to create a swirling motion of the air in the casing to withdraw the dust therefrom, substantially as described.

7. In combination in an air cleaner, a substantially tubular casing having a substantially annular raised portion intermediate its length, providing an internal substantially annular chamber between itself and a substantially annular perforated partition secured to the wall of the casing, said raised portion having an opening in its wall providing an outlet from said chamber, and an ejector mounted on said raised portion in communication with said outlet.

8. Apparatus according to claim 7 in which said chamber is tapered so that it is largest at its outlet end and smallest at its other end, and said partition having its smallest perforation at its end adjacent the outlet and its largest perforation at its other end.

9. An air cleaner comprising a casing adapted to be disposed in an air blast from a fan with its end towards the fan closed, and having an air inlet from the atmosphere in its end facing away from the fan, means for inducing a flow of air from the air blast into said inlet and through said casing, means within the casing to separate dust from the air, a connection to said inducing means from the fan to operate said inducing means by the air blast, said casing having an outlet for cleaned air.

10. An air cleaner comprising a substantially tubular casing adapted to be disposed in an air blast from a fan with its end toward the fan closed, and having an air inlet from the atmosphere in its end facing away from the fan, means for inducing a flow of air from the air blast into said inlet and through said casing, means within the casing to separate dust from the air, a connection to said inducing means from the fan to operate said inducing means by the air blast, said casing having an outlet for clean air in its open end and having a dust outlet through

its substantially tubular wall, said inducing means including a substantially tangentially disposed ejector communicating with said dust outlet and disposed transversely to the axis of said casing and to the air blast.

5 In testimony whereof, I affix my signature.

FREDERICK STRATTNER OREM.

10

15

20

25

30

35

40

45

50

55

60

65