A. E. SCHRAM.

AIR CLEANING DEVICE.

APPLICATION FILED APR. 21, 1920.

1,409,593. Patented Mar. 14, 1922.

2 SHEETS—SHEET 1.

Fig. 1

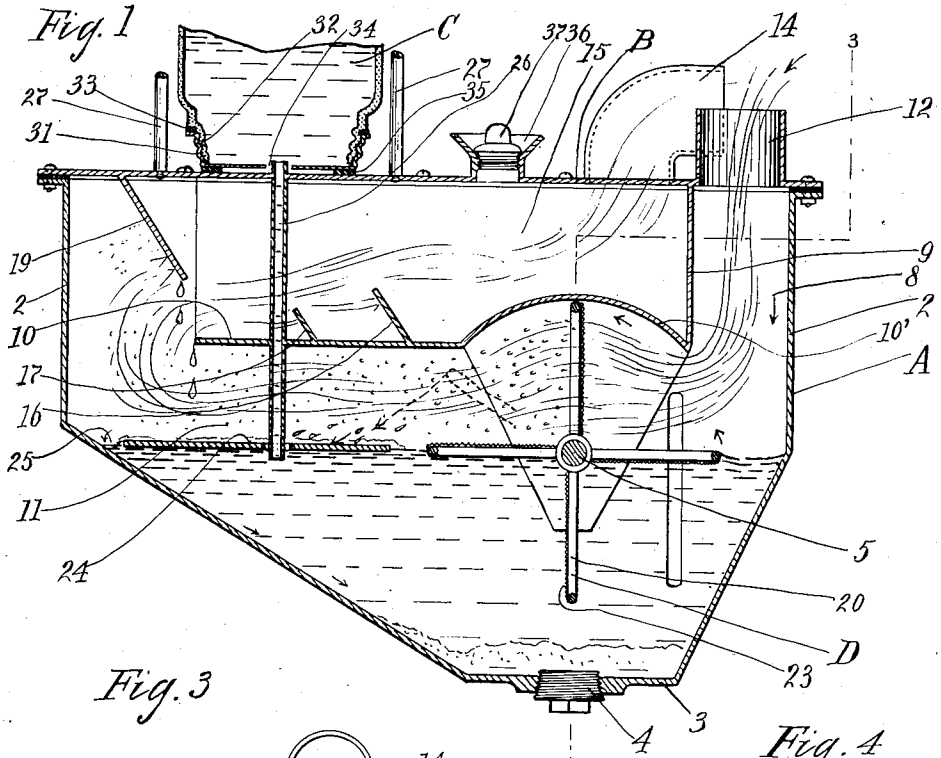


Fig. 3

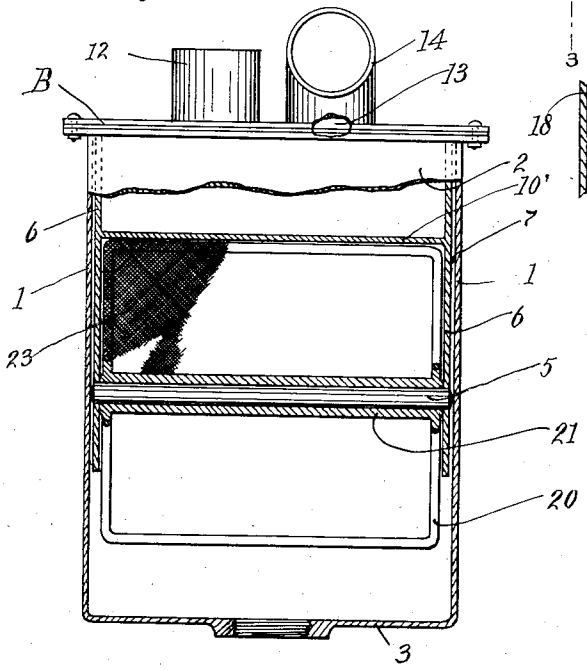


Fig. 4

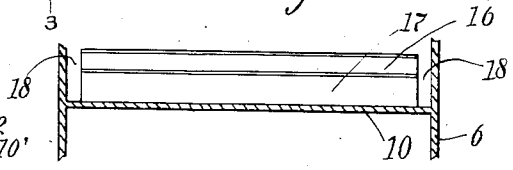
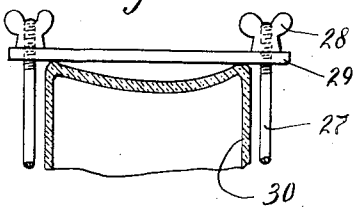


Fig. 5



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2 SHEETS—SHEET 2.

Fig. 2

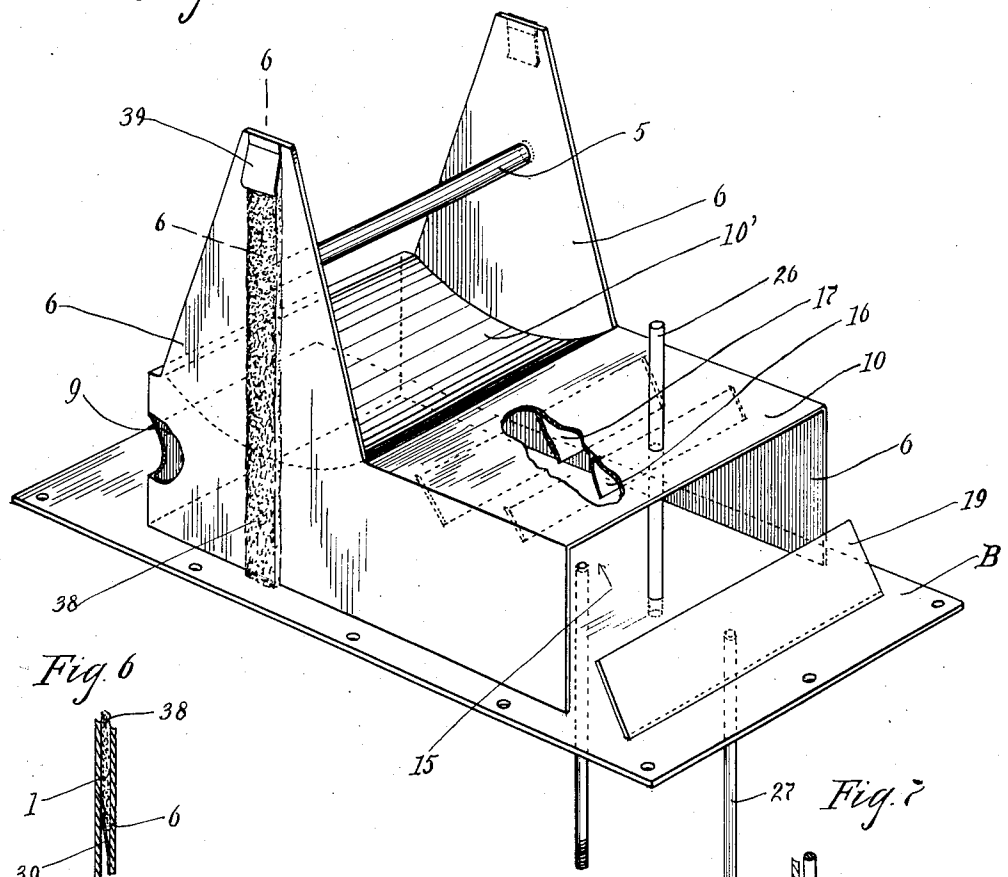


Fig. 6

Fig. 7

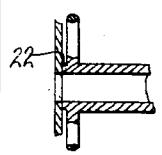
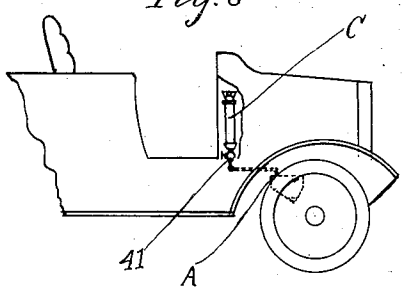


Fig. 8



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UNITED STATES PATENT OFFICE.

ARTHUR E. SCHRAM, OF ST. PAUL, MINNESOTA.

AIR-CLEANING DEVICE.

1,409,593. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed April 21, 1920. Serial No. 375,475.

To all whom it may concern:

Be it known that I, ARTHUR E. SCHRAM, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Air-Cleaning Devices, of which the following is a specification.

This invention relates to air cleaning devices for internal combustion engines and more particularly to that type wherein water is employed for intercepting the dust particles.

The invention is especially useful on tractors and is designed for separating the sand and finer dust particles from the air before it enters the mouth of the air intake of the carburetor.

The present invention is an improvement upon the air cleaner for which I have filed an application for Letters Patent on February 16th, 1920, Ser. No. 358,878 and is now pending.

An object of the present invention is to provide improved means for intermingling water and air to wash the latter by mechanical means set in motion by the suction in the intake of the carburetor set up by the engine.

A further object of the invention is to provide in a device of the class described improved means for maintaining a constant water level, said means including a water supply reservoir forming part of the device, the reservoir consisting of an ordinary fruit jar or the like, which can readily be replaced from any nearby household in case of accident. This is an important improvement in devices of this kind as there is more or less waste due to evaporation and other causes, and because it is desirable at times to remove some of the sand accumulated at the bottom of the water bath, the water in the jar then serving as an immediate supply to replace the water lost in so doing. This is very important when on the field on a dry windy day.

Another object of the invention is to provide in a device of the class described a water gauge so positioned as to render visible from outside the moving parts within the enclosed tank forming part of the device.

A still further object of the invention is to provide a self washing rotary water lifting device mounted in the path of the sucked in air so as to be operated by the suction of the engine, the air being cleansed wholly above the surface of the water, and being drawn through comparatively long corridors which are in close and open communication with said device so as to mingle with the supply of water mechanically shaken from said device in its operation.

To this end the invention consists in the construction, combination and arrangement of parts hereinafter described and claimed:

Figure 1 is a vertical sectional side view showing the general contour of the casing.

Figure 2 is a perspective view of the cover of the casing showing it in inverted position.

Figure 3 is an end elevation of Figure 1, a part thereof being shown in section on line 3—3 of Figure 1.

Figure 4 is a fragmentary sectional view of two of the baffle plates within the casing.

Figure 5 is a side view of the top of the water supply jar showing the method of holding the same positioned on the casing, the jar being shown in section.

Figure 6 is a fragmentary sectional view on line 6—6 of Figure 2.

Figure 7 is a sectional view of a part of the reel, and

Figure 8 is a diagrammatic side view of a portion of an automobile showing applicant's water supply positioned adjacent the dash board so as to be accessible and visible from the seat of the operator of the car.

In Figure 1 A represents an elongated casing or tank and B the cover therefor, and C designates a water supply reservoir removably secured on the top of the cover B. The tank A is formed with parallel side walls 1 and end walls 2. The end walls as shown are also parallel to each other for a distance approximately half the depth of said tank and then slant inwardly to the bottom 3 of the tank so as to materially reduce the length of the latter, a drain plug 4 having screw threaded engagement with said bottom said plug serving as an outlet to remove the sand and grit accumulated within the tank. As shown in Figure 1 the level of the water carried in the tank is located approximately at the bend of the end walls 2 so as to form a comparatively long water surface lengthwise of the

tank. At a point above the bottom 3 of the tank and at said water level is the transverse horizontally disposed shaft 5, the latter being mounted at its respective ends in the auxiliary side walls 6 secured on the undersurface of the cover B and extending downwardly into said tank a distance beyond said shaft and being parallel with the walls 1 and in close proximity thereto so as to form a comparatively narrow space 7 between them. The walls 6 are considerably shorter than the walls 1 so as to form at one end of the interior tank an intake chamber 8 a cross wall 9 connecting them for this purpose. Between the cover and the water level and joining the side walls 6 is the horizontal partition wall or floor 10, said floor being formed with a curved portion 10′ directly over the shaft 5 so as to form a circular undersurface concentric with the center of said shaft, the height of said floor from the water level being such as to form a comparatively wide elongated corridor air passage way 11 in open communication with the intake chamber 8, the latter being in open communication with the intake pipe 12 cutting through the cover and extending upwardly therefrom. The space above said floor is somewhat higher than the corridor 11 and forms a second corridor having an outlet 13 communicating with the pipe 14 leading to the intake of the carburetor not shown. Thus, the air is drawn in through the air intake pipe 12 through the chamber 8, the corridor 11 over the shaft 5, thence through the secondary corridor 15 and out of the pipe 14 into the carburetor. For the purpose of intercepting the air in its passage through the secondary corridor baffle plates 16 and 17 are provided, the former being somewhat higher than the latter to conform to the line of flow of the air and both extending upwardly and rearwardly for the purpose of having their undersurfaces at right angles to the flow of air. The plates 16 and 17 (Figure 4) are somewhat shorter than the width of the corridor 15 so as to form spaces 18 at either end thereof for the purpose of draining water which may accumulate behind and between said plates back into the water below as indicated in Figure 1. Extending downwardly and forwardly from the undersurface of the cover B and extending the full width of the tank A but not secured thereto is the baffle plate 19, the latter partly blocking the opening of the corridor 15 so that the inrushing air will strike the back of said plate to deposit any moisture that may be carried therewith from whence it will drop back into the tank. Rotatably mounted on the shaft 5 is the reel D which is somewhat similar to the reel shown in my pending application hereinbefore mentioned. The reel consists of four radially disposed open frames 20, having a tubular journal bearing 21 extending throughout the length thereof, said tube being formed with a slightly raised boss 22 at opposite ends. The frames 20 are rectangular in shape and fit closely within the walls 6 so as to form a comparatively air tight joint between them. The openings of the frames are covered with a fine wire gauze netting 23 the latter being suitably soldered thereon.

The top rail of the frames of the reel move during rotation in close proximity to the curved portion 10′ so as to form a comparatively air tight joint thereat. Thus, when the device is connected to the carburetor of an engine the suction set up in the passageways from the cylinders (not shown) will suck the air into the intake pipe 12, the suction being sufficiently strong to cause the reel to rotate thereby successively blocking the passage way 11 with one of its screened wings. As the water adheres to the screen by capillary attraction the passage way is virtually blocked by a film of water raised by mechanical means, the water being sucked from the screen to form a spray throughout the passage ways 11 and 15, the air mingling therewith and the free dirt particles being caught by the spray and deposited in the bath below. As the spray and air proceeds along its course the baffle plates 16, 17 and 19 serve as obstructions to break up the straight course of the advancing air currents, the water depositing on the faces thereof and drain back into the tank as hereinbefore described.

Spanning the width of the tank and located approximately on the level of the shaft 5 or in other words at normal water level is the splash wall 24, the latter extending within a short distance of the reel at one end and the end wall of the casing at the other. When the tank is abruptly tilted, as is the case when the tractor is operating on uneven ground, the volume of water is prevented from splashing against the floor 10 which would result in the blocking of the passage way 11, the water finding its way into the latter, flowing back over the ends of the splash plate into the reservoir below. The plate 24 also functions as a dash plate to receive the dust particles thrown off at a tangent from the reel as is clearly indicated in dotted lines in Figure 1 of the drawings. The reel sometimes rotates in excess of 50 or 60 revolutions per minute the water being thereby thrown off at a tangent with considerable force causing it to dash against the top of the plate and carrying with it grit and sand, which latter is washed across the plate by the force of the stream to the opening 25, from whence it enters the tank below by means of the slanting portion of the end wall 2. The rapid rotation of the reel causes the water to surge over the plate

keeping a constant stream flowing thereover. Thus, the dirt collected is carried to the bottom of the tank as shown by the arrows at a point farthest removed from the reel so as to insure comparatively clear water in the zone in which the reel operates which facilitates washing of the frames thereof.

By locating the reel nearer one end of the tank, a long space is provided in the passage 11, between the reel and the wall 2, whereby the grit and other matter is caused to hit the surface of the water or the plate 24, before it can strike the wall 2, as is the case in my pending application, wherein the grit strikes the wall 1 and bounds against the screen G. In the present invention I position the suction opening 14 as far as possible from the discharge end of the passage 11, so that any free matter that might find its way past the baffle plate 19, will be dissipated in its long travel to the suction opening.

Firmly secured in the cover B and extending downwardly through the plate 24 is the tube 26. Arranged one on either side of the tube 26 and firmly secured in the cover B are the rods 27 having threaded engagement at their outer free ends with thumb nuts 28, a cross bar 29 suitably drilled to loosely receive said rods being positioned so as to rest on the container 30, the latter being shown in the form of an ordinary fruit jar. As indicated in Figure 1 the jar has the usual threaded cover 31 fitting the threads of the neck 32 of the jar, a suitable gasket 33 forming an air tight joint in the usual manner. The cover has a central aperture 34 adapted to loosely receive the upper end of the tube 26, a gasket 35 being interposed between the covers 31 and B so as to form an air tight joint between them. Thus, the water in the jar mingles with the water in the tank below, the mouth of the tube extending a slight distance below the water level. Obviously, when the water level becomes lowered below the mouth of the tube 26 air will enter the latter and permit the water from the jar to descend into the reservoir until the tube is again sealed. Thus, the water level in the tank is automatically maintained. A water inlet 36 piercing the cover B and having a screw cap 37 to form an air tight closure for said inlet is provided for replenishing the tank or for flushing the same.

By having the discharge opening 26 of the barometric water supply positioned on the discharge side of the reel in the region of the plate 24, the fresh clean water enters at a point near the wings as they successively enter the water heaviest laden with grit, and at which point the water in the tank becomes normally thickly charged with sand and other matter.

In order to render the interior above the water level on the suction side of the tank comparatively air tight so that a maximum suction action may be obtained for actuating the reel a felt strip 38 held positioned on the side wall as by means of the spring clip 39 is provided. A feature of construction in the present invention resides in the mounting of the reel support together with the intermediate wall effecting the two superposed air passage ways, on the underside of the cover so as to be movable therewith. By simply removing the cover the device is accessible for cleansing purposes or repairs, this construction also facilitating the manufacture thereof. Arranged in one of the sides 1 of the tank and positioned so as to render visible a part of the reel both above and below the water line is the gauge glass 40 whereby the condition of the operating parts may be readily ascertained without disassembling the entire device. In Figure 8 applicant's device is shown as applied to an automobile, the water supply reservoir C being located at the dash board of the machine so as to be visible by the operator thereof. When the water in the reservoir falls below a given level the valve 41 is closed to prevent air entering the tank and the reservoir may then be refilled.

I claim:

1. An air cleaner, comprising a liquid container, a cover detachably secured thereto and having an air intake opening and a suction opening, the latter to be connected with a source of suction, a partition wall between the surface of the liquid and said cover to form an upper and a lower air passage in open communication with each other and respectively with said outlet and suction openings, a rotary device partly immersed in the liquid, operative responsive to the suction in said suction opening and having radially disposed screen members, said rotary device being mounted so as to rotate in said lower passage way in a manner to successively block the latter with its screen members when rotated, and a construction in connection with said cover, including the mounting for said rotary device, whereby said device may be lifted out of said container concurrently with the removal of said cover.

2. An air cleaner, comprising a liquid container, a cover therefor having an air intake opening and a suction opening, the latter to be connected with a source of suction, a partition wall between the surface of the liquid and said cover to form an upper and a lower air passage in open communication with each other and respectively with said outlet and suction openings, a rotary device located directly beneath said partition wall and vertically below said suction opening and partly immersed in the

liquid and operative responsive to the suction in said suction opening, and having radially disposed screen members, said device being rotatably mounted in said lower passageway in a manner to successively block the latter with its screen members when rotated, a plurality of baffle plates extending transversely partly across said upper passage way and extending varying distances upwardly from said partition wall and being inclined in a direction away from said rotary device, the size of said baffle plates decreasing inversely as the distance from said suction opening.

3. An air cleaner of the class described, comprising a liquid container, a cover therefor having an air intake opening and a suction opening, the latter to be connected with a source of suction, a partition wall between the surface of the liquid and said cover to form an upper and a lower air passage in open communication with each other and respectively with said outlet and suction opening, a rotary device located directly beneath said partition wall and vertically below said suction opening and partly immersed in the liquid and operative responsive to the suction in said suction opening, and having laterally disposed screen members, said device being rotatably mounted in said lower passage way in a manner to successively block the latter with its screen members when rotated, and baffle plates extending laterally across said partition wall and upwardly therefrom into said upper air passage, said baffle plates being constructed so as to effect drain passages whereby the water is drained from said partition wall.

4. An air cleaner, comprising a liquid container having side and end walls and having an air intake and an air outlet opening at the top thereof, a partition wall dividing the space above the liquid longitudinally to form an upper and a lower air passage way in open communication with each other and respectively with said outlet and inlet openings, a rotary screen carrying reel having its axis of rotation approximately on the level of the liquid the screens thereof moving in succession through said lower air passage way to block the latter when said reel is rotated, and a horizontally disposed plate approximately at the level of the liquid extending between said side walls and to within a comparatively small distance of said reel and one of said end walls and located in front of said reel for the purpose set forth.

5. An air cleaner, comprising a liquid container a cover therefor having an air intake opening and a suction opening, the latter to be connected with a source of suction, a partition wall between the surface of the liquid and said cover to form an upper and lower air passage in open communication with each other and respectively with said outlet and suction opening, a rotary device located directly beneath said partition wall and vertically below said suction opening and partly immersed in the liquid and operative responsive to the suction in said suction opening and having laterally disposed screen members, said device being rotatably mounted in said lower passage way in a manner to successively block the latter with its screen members when rotated, a plurality of baffle plates extending transversely of and upwardly from said partition wall a distance into said upper passage way, a drain passage for draining the liquid from said partition wall past said baffle plates, and a clean-out opening in said cover between said baffle plates and said suction opening for the purpose set forth.

In testimony whereof I affix my signature.

ARTHUR E. SCHRAM.