

July 1, 1930.

E. C. RANEY

1,769,071

AIR CLEANER

Filed Oct. 1, 1925

3 Sheets-Sheet 1

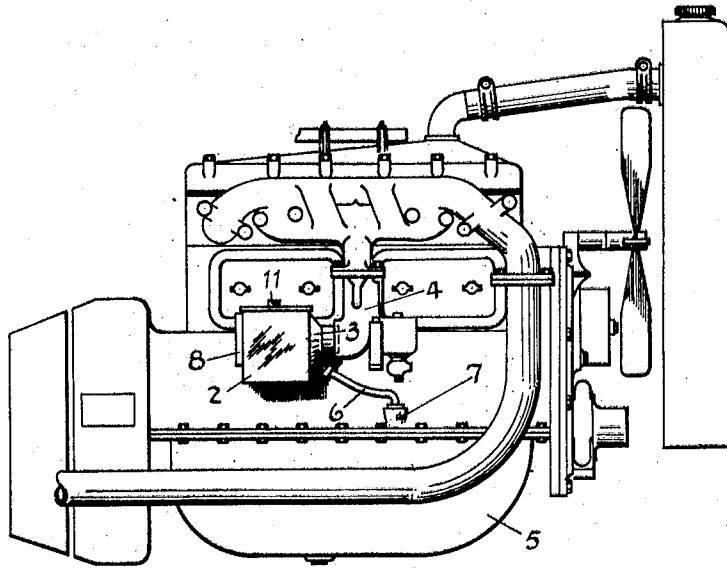


Fig 1

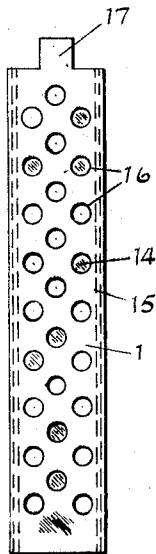


Fig 2

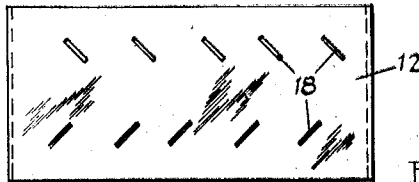


Fig 3

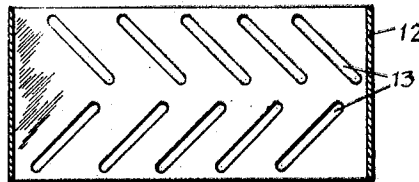


Fig 4

Inventor

Estel C. Raney

By *Harold C. Ransom*
Attorney

July 1, 1930.

E. C. RANEY

1,769,071

AIR CLEANER

Filed Oct. 1, 1925

3 Sheets-Sheet 2

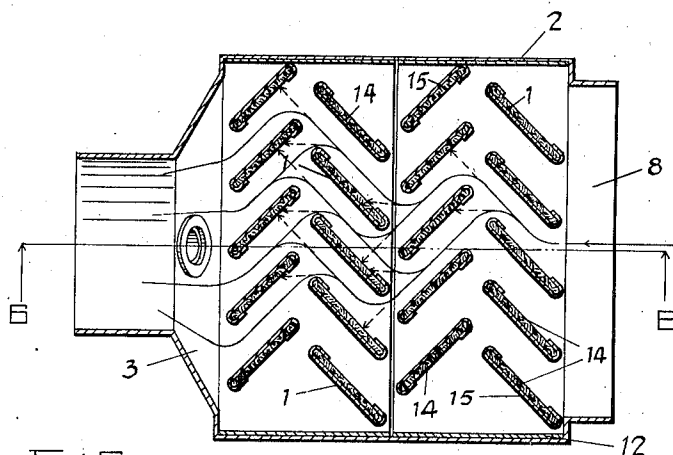


Fig 5

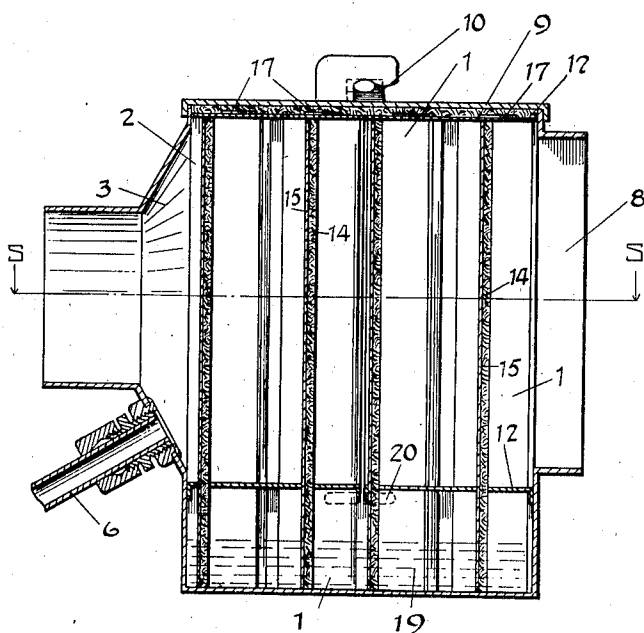


Fig 6

Inventor

Estel C. Raney

By *Faust G. Davenport*
Attorney

July 1, 1930.

E. C. RANEY

1,769,071

AIR CLEANER

Filed Oct. 1, 1925

3 Sheets-Sheet 3

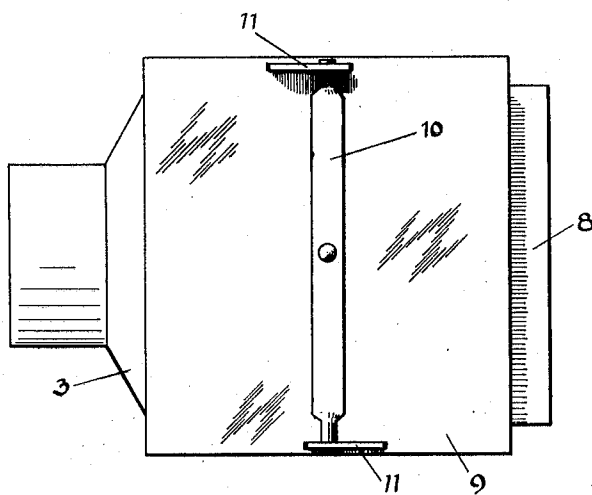


Fig 7

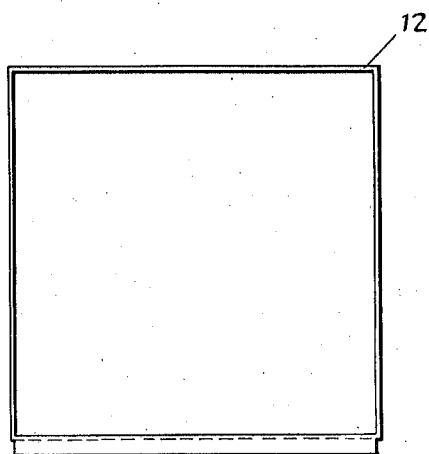


Fig 8

Inventor

Estel C. Raney

By *Paul F. Dampston*

Attorney

UNITED STATES PATENT OFFICE

ESTEL C. RANEY, OF COLUMBUS, OHIO

AIR CLEANER

Application filed October 1, 1925. Serial No. 59,768.

My invention has for its object to remove the dust from the air that is drawn into the apparatus such as air pumps, air compressors, internal combustion engines, rotor fans, etc., for preventing the wear of the relatively moving parts of the apparatus that would otherwise be caused by the grinding action produced by the dust that invariably lodges between such moving parts. In the case of air pumps, internal combustion engines and the like, the dust will cause scoring of the cylinder walls and the wearing of the piston rings, cylinders, and in connection with all forms of pneumatic apparatus, the bearings of relative rotative parts will be likewise worn by the particles of dust or grit that are drawn in with the air. This requires re-boring of cylinders or re-grinding and the installation of new pistons and piston rings and frequent adjustments and replacement of parts. My invention prevents the entrance of the dust into such pneumatic apparatus and consequently prevents the rapid wear of the moving parts thereof. It greatly prolongs the life of the apparatus or mechanism in connection with which it is used and eliminates a large expense in the maintenance of such apparatus or mechanism.

In constructions embodying my invention the dust is removed from the air before it enters the air utilizing mechanism or pneumatic apparatus by means of an adhesive material that will cause the dust to adhere to it as the air is drawn over its surface, the material being of such a character that it is substantially non-evaporative and also of such a character that it will spread itself over the surface of a body over which the air may be drawn. The material used is preferably absorbent and absorbent or porous walls are used in connection therewith to present a large area of the dust adhesive material to the air entering the apparatus in connection with which my invention is used. The side walls of the cleaner may be charged with the dust adherent material or partitioning walls, or baffle members may be covered or impregnated with the material. In the specific embodiments of my invention I uti-

lize oleiferous material such as oil or grease, which is, practically, non-evaporative under normal atmospheric temperatures and is sufficiently adhesive to cause the particles of dust that come in contact with it to adhere and collect on surfaces covered therewith and, furthermore, will be more or less readily absorbed by fibrous bodies so as to automatically spread itself over the surface of the bodies. The material is also of such a character that it will be absorbed by the dust particles in the same manner that it is absorbed by the fibrous bodies and will thus constantly present to the moving air and dust an oil surface, as the dust accumulates, which will cause the dust to continuously deposit and collect. If grease is used it may be spread over surfaces located in the line of movement of the air through the cleaner. The arrangement of the fibrous bodies is such that the air passage between the fibrous bodies will not be obstructed by the accumulation of the dust.

The invention may be contained in air cleaners of different forms and to illustrate a practical application of the invention and describe its operation, I have selected an air cleaner containing my invention as an example of such structures and shall describe it hereinafter. The air cleaner selected for purposes of illustration is shown in the accompanying drawings as applied to an internal combustion engine.

Figure 1 of the drawings is a side view of the cleaner connected to the carburetor and to the engine casing of an automobile engine. Fig. 2 illustrates a baffle member which is located in the air passage of the cleaner. Fig. 3 illustrates a top view of a removable frame for removably supporting a plurality of baffle members of absorbent material. Fig. 4 illustrates a view of a horizontal section of the frame shown in Fig. 3. Fig. 5 illustrates a view of a section of the cleaner taken on the plane of the line 5-5 indicated in Fig. 6. Fig. 6 illustrates a view of a section taken on the plane of the line 6-6 indicated in Fig. 5. Fig. 7 is a top view of the cleaner. Fig. 8 is an end view of the removable baffle supporting frame.

In the air cleaner shown in the drawings, a plurality of baffle plates 1, having sheets of oil charged or impregnated material, are so disposed as to subdivide the air into thin "sections" and to direct the air along sinuous lines while the dust particles will move in straighter lines substantially tangential to the lines of movement of the air and will, by reason of their inertia, strike against the oil charged sheets and be collected on the baffle plates and caused to accumulate. The baffle plates 1 are supported in a shell 2 that has a funnelled end 3 which is connected to the carburetor 4, either directly or through a suitable pipe. It is also connected to the crank shaft casing 5 through the pipe 6, the casing being otherwise closed to preclude the entrance of air therein except through the pipe 6.

The end 8 of the shell 2 is open. It has an open area that is much larger than the opening through the inlet of the carburetor plus the size of the pipe 6 in order that there may be but very little resistance of the air through the cleaner whereby the carburetor will receive its normal supply of air to produce proper fuel mixture without the necessity of changing the adjustment of the parts of the carburetor ordinarily existing when no cleaner is connected therewith.

The backs of the baffle plates may be placed in contact with an oil charge body, or with oil, in order to maintain the baffle plates, or partitioning members, in an oil charged condition.

The baffle plates 1 of the cleaner extend preferably vertically across the interior of the shell and into an oily material compartment 19 formed in the bottom of the shell 2 and in which any suitable oil may be located. The absorbent material of which the baffle plates 1 are formed in part, preferably, dip into the oil, and the oil by reason of its capillary attraction will spread itself over the entire surface of the absorbent material. The baffle plates may be arranged in series, the baffle plates of each series being located parallel to each other and the baffle plates of one series being located at an angle to the baffle plates of juxtaposed series. Also the following edges of the plates of each series may be located substantially opposite the mid-point between the leading edges of the following series of baffle plates. This results in not only dividing the air into "sheets" or "sections" when the air enters the cleaner, but also, continuously causes subdivision and recombination of the "sheets" of air as the air passes between each series of baffle plates. Furthermore, it causes the air to move sinuously through the shell giving full opportunity for all the dust particles to impinge upon the baffle plates and be caught by the oil. Thus by my invention the air will be

thoroughly cleansed from the dust before it enters the intake of the engine and also the crank shaft casing, if the cleaner is connected therewith.

To provide for the ready removal, inspection and, if desired, the cleaning of the baffle plates, the shell 2 is provided with a cover 9 that may be secured to the top of the shell 2 by any suitable means. In the form of construction shown in the drawing a spring bar 10 is pivotally connected at its center to the cover and a pair of slotted ears 11 formed integrally with the sides of the shell project from the upper edges of the sides of the shell and through slots formed in the cover. The cover 9 is elastically secured to the top of the shell by inserting it in position on the shell and so that the ears protrude through the slots and then rotating the bar 10, the ends of the bar being depressed so that they may enter slots formed in the side edges of the ears. The bar will thus elastically engage in the slots of the ears.

The baffle plates, if desired, may be mounted in one or more removable frames 12. The frames 12 are formed of four sides substantially as shown in the figures. The lower sides of the frames 12 are provided with slots 13 through which the lower end portions of the baffle members extend. The sides of the frames substantially fit the interior of the shell 2 and their open ends, consequently, permit substantially the same free movement of the air through the frames that is permitted by the shell. Any suitable means may be provided for securing the baffle plates in position in the frames. The baffle plates are necessarily so formed as to produce the required rigidity and firmness to prevent their sagging or their fraying by reason of the air moving swiftly through the shell. In the construction shown in the drawings the absorbent material is formed of strips of a suitable sheet fibre 14 such as felt, paper, wicking or any similar absorbent material, and the strips are backed by sheet metal strips 15 having edge portions that are bent over the edges of the strips of absorbent sheet material 14. The sheet metal strips 15 may be perforated as indicated at 16, in order to present oily surfaces to the air on the following sides of the baffle plates, that is, on the backs of the metal strips, and on portions of the strips of the absorbent material, for collection of dust from the eddy current that may be produced at the back of the baffles. The strips 15 and the sheet fibre 14 may extend a short distance below the lower sides of the frame 12 and rest on the bottom of the shell 2. The upper ends of the strips 15 are provided with ears 17 that extend beyond the upper ends of the sheet fibre 14 a short distance while the upper sides of the frames 12 have slots 18 in which the ears 17 are placed and are then bent over to secure

the upper sides of the frames 12 between the ears and the ends of the baffle plates 1, particularly, the ends of the sheet metal strips 15. Thus the frames 12 are supported on the bottom of the shell 2 by means of the baffle plates 1, the lower sides of the frames 12 forming a dividing wall between the oil compartment 19 and the chamber of the shell through which the air moves. A small opening 20 may be formed in the side wall of the oil compartment through which the pressure in the compartment is maintained at atmospheric pressure.

The oil is thus located in a separate compartment formed in the bottom of the shell by the lower sides of the frames which taken together form a partitioning wall, dividing the shell into the air chamber through which the air passes and an oil containing chamber. The absorbent material of the baffle members extend through the partitioning wall, that is, through the lower sides of the frame so as to be absorbently in contact with the oil, either directly or through other absorbent material. The lower sides of the frames have an area sufficient to close the oil chamber and prevent the oil from being caught up by the swiftly moving air or from having its level raised at the outlet end of the shell by the difference in pressure at the inlet and outlet of the shell.

Any number of frames 12 may be used for supporting the baffle plates 1. In the form of construction shown, each frame is used for supporting two series or sets of baffle plates. Each frame of baffle plates may be considered as a unit, for purposes of assembling, and the air cleaner may contain any number of units according to the number of sets or series of baffle plates that it is found desirable to use in order to thoroughly separate the dust from the air before it enters the intake of the mechanism to which the cleaner is connected. Also it is found very desirable to place a pair of sets or series of baffle plates in each of the frames in order that each of the baffle plates may be readily inspected and cleaned when occasion requires.

If the vacuuous condition produced by the mechanism reaches a certain point a slight restriction will be produced by the baffle plates within the shell which produces a slightly lower pressure than that of atmospheric at the point of connection of the pipe 6 with the air cleaner. This slight difference of pressure will cause the air to flow through the cleaner as required for the production of the proper fuel mixture. Up to a certain speed of the engine there will be some fluctuation of the air through the pipe 6 and all the air that enters the crank shaft casing 5 will be cleaned of dust. When the speed increases volatile portions of the fuel escape to the crank shaft casing. The amount that thus escapes of course is increased where the

piston rings do not effectively seal the piston. The higher speed also reduces the fluctuation in the pipe 6 and the vapor that enters or forms within the crank shaft casing escapes therefrom. By my invention it is drawn into the carburetor through the pipe 6 and is then utilized as part of the engine fuel. The crank shaft casing being connected with the intake of the carburetor produces only a slight draft in the casing as distinct from a heavier draft which would draw the oil from the casing. The cleaner thus produces a pressure at its point of connection with the carburetor that will cause the vaporized and misted liquids only to pass from the crank shaft casing into the engine cylinders. This will result in a large saving of fuel that would otherwise be lost and also reduces thinning of the oil in the casing, and provides a means whereby all dust may be excluded from the interior of the engine.

Thus by my invention I have provided a means for separating and removing the dust from air that may be drawn into any mechanism or apparatus, whereby the moving parts of such apparatus that come in contact with the air will be protected as against any grinding produced by grit or particles of foreign matter which insures an extended life or utility of such apparatus to which my invention may be applied.

In the operation of the cleaner, the suction produced by the engine to draw fuel mixtures into the cylinders of the engine in the manner well known in the art, draws the air through the intake of the carburetor and as the cleaner is being connected to the air intake of the carburetor, the air will be drawn through the cleaner. The baffle members of the cleaner being so located relative to each other that the air streams are subdivided and recombined and again subdivided by a plurality of sets of baffle members located in removable frames, there is but a very slight restriction to the movement of the air through the cleaner. As the air passes through the cleaner the dust of the air impinges upon the first set of baffle members which are located at an angle to the line connecting the centers of the inlet and outlet of the shell. The air is thus subdivided and the subdivided parts are caused to change their direction of flow. The subdivided parts are caused to recombine at the inner edges of the baffle members with respect to the direction of the air flow and then the air is subdivided by the outer edges of the succeeding set of baffle members and at the same time the air is again deflected which causes the dust to impinge upon the surfaces of the baffle members. Again the subdivided air portions are recombined at the inner edges of the said second set of baffle members and the air again is subdivided by the outer edges of the third set of baffle members. Thus as the air advances

towards the carburetor, the dust is removed and by reason of the recombining of the separated portions of air as it progresses through the cleaner, there is a constant disturbance of the air current which causes the constant impingement of the dust upon the surfaces of the baffle members and produces an exceedingly efficient cleaner while substantially eliminating all restriction of the air flow.

I claim:

1. In an air cleaner for air utilizing mechanism, a shell for containing liquid at the bottom thereof, means for connecting the shell with the mechanism, a plurality of baffle members of absorbent material in sheet form, for deflecting the air that passes through the shell, each baffle member having a portion within the air passage-way through the shell and a portion absorbently in contact with the liquid located in the shell, a plurality of frames for removably supporting the baffle members, the baffle members arranged in series, a pair of series of baffle members supported in each frame, the baffle members of each series being located in planes that are inclined to the general direction of the air flow through the shell and the baffle members of one series of each frame being inclined to the planes of the baffle members of the other series of the frame.

2. In an air cleaner for air utilizing mechanism, a shell for containing a liquid at the bottom thereof, means for connecting the shell with the mechanism, a plurality of baffle members of absorbent material in sheet form for deflecting the air that passes through the shell, each baffle member having a portion within the air passage-way through the shell and a portion absorbently in contact with the liquid located in the shell, a plurality of frames for removably supporting the baffle members the lower side of each frame spaced from the bottom of the shell, the baffle members being arranged in series, a pair of series of baffle members supported in each frame, the baffle members of each series being located in planes that are inclined to the general direction of the air flow through the shell and the planes of the baffle members of one series of each frame being inclined to the planes of the baffle members of the other series of the frame, the lower sides of the said frames substantially covering the liquid.

3. In an air cleaner for air utilizing mechanism, a shell adapted to contain a liquid at the bottom thereof, means for connecting the shell with the mechanism, a plurality of baffle members of flexible absorbent material in sheet form, and located in planes that are inclined to the general direction of air flow through the shell, each baffle member having a portion within the air passage-way through the shell and absorbently in contact with the liquid located in the shell, each baffle member

having a backing formed of sheet metal, the sheet metal having turned edges for engaging the edges of the absorbent material.

4. In an air cleaner for carburetors for internal combustion engines, means for connecting the shell with the intake of the carburetor, a plurality of baffle members of absorbent material in sheet form arranged in sets, each set extending across the interior of the shell, frames for supporting the baffle members, the lower sides of the frame substantially covering the lower side of the shell, and forming a partitioning wall to form a chamber in the lower part of the shell for containing a liquid, the lower ends of the baffle members extending through the lower sides of the frames and absorbently in contact with the liquid.

5. In an air cleaner for carburetors of internal combustion engines, a shell open at opposite ends, a set of substantially parallel baffle members extending across the shell and located in planes that are inclined to a line extending through the openings of the shell, a second set of substantially parallel baffle members located in planes inclined to the said line and extending across the said shell and also located at an angle to the planes of the first set of baffle members, the width of the baffle members and the spaces between the baffle members being such as to locate the leading edges of the baffle members, with reference to the direction of the moving air, opposite intermediate points between the leading and following edges of the juxtaposed baffle members and the following edges of one set of baffle members being located opposite points intermediate the leading edges of the second set of baffle members.

In testimony whereof I have hereunto signed my name to this specification.

ESTEL C. RANEY.