

April 9, 1957

F. HOLZKNECHT

2,788,084

AIR WASHER AND HUMIDIFIER

Filed Oct. 29, 1952

6 Sheets-Sheet 1

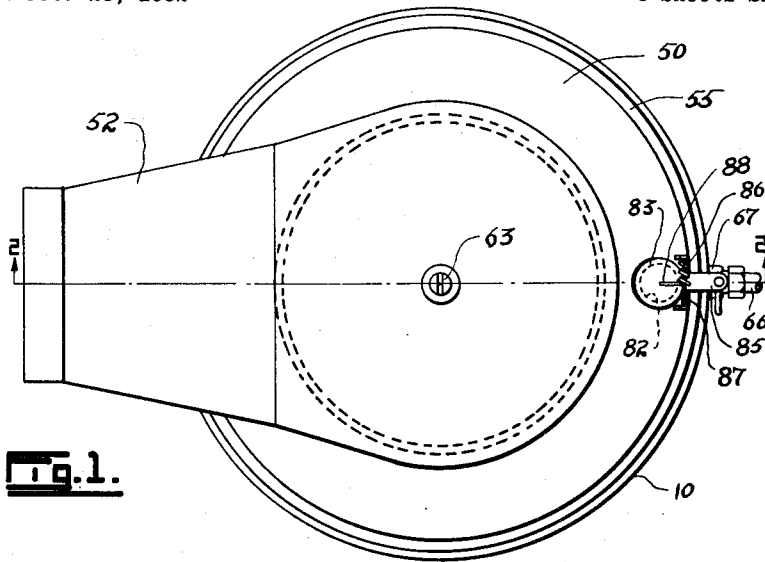


Fig. 1.

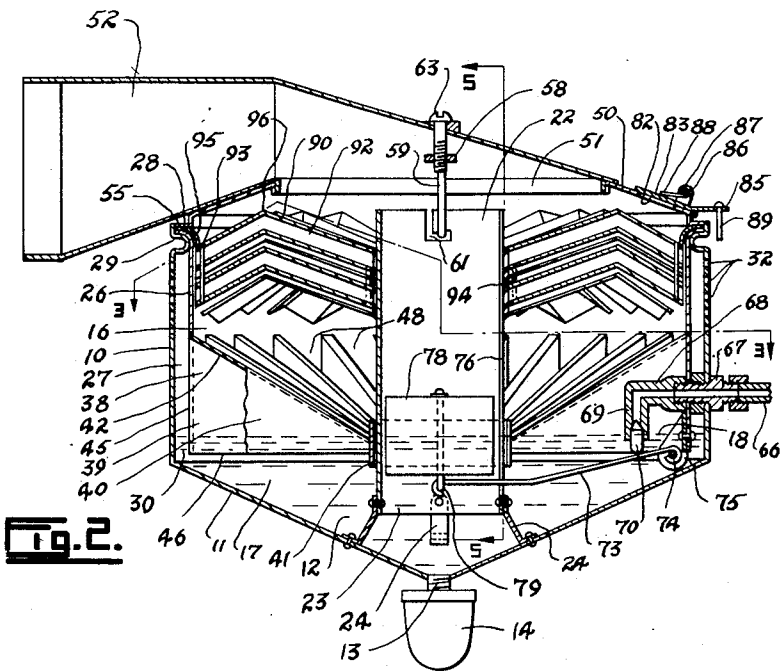


Fig. 2.

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6 Sheets-Sheet 2

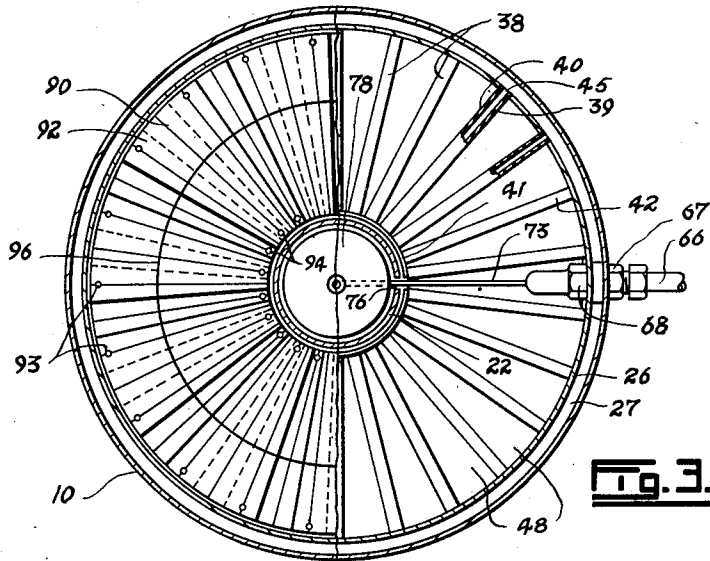


Fig. 3.

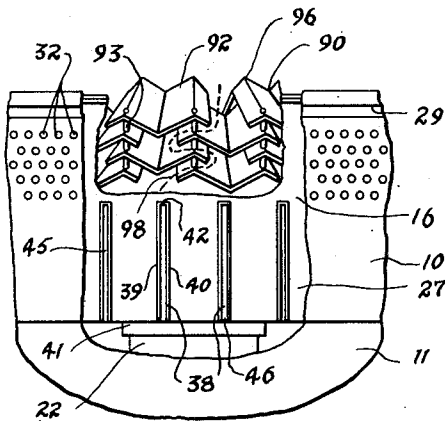


Fig. 4.

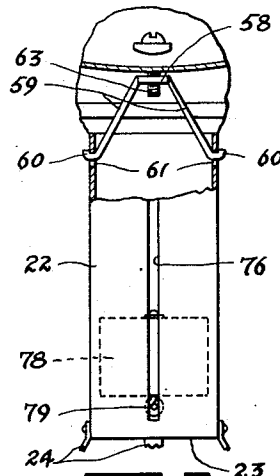


Fig. 5.

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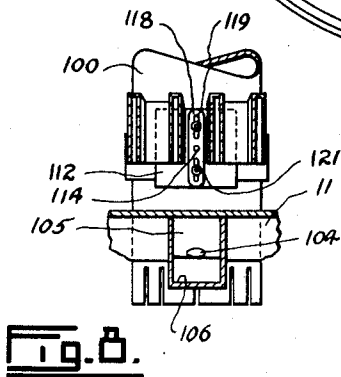
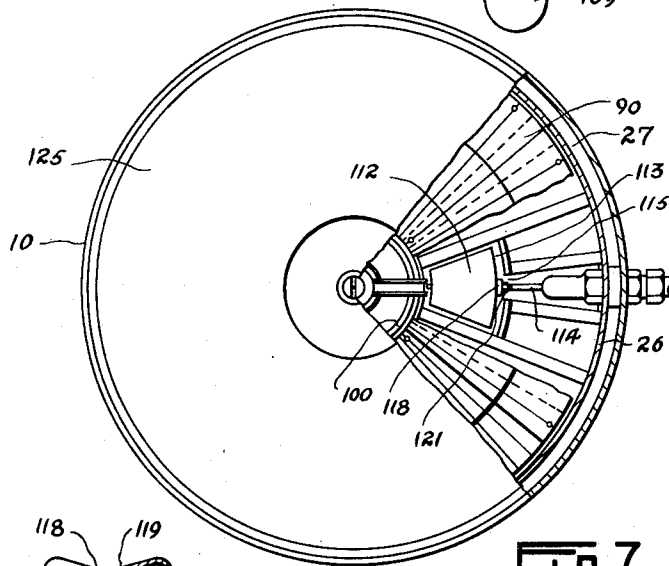
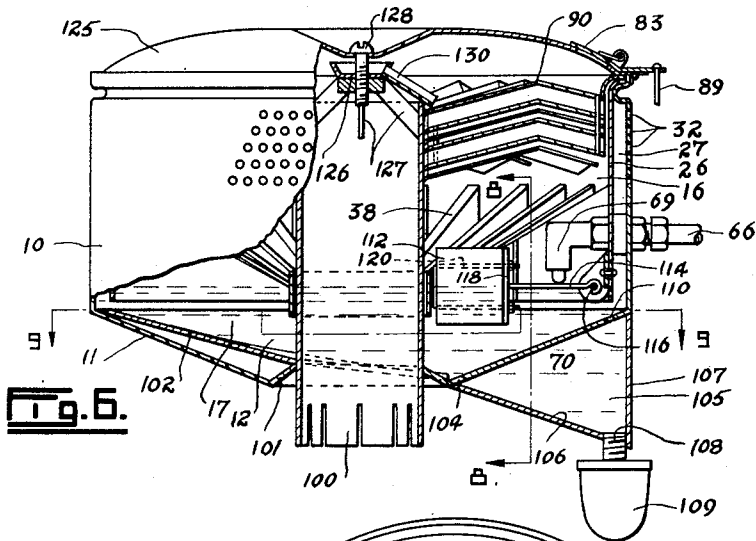
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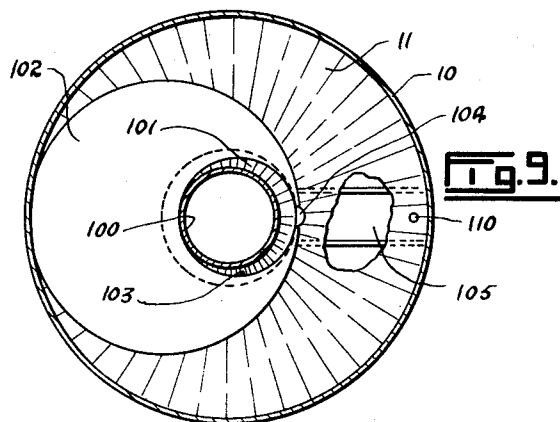
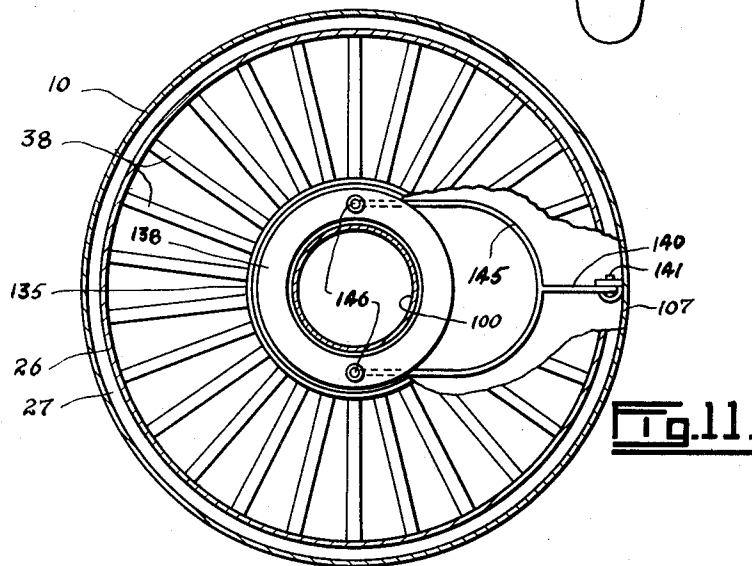
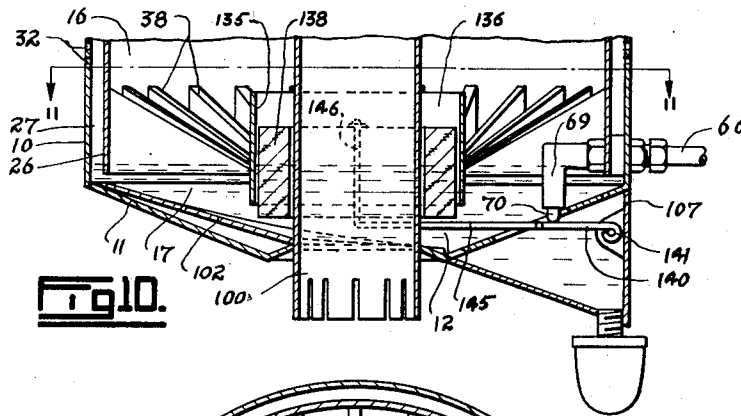
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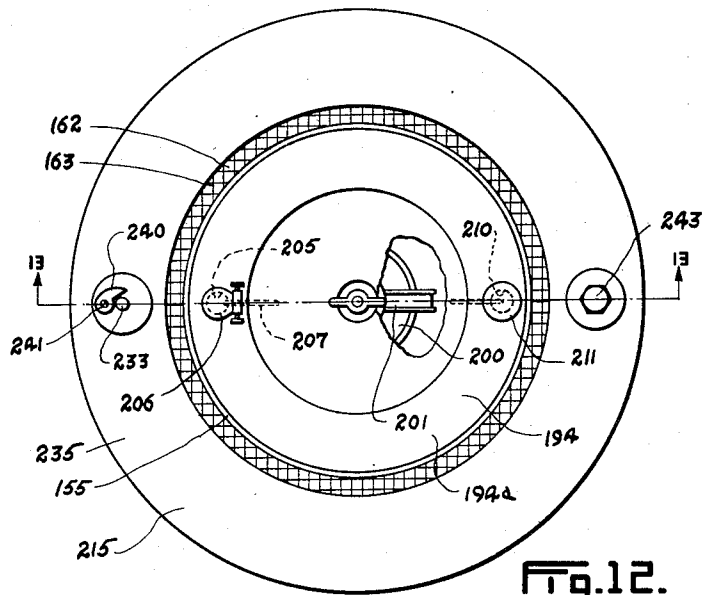


Fig. 12.

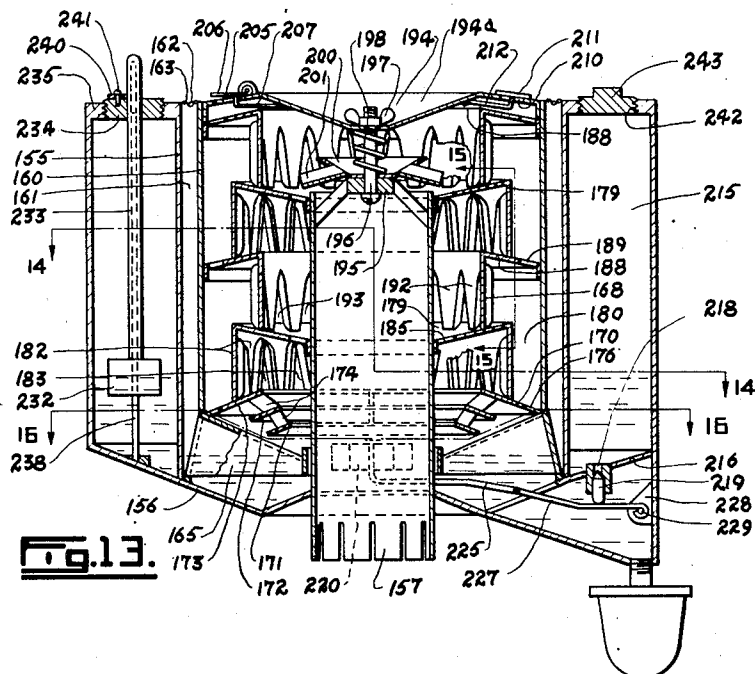


Fig. 13.

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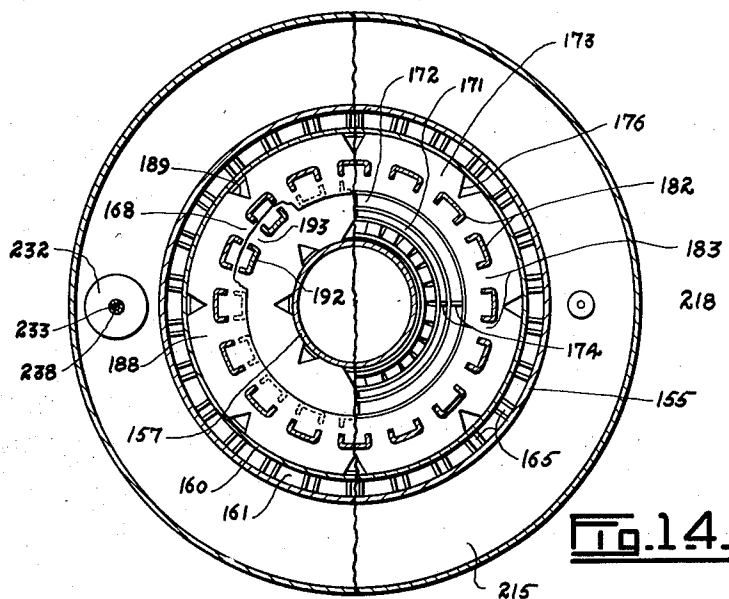


Fig. 14.

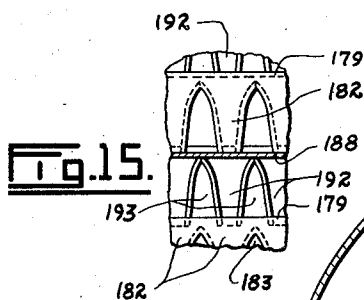


Fig. 15.

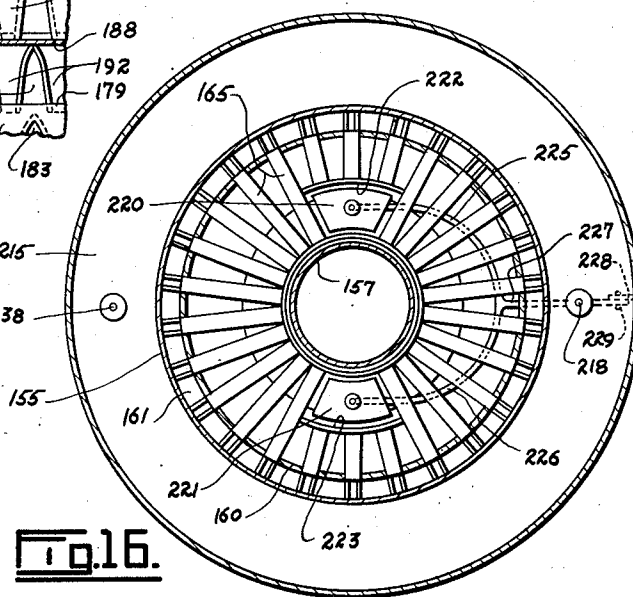


Fig. 16.

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AIR WASHER AND HUMIDIFIER

Felix Holzknacht, Vancouver, British Columbia, Canada

Application October 29, 1952, Serial No. 317,550

5 Claims. (Cl. 183—25)

This invention relates to improvements in devices for washing and humidifying air.

An object of the present invention is the provision of an air washer and humidifier particularly for the air intake of internal combustion engines, but which may also be used for any other desired purpose.

Many devices have been developed for cleaning air to be supplied to internal combustion engines. The two now in common use are oil filters and dry air filters. Neither of these is very successful since it is possible under some circumstances for dirt to be drawn completely through an oil filter. On the other hand, if the dry air filter is open enough to permit the passage of air, it cannot stop fine dirt from going through.

It has been known for a long time that water moistened fuel air mixture gives an engine more pep. Injected water keeps the temperature of the explosive mixture down, and this promotes a more even explosion and prevents detonation, commonly known as knocking or ping-pong. With water injection, it is possible to use lower octane gasoline without knocking.

Devices have been produced in the past in which air is drawn through water before being directed to an internal combustion engine. These have not proven successful for, amongst others, the following reasons:

1. The air did not have an intimate contact with the water. As a result of this, the air could boil through the water in bubbles so that a large percentage of it never came in contact with the water to be humidified, and it carried a lot of dirt through with it.

2. The floats were located in chambers separated from the container holding the main body of water, the only connection being a passage through which the water flowed from the float chamber. When the pressure of the air above the water in the water chamber was lowered, the level of the water would rise, causing the level in the float chamber to drop. This would open a supply valve to raise the water level. Consequently, the water would rise again in the main chamber and this process would continue until the water would flow into the engine and/or out through the air entrance holes.

3. If the device were designed so that the water was humidified when the engine was operating at ordinary speeds, solid droplets would be drawn into the engine at high speeds. This water would either accumulate in the cylinders to cause damage sooner or later, and/or it found its way into the base to dilute the crank case oil.

The present apparatus is designed to eliminate each of the above-noted disadvantages, and thoroughly to wash and humidify the air before it reaches the engine. The apparatus includes a distributor having a plurality of wide but very thin air channels through which air passes into a body of water. These channels may be arranged so that they direct the air downwardly into the water so that it arises in two separate films of minute bubbles along opposite walls of each channel. The thin layers or films of air ensure practically every particle of the air

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coming into direct contact with the water. These air channels may be arranged in such a way that the intimate contact between air and water may be gained in a very limited space.

5 Another feature of the invention is to subject the float to the same degree of suction as the main body of water. This prevents the float from moving downwardly to open the inlet valve when the main water chamber is subjected to a partial vacuum.

10 The present invention also includes means for removing any solid water that may move with the air before it leaves the device. This means consists of a plurality of baffles so shaped and arranged that the moisture laden air must swing sharply around a plurality of corners in tortuous passages before leaving the device. The vapor being lighter than the air, swings around the corners with the latter, whereas any heavier particles of water do not make the turn and are directed back to the body of water.

Examples of this invention are illustrated in the accompanying drawings, in which,

Figure 1 is a plan view of one form of the invention,

Figure 2 is a vertical section taken substantially on the line 2—2 of Figure 1,

Figure 3 is a horizontal section taken on the line 3—3 of Figure 2,

Figure 4 is a fragmentary side elevation of the device with part thereof broken away,

Figure 5 is a fragmentary section taken substantially on the line 5—5 of Figure 2,

Figure 6 is a side elevation, partly in section, of an alternative form of the invention,

Figure 7 is a plan view, partly in section, of the form of the invention illustrated in Figure 6.

Figure 8 is a section taken on the line 8—8 of Figure 6,

Figure 9 is a slightly reduced horizontal section taken on the line 9—9 of Figure 6,

Figure 10 is a fragmentary vertical section through yet another alternative form of the invention,

Figure 11 is a horizontal section taken on the line 11—11 of Figure 10,

Figure 12 is a plan view of a still further alternative form of the invention,

Figure 13 is a vertical section taken on the line 13—13 of Figure 12,

Figure 14 is a horizontal section taken substantially on the line 14—14 of Figure 13,

Figure 15 is a fragmentary section taken substantially on the line 15—15 of Figure 13, and

Figure 16 is a horizontal section taken on the line 16—16 of Figure 13.

Referring to Figures 1 to 5 of the drawings, 10 is a container of any desired shape, such as cylindrical, as shown. This container is provided with a bottom 11 which preferably is conical in shape to form a sump 12 having an outlet pipe 13 therein which is normally closed. In this example, the pipe extends to sediment bowl 14 removably connected thereto. The container 10 forms a suction chamber 16 at the bottom of which a body of water 17 is maintained at a constant level 18 by means of suitable apparatus. A tube 22 extends upwardly through the chamber substantially centrally thereof. The lower end 23 of this tube is spaced above the bottom of the chamber, and may be connected thereto by a plurality of legs 24.

An inner wall 26 is spaced inwardly from and the same shape as the wall of the container 10 to form a passage 27 therebetween. The top of the inner wall is bent over as at 28, see Figure 2, where it is connected to the upper edge of the container in any desired manner. For example, the portion 28 may rest on a head 29 formed in the container wall. This closes the upper end of the passage

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27, while the lower end 30 thereof is located near the lower edge of the container and communicates with the space above the bottom 11. By reference to Figure 2, it will be noted that the water level 18 is a short distance above the lower end of this passage. Air is admitted to this passage in any convenient manner, and this is preferably done by forming a large number of inlet holes 32 in the container wall adjacent the upper edge thereof. These holes extend completely around the container in order to form an entrance of relatively great area for air to the air passage. By forming a large number of small holes in the manner illustrated, they act as a screen to keep coarse particles out of the device.

A distributor is provided for directing air from the passage 27 into the water 17 in thin layers. This may be done in different ways as long as the channels are capable of handling more air than will ever be required by any engine with which this device may be used. It is, however, desirable to direct the air downwardly into the water. The preferred way of doing this is to provide a plurality of channels 38 extending radially from the inner wall 26 to the tube 22. Actually, each channel is formed by spaced side walls 39 and 40 extending from the wall 26 to a ring 41 extending around the tube 22 adjacent the lower end thereof. The upper edges of the side walls may slope downwardly from the inner wall to the ring, as shown in Figure 2, and may be joined by a cover 42. Each channel is very thin between the side walls and is relatively wide from the wall 26 to the ring 41. Furthermore, each channel has a large entrance 45 opening through the inner wall, and a large outlet 46 extending the width thereof and facing towards the bottom 11 of the container. The channels are spaced apart from each other to form spaces 48 therebetween which extend from the bottom edges of the channels beneath the level of the water 17 up to the chamber 16.

When the pressure in the chamber 16 is lowered by suction, air entering the container through the holes 32 moves from the passage 27 into the many channels 38. These channels direct the air downwardly into the water and this air rises along the outer surfaces of the side walls of each channel through the water in thin layers of minute bubbles. This makes it practically impossible for any air to pass through the water without coming into direct contact with it. Furthermore, it makes it almost impossible for any foreign particles, such as dust or grit, to pass through the water without being washed out of the air. The air channels actually combine to form a distributor having a plurality of thin elongated nozzles for directing the air into the water. While these channels are shown as opening out through the inner wall 26, it is obvious that the side walls and covers thereof may be extended outwardly so that the channels open out through the container wall. In this case, it would be advisable to place suitable screening means over the channel entrances to prevent relatively large particles from entering them.

A cover 50 is removably mounted on the top of the container 10 in any desired manner. This cover has a large central opening 51 therein which is to be connected to the air inlet of a carburetor in any convenient way. A relatively large tube 52 extends from this opening for this purpose.

In this example, the cover 50 is provided with a peripheral flange 55 which rests on the bent-over portion 28 of the inner wall 26 which, in turn, is carried by the head 29. A convenient way of holding this cover in position is shown in Figures 2 and 5. A spider 58 is provided with legs 59 having lugs 60 at their outer ends adapted removably to fit into bayonet slots 61 formed in the upper edge of the tube 22. A bolt 63 extends freely through the cover 50 and is threaded into the spider. When this bolt is tightened, the cover is drawn down into position on the container 10.

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As previously stated, the level of the water in the container is maintained at a constant level a short distance above the outlets 46 of the passages 38 in any convenient manner. For this purpose, a pipe 66 extends from a suitable source of water supply, such as a tank, to a nipple 67 which extends through the wall of the container and the inner wall 26 between two passages 38, see Figures 2 and 3. A nozzle 68 is connected to the inner end of the nipple and has a downwardly extending projection 69 in which a tapered valve 70 is seated. This valve is supported by an arm 73 which is pivotally mounted at 74 on a bracket 75 connected to the lower edges of the wall 26. This arm extends inwardly from its pivot point through a slot 76 formed in the tube 22 and extending the length thereof. A float 78 is located within the tube and is pivotally connected to the inner end of the arm 73 at 79. The tube acts as a float chamber. It will be noted that the lower end of this tube opens into the water within the container and its upper end opens into the chamber 16 so that the float is subjected to the same degree of suction as the chamber.

With some installations, it may be necessary to supply air directly to the engine when it is idling, thus by-passing the air passages and water. For this purpose, a small hole 82 is formed in the cover 50 adjacent the edge thereof. A cover valve 83 normally closes this hole. This valve is resiliently held in the closed position in any suitable manner. For example, a spring 86 carried by a shaft 87 supported from the cover above the valve has one end 88 bearing against the valve to retain it in its closed position. The valve has a lug 85 projecting outwardly therefrom beyond the side of the container. A rod 89 extends from this lug and is connected by whatever linkage is required to the throttle valve linkage of the carburetor of the engine in such a way that the valve 83 is opened when the engine is idling.

It is highly desirable to provide a baffle system 90 between the water in the container and the outlet opening 51 in the cover thereof. This system consists of a plurality of inverted W-shaped baffles 92 extending in a radial direction from the tube 22 to the inner wall 26, said baffles being spaced laterally and vertically and being staggered in relation to each other, see Figure 4. The baffles are secured at their outer ends in their spaced and staggered relationship by vertical pins 93 and are connected at their inner ends by additional pins 94. A hanger 95 is connected to the uppermost baffles and extends between the flanges 55 of the cover and the bent over portion 28 of the inner wall where it is removably held in position. The hanger supports the baffle assembly with the opposite ends of the baffles thereof spaced slightly from the inner wall 26 and the tube 22 in order to allow water to drop downwardly therebetween.

It is preferable to form each baffle 92 with a peak 96 between the opposite ends thereof so that it slopes downwardly from said peak towards the tube 22 and the inner wall 26 as clearly shown in Figure 2. However, the baffles may slope from the wall to the tube.

The side of each baffle overlaps the adjacent side of the next baffle, see Figure 4, and since these baffles are staggered in relation to each other, a plurality of tortuous passages are formed extending from the lowermost baffle upwardly through the assembly to the uppermost baffle. One of these passages is indicated by the broken line 98 shown in Figure 4. This passage actually extends around the edges of a number of baffles so that it includes a plurality of very sharp turns in it.

When this device is in use, the tube 52 is connected either directly to the air inlet or a carburetor or is connected thereto by means of an additional tube. The level of the water is maintained at 18 in the chamber 16 by means of the float 78 and valve 70. When the level drops, the float drops with it to withdraw the valve 70 from the nozzle 69 to allow water to enter the chamber 16 and raise the level to the required point. When the

engine with which this device operates is started, the suction creates a degree of vacuum in the chamber 16 and the tube 22. Both the surface of the water and the float are exposed to this vacuum. The vacuum causes air to enter through the holes 32 into the passage 27, whence it moves through the channels 38 down into the water. The air from each channel is divided into two very thin layers which move upwardly along the outer surface of the channel side walls, each layer actually consisting of a plurality of extremely minute air bubbles. Thus, the air is brought into very intimate contact with the water and this action results in a thorough cleansing of the air and in the air absorbing a great deal of moisture vapor. If the baffle assembly 90 is used, the air must pass through the tortuous passages 98 of the assembly before reaching the outlet opening 52 of the device. In moving through these passages, the air has to swing around a plurality of very sharp bends. As the water vapor is lighter than air, it makes the turns with it. However, any solid water which may be entrained with the air is thrown out of the stream at these points and drops down on to the adjacent baffle and directed towards either the inner wall 26 or the tube 22. When the water reaches the ends of the baffles, it drops back into the main body at the bottom of the water chamber. The air with its water vapor moves through the pipe 52 to the carburetor. The dirt collected by the water sinks to the bottom 11 of the casing and eventually passes through the pipe 13 to the bowl 14, from which it may be periodically removed.

The alternative of the invention illustrated in Figures 6 to 9 is particularly designed for a down draft carburetor. In this example, the tube 22 is replaced by a tube 100 located centrally of the container 10 and extending downwardly from a point adjacent the top thereof through the bottom 11. The lower end of the tube is designed to be connected directly to the air inlet of a carburetor, or it may be connected thereto by a suitable pipe. The bottom 11 may be formed with an upwardly sloping flange 101 centrally thereof through which the tube actually extends. A slightly dished plate 102, see Figure 9, is positioned over the bottom 11 at one side thereof, said plate sloping downwardly from the outer edge of the bottom towards and a little beyond the centre thereof. This plate has an opening 103 cut therein through which the tube 100 extends. By referring to Figure 9, it will be seen that this opening is larger than the tube and is offset in relation thereto. The plate 102 slopes downwardly to a hole 104 formed in the bottom 11 at a point thereof joining the flange 101 on the side of the central tube remote from the main portion of the plate. A trough 105 is formed beneath the bottom 11 at the hole 104. This trough has a bottom 106 sloping downwardly and outwardly from beneath said hole to a substantially vertical wall 107 which closes the outer end of the trough. An outlet tube 108 extends downwardly from the lowermost parts of the trough bottom to a removable sediment bowl 109. One or more air holes 110 may be formed in the container bottom above the trough adjacent the outer end thereof.

With the arrangement just described, the plate 102 slopes towards the discharge hole 104, and the bottom 11 and flange 101 slope either towards said hole or towards the plate. Thus, any sediment deposited in the bottom of the container is directed through the hole 104 into the trough 105 and thence through the pipe 108 into the bowl 109.

In this alternative, a float 112 is located outside the central tube 100 within the container. The air passages 38 are cut away at one point to form a small float chamber 113, see Figure 7, which communicates at its upper end with the suction chamber 16 and its lower end is immersed in the water 17. An arm 114 is connected to this float and extends through a slot 115 in the side of the float chamber to a pivot 116 carried by the inner wall

26 adjacent the lower edge thereof. This arm supports the valve 70 of the water inlet nozzle 69.

If desired, the outer end of the arm 114 may be adjustably connected to the float 112. This may be accomplished by providing a vertical plate 118 at the outer end of the arm having elongated slots 119 formed therein, see Figure 8. A U-shaped bolt 120 extends through the float and has its legs extending through the slots 119. Nuts 121 threaded on the outer ends of these legs are tightened to hold the float in any adjusted position relative to the plate and its attached arm.

A cover 125 is provided for the casing 10. As there is no outlet in this cover, it is shaped slightly differently from the cover 50 of the previously described form of the invention. However, the cover 125 is secured to the container in much the same manner as the other cover. Since there is no float in the tube 100 to be removed therefrom, it is not necessary removably to connect the spider to the top thereof. Accordingly, a spider 126 is provided with downwardly extending legs 127 which are fixedly secured at their outer ends to the tube. A bolt 128 extending freely through the cover is threaded into the spider to hold the cover in position. A short trough 130 may be provided for directing any moisture accumulating on the spider to the top of the baffle assembly 90.

The alternative of Figures 6 to 9 operates in the same manner as that of Figures 1 to 5. When the engine is started, the pressure is lowered by suction in the tube 100 and the suction chamber 116. This draws air through the passages 38 of the distributor and through the body of water 17. As the top of the float chamber opens into the suction chamber, the float and the water in the chamber are subjected to the same degree of vacuum as the rest of the water.

The alternative of Figures 10 and 11 is very similar to that of Figures 6 to 9, with the exception that the float is mounted in a different position. In this example, the air passages 38 are not as wide as in the previous examples and the side walls thereof are connected to a sleeve 135 surrounding and spaced from the tube 100 to form an annular float chamber 136. The top of this chamber communicates with the suction chamber 16, and its lower end is immersed in the water 17. An annular float 138 is positioned within the chamber 136. An arm 140 is pivotally mounted at 141 on the outer wall 107 of the trough 105. This arm divides at its inner end into a yoke 145, the outer end of each leg 146 of which is bent upwardly to extend through the float. The arm 140 supports the valve 70 of the water inlet nozzle 69.

The float 138 and the water in the chamber 136 are exposed to the same degree of vacuum as the suction chamber 16. The remainder of the device functions exactly the same as the alternative of Figures 6 to 9.

Figures 12 to 16 illustrate still another form of the invention showing an alternative baffle system which may be substituted for the system 90 of the previously-described forms of the invention. This alternative also includes a water tank which may be added to the devices of Figures 1, 6, and/or 10.

Referring to Figures 12 to 16, a container 155 has a bottom arrangement 156 similar to that shown in Figure 6 around a central tube 157 adapted to be connected to the air intake of a carburetor in any suitable manner. An inner wall 160 is spaced inwardly from the container wall to form an air passage 161 which opens outwardly at the top of the container at 162. The outer end of this passage may be covered by a screen 163. The lower end of the air passage communicates with an air distributor 165 similar to the distributor described above.

A baffle system 168 is provided within the inner wall 160 of the container 155 above the distributor 165. This system includes a plurality of concentric and vertically spaced baffle rings 170. In the illustrated example, there are three rings 171, 172 and 173 separated by spacers 174. The lower ring 171 is spaced from the tube 157,

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intermediate ring 172 is above and partially overlaps the lower ring, while the upper ring 173 partially overlaps the intermediate ring and extends outwardly to the bottom of the inner wall 160. The upper ring has a plurality of holes 176 around the outer edge thereof. By referring to Figure 13, it will be seen that each baffle ring slopes downwardly in cross section between its inner and outer edges.

A dished baffle plate 179 is connected to the tube 157 and extends outwardly therefrom and terminates short of the wall 160 to leave a passage 180 therebetween. A plurality of spaced fingers 182 of any suitable cross sectional shape project downwardly from the periphery of this plate to the upper baffle ring 173. It has been found that fingers which are U-shaped in cross section produce very good results, and passages 183 are formed therebetween. The U of these fingers opens inwardly, as clearly shown in Figure 14. Holes 185 are formed in the plate 179 adjacent the tube 157.

An annular baffle plate 188 is spaced above the plate 179 and extends inwardly from the wall 160 and partially overlaps said plate. The annular baffle plate extends downwardly in cross section between its inner and outer edges and has holes 189 therethrough adjacent the latter edge. A plurality of spaced fingers 192 extend downwardly from the inner edge of the plate 188 to the upper surface of the plate 179, see Figure 13. These fingers also may be of any suitable cross sectional shape, and in this example, they are U-shaped in cross section, with each U opening outwardly, as shown in Figure 14. Passages 193 are formed between these fingers.

There may be only one of each of the baffle plates 179 and 188 in the container, but there may be more if desired. Figure 14 shows two plates 179 and two plates 188, said plates being alternately arranged within the container.

A cover 194 is provided for the container within the inner wall 160, said cover having a deflecting surface 194a in the form of an inverted cone centrally thereof, and this cover may be removably secured in place in any desired manner. In this example, a spider arrangement 195 is fixedly secured to the upper end of the tube 157, and a bolt 196 extends upwardly therefrom through the cover, upon which a nut 197 is threaded. A spring 198 may be mounted on the bolt between the spider and the cover.

If desired, a cup 200 may be mounted on top of the central portion of the spider arrangement 195, and this cup is provided with one or more troughs 201 extending outwardly and downwardly therefrom beyond the wall of tube 157.

An idling opening 205 may be formed in the cover 194, said opening being controlled by a cover valve 206 held open by a light spring 207. If desired, a blow-off opening 210 may also be formed in the cover which is normally closed by a valve 211 resiliently held in position by a spring 212.

Water may be supplied to the bottom of the container 155 in any desired manner. One way of doing this is to provide a reservoir 215 around the outside of the container, said reservoir having a bottom 216. The reservoir has an outlet 218 in the bottom thereof controlled by a valve 219. The valve is opened and closed by a suitable float arrangement within the chamber 155. This may consist of floats 220 and 221 positioned in float chambers 222 and 223 formed in the distributor 165. These float chambers open into the water at the bottom of the container and into the space within the wall 160 of the latter above the distributor. The floats are connected by arms 225 and 226 to a common arm 227, see Figures 13 and 16, and the latter arm is pivotally mounted in a bracket 228, as at 229. The arm 227 supports the valve 219 so that as the arm is lowered and raised, it opens and closes the opening 218.

Suitable means may be provided for indicating the

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depth of the water in the reservoir 215. This may include a float 232 having a tube 233 projecting upwardly therefrom through a removable plug 234 in the top 235 of the reservoir. This tube is slidably mounted on a guide rod 238 which extends through the float and is secured to the bottom of the reservoir. As devices of this nature are usually mounted in a confined space, it may be desirable normally to keep the tube 233 within the device. In this case, a spring-loaded dog 240 is pivotally mounted at 241 on the plug 234, said dog normally closing the hole through which the tube 233 extends. When it is desired to ascertain the depth of the water in the reservoir, this dog is pivoted away from the hole to allow the tube to rise under the influence of the float 232. Once this has been done, the tube is pressed back down into the plug and the dog allowed to cover the hole.

Water may be supplied to the reservoir through a hole 242 in the top of the latter which is normally closed by a plug 243.

The device of Figures 12 to 16 functions practically in the same manner as the others. When the engine with which the device is associated is operating, an area of low pressure is created in the tube 157 and within the casing 155. Air is drawn through the entrance 162, the air passage 161, and the distributor 165. As it passes through the latter, it is moved through the water in the bottom of the container in the manner described above. On leaving the distributor, the air is deflected by the baffle rings 171, 172 and 173 out of the course it would normally take. After passing through these baffles, the air is directed by the baffle plate 179 through the passages 183 between the fingers 182. In order to do this, the air must make substantially a right angle turn, and most of the water in solid form will be trapped within the U-shaped fingers. Any such water will be directed downwardly on to the top of the baffle 173 whence it drops through the holes 176 back to the body of water in the bottom of the container. After passing the fingers 182, air must turn upwardly and then inwardly to pass through the passages 193 between the fingers 192. Here again, water may be trapped in the U-shaped fingers 192. By referring to Figure 15, it will be seen that the fingers 182 are staggered laterally in relation to the fingers 192. Water from the latter fingers runs down the baffle plate 179 and drops through the holes 176 therein. It will be noted that the plates 179 and 188 are alternately arranged, and they actually form a tortuous passage for the air and vapor from the bottom of the container to the top thereof. When the air strikes the container cover 194, it is deflected downwardly through the tube 157. Any water that may gather on this cover drops down into the cup 200, whence it is directed by the troughs 201 to the nearest baffle plate 179.

During normal operation, the air suction in the tube 157 is sufficient to keep the cover valve 206 closed. However, when the engine is idling, there may not be sufficient suction to draw the required air and/or the engine through the body of water at the bottom of the container. In this case, the suction is not sufficient to keep the cover valve closed so that at least some air may enter through the opening 205. The normally closed opening 210 is provided in case of backfire. Any sudden increase in pressure in the container will result in the valve 211 being opened.

While this invention has been particularly described as an air washer and humidifier, it is to be understood that it may be adapted to be used as an oil washer for the crank case oil of internal combustion engines. In this case, it would not be necessary to include a baffle system above the distributor, and it may even be possible to eliminate the float arrangement for controlling the level of the water in the container, since the water would not leave the device with the oil.

What I claim as my invention is:

1. A device for washing and humidifying air for in-

ternal combustion engines and other purposes, comprising a wall defining a suction chamber, a cover on the wall closing the chamber, an outlet for the chamber to be connected to a source of suction, means for holding water at the bottom of the chamber, a plurality of channels spaced from each other within the chamber, each channel being formed by a pair of slightly spaced vertical walls and a cover over the upper edges of the walls, each channel opening out at one end through the wall above the water and opening downwardly throughout substantially the length of its lower edge into the water, and baffle means between the water and the chamber outlet, said baffle means comprising a baffle plate mounted in the suction chamber, a plurality of spaced fingers depending from the plate, and means for directing all air passing through the suction chamber towards and between the fingers.

2. A device for washing and humidifying air as claimed in claim 1 in which each finger is substantially U-shaped in cross section, and the air in the suction chamber is directed towards the open side of the U of each finger.

3. A device for washing and humidifying air for internal combustion engines and other purposes, comprising a wall defining a suction chamber, a cover on the wall closing the chamber, an outlet for the chamber to be connected to a source of suction, means for holding water at the bottom of the chamber, a plurality of channels spaced from each other within the chamber, each channel being formed by a pair of slightly spaced vertical walls and a cover over the upper edges of the walls, each channel opening out at one end through the wall above the water and opening downwardly throughout substantially the length of its lower edge into the water, and baffle means between the water and the chamber outlet,

said baffle means comprising a plurality of vertically-spaced baffle plates mounted in the suction chamber and staggered relative to each other to form a tortuous passage from the bottom to the top of said chamber, and a plurality of spaced fingers extending from each plate down to the plate therebeneath, and means for directing all air passing through the suction chamber towards and between the fingers of the lowermost baffle plate.

4. A device for washing and humidifying air as claimed in claim 3 in which each finger is substantially U-shaped in cross section with the open side of each U facing substantially the direction from which the air in the suction chamber approaches said finger.

5. A device for washing and humidifying air as claimed in claim 4 in which the means for directing the air towards the lowermost baffle fingers comprises a plurality of vertically-spaced baffle rings between the lowermost baffle plate and the water in each container, each baffle ring partially overlapping the ring below it, and the fingers of the baffle plate extending down to the uppermost ring.

References Cited in the file of this patent

UNITED STATES PATENTS

404,621	Hilbert	June 4, 1889
773,784	Brunck	Nov. 1, 1904
1,884,534	Betz	Oct. 25, 1932
1,908,207	Wrenn	May 9, 1933
2,147,094	Heckmann	Feb. 14, 1939
2,186,152	Seitz	Jan. 9, 1946
2,422,527	Campbell	June 17, 1947
2,596,782	Moore	May 13, 1952