Oct. 3, 1933. G. H. DAVIS 1,929,017

APPARATUS FOR CLEANING AIR AND CONDITIONING FUEL MIXTURES

Filed Oct. 17, 1930

Fig. 1

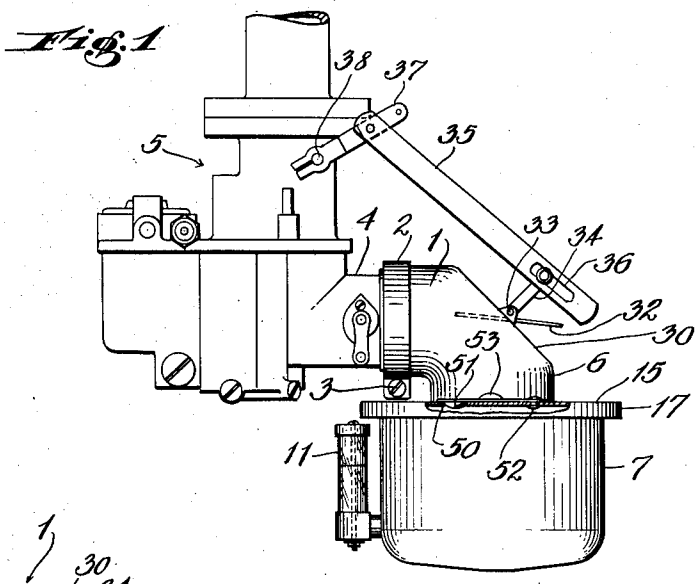


Fig. 2

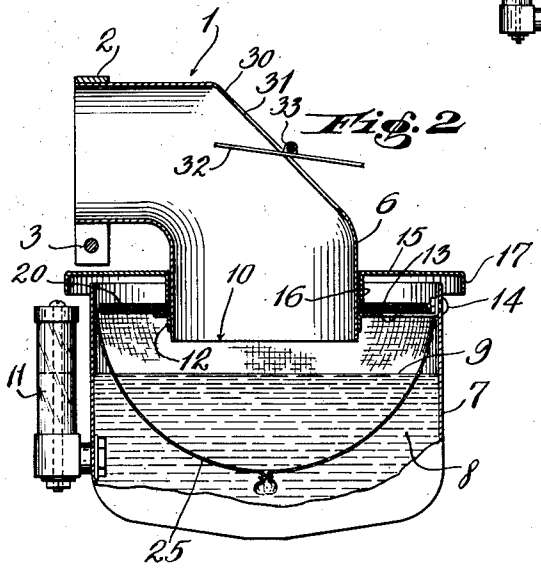


Fig. 3

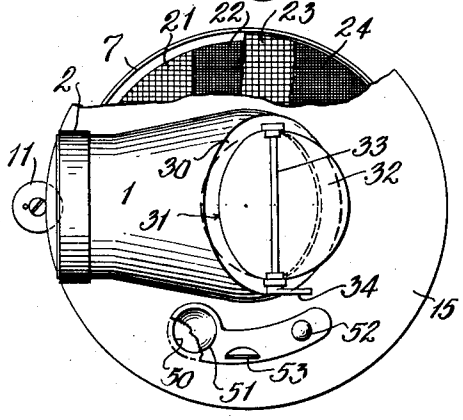
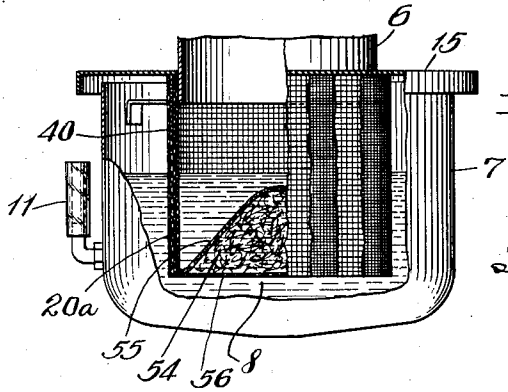


Fig. 4



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APPARATUS FOR CLEANING AIR AND CONDITIONING FUEL MIXTURES

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16 Claims. (Cl. 261—107)

My invention relates to mechanism or apparatus for cleaning air supplied to an internal combustion engine and at the same time conditioning the complete combustible mixture or treating it with a liquid solution which acts as a decarbonizer, lubricator and fuel economizer.

To these ends, the invention structure consists, in preferred embodiments as here shown, in a liquid container and connection or attachment means for securing it, either as an attachment or as a part of a complete or combined unit, to the engine carbureter at the air intake point or fitting thereof. The container is arranged, or has means affording a passage for outside air into and through it and through the attachment fitting to the air intake of the carbureter and also has screens of suitable material, including portions or elements having a capillary function, to bring the cleaning and mixture conditioning liquid into intimate contact with the air, serving first to remove from the air supplied to the engine, dust, grit, etc., and also to supply to the air an appreciable proportion of the conditioning liquid, which forms a part of the complete carbureted mixture and removes or prevents formation of carbon deposits in the engine and lubricates moving surfaces to which fuel mixture has access, and also increases the fuel value of the mixture, with resulting fuel economy.

In practice, the improved composition is composed of water, oil, and carbon disulphide, with preferably a slight quantity of liquid soap, and lead tetra-ethyl, may be used in addition, if desired, though the solution gives excellent results without the last named constituent.

The composition of the mixture is:—

Water	95½ parts by volume
Oil	3 parts
Carbon disulphide	1 part
Liquid soap	½ part

The oil may be any suitable light oil, such as castor or mineral oil, and there is sufficient agitation during the operation of the engine to insure a thorough mixture at all times when the engine is running, so that no other agitation is required.

The improved composition in addition to preventing the formation of carbon, lubricating and saving fuel, acts to decarbonize.

The characteristics and advantages of the invention are further sufficiently explained in connection with the following detail description of the accompanying drawing, which show representative embodiments. After considering these examples, skilled persons will understand that many variations may be made without departing from the principles disclosed, and I contemplate the employment of any structures that are properly within the scope of the appended claims.

Fig. 1 is a side elevation of apparatus or mechanism embodying the invention in one preferred form, the invention structure being shown as an attachment to one typical carbureter; otherwise it may be considered as forming a part of a unitary structure or combination including the carbureter and the invention structure.

Fig. 2 is a vertical section of the invention structure in one form, as shown in Fig. 1.

Fig. 3 is a top plan, with parts broken away.

Fig. 4 is a view, partly in side elevation and partly in section, of a modified form of the device or apparatus.

In one form, as shown in Figs. 1, 2 and 3, I provide a tubular fitting 1 of substantially L-form, having at one end a clamp band 2 and screw or bolt 3 for clamping it on the air intake tube or fitting 4 of a typical carbureter 5, Fig. 1. To the vertical portion 6 of the L fitting I connect or secure a cup 7 forming a receptacle for a liquid 8 of the character and for the purposes above referred to. The liquid is normally kept at a level such as 9, substantially below the lower end 10 of the tubular fitting 1, approximately as shown in Fig. 2. If desired, a liquid gauge 11 may be provided to indicate at all times the liquid level so that renewal may be made when necessary.

The cup or receptacle 7 may be supported from the fitting 1 in any suitable manner, as by a spider of sheet metal having a sleeve or thimble portion 12 slipped on the lower end of the attachment fitting and secured by a press fit, or solder, etc. Spaced arms 13 extend from the sleeve or thimble portion and are secured to the cup 7 as by rivets or bolts 14 near the upper edge of the cup. The cover plate 15 is suitably connected and supported, as by securing its sleeve or thimble portion 16 on the tubular fitting 1, with a press fit, or by solder, etc. The cover has a peripheral depending flange 17 and is so positioned as to afford an annular air passage between the flange and the cup and over the edge of the cup and so downward into the cup and into the lower end of the attachment fitting, through which the air passes into the carbureter, where it is carbureted and then goes to the engine intake manifold.

In the upper portion of the cup, somewhat below its upper edge, and occupying the annular space between the lower portion 6 of the attach-

ment fitting and the cup, I provide a screen 20 of generally foraminous character. This screen preferably consists of a plurality of layers or sheets of suitable mesh materials. One layer or sheet of the screen, which may be the lower sheet, 21, in Fig. 3, is desirably of wire mesh, principally to afford means for readily connecting the screen as a whole in position, as by soldering the inward margin of this wire mesh piece to the lower end of the attachment fitting, or in some cases to the inner face of the cup wall. The wire mesh also serves to properly support and retain the fabric sheets. Upon the lower screen sheet are placed other sheets of layers of screen material; thus there may be directly upon the layer or sheet 21, another sheet or layer 22 of relatively fine mesh and thereon another sheet or layer 23 of relatively coarse mesh and superposed thereon another or upper layer 24 of fine mesh. The various sheets or pieces of screen material, except the lower one of wire mesh, are preferably composed of textile mesh fabrics, such as cotton fabrics; and the layers 23 of relatively coarse mesh, and with coarse or double threads are designed to have substantial capillary action or effect while intermediate layers, such as 22 and 24, of relatively fine mesh, are designed to filter and strain air passing through the screen and effectively extract dust, grit, etc., therefrom. In some cases the fine mesh pieces may be of other material than cotton, such as linen or other fibre having a relatively hard texture or finish.

The number of sheets of fabric screen material may vary. Thus, there may be two or more of the coarse mesh sheets with corresponding numbers of pieces of fine mesh interspaced therewith.

In a preferred example, the mesh size of the coarse mesh pieces may be of the order of six to the inch, and the mesh size of the finer pieces may be of the order of twenty to the inch, more or less.

To supply liquid, such as 8, carried in the cup, to the screen 20, I provide another screen 25 of bag form or approximately semi-spherical shape, as well shown in Fig. 2, the periphery of this being connected to the periphery of screen 20, and its lower portion being immersed in the liquid. This screen 25 is preferably of a capillary fabric similar to the coarse mesh fabric 23 and continuously supplies portions of the conditioning liquid 8 to screen 20, throughout which the liquid is distributed by capillary action and entering air is compelled to pass through screen 20 in intimate contact with the liquid, whereby the air is purified before entering the carbureter proper. The air also entrains a substantial amount of the conditioning liquid, which is carried to the engine combustion spaces and displaces carbon deposits already formed, serves to prevent further deposit of carbon, lubricates moving parts to which the fuel mixture has access, and also increases the fuel value of the mixture with resultant fuel economy when the carbureter is properly adjusted or readjusted for this purpose.

In some cases a component of the conditioning liquid may be equivalent to ethylizing substances, whereby to practically ethylize the fuel mixture, improve its combustion efficiency, and reduce or eliminate knocking due to detonation, etc.

In many cases, or all cases except when the engine is run with nearly wide open throttle, the appliance does not noticeably choke or retard the inflow of air to the carbureter. In cases where with wide open or nearly wide open throttle such a retardation of air supply is noticeable, with resultant retardation of engine speed or loss of engine efficiency, I provide in the attachment fitting 1, at a suitable point which may be a flat face 30 at the outside of the elbow thereof, a port 31 with a butterfly valve 32 to close the port, pivotally mounted at 33 and having a controlling arm 34. This arm is connected by a link 35 having a pin and slot connection 36 providing lost motion, to the arm or lever 37 on the shaft 38 of the carbureter throttle, so that when the throttle arm is moved within any ordinary speed ranges, the butterfly valve 32 remains in closed position by reason of lost motion provided by the pin and slot connection; but when the throttle is moved to nearly full or full open positions, link 35 causes the butterfly valve 32 to open proportionately, thus supplying air freely to the carbureter intake at a point posterior to the present conditioning appliance, and thus avoiding any choking effect on the air supply.

Any suitable means or fitting may be provided for refilling the cup. Fig. 3 shows such a filling device in one preferred form, consisting of a filling hole 50 in the cover, normally closed by sliding cap or cover piece 51 pivotally mounted at 52 and having a finger piece 53.

Fig. 4 shows a modified form of the appliance which is preferred in many cases. In this arrangement the cup or reservoir 7 and cover 15 are arranged as previously, the cup being supported from the cover or from the portion 6 of the attachment fitting in any convenient way, as by spaced arms or a spider having a thimble portion connected to the cover or to the tubular member 6; and in some cases also, if desired, the connection of the cup to the supporting spider or its arms may be of the bayonet joint type, permitting easy and quick removal of the cup for access to the screen, which may also be devised in any known or suitable ways for easy attachment and detachment, permitting ready cleaning or renewal of the screen when necessary.

In this form of the invention the screen 20*a* may be of character and structure similar to screen 20 except that it is preferably in cylindrical form, its upper marginal portion being secured upon and about the lower margin of the tubular fitting 6, and the lower portion of the tubular screen being submerged to a substantial depth in the liquid 8 in cup 7. The action is substantially similar to that of the first described apparatus except that in this case the screen 20*a* including capillary layers or portions and filtering or cleaning portions, extends directly into the liquid, which is drawn up and distributed throughout the zone 40 of the screen exposed above the liquid level, and the entering air passes through this zone of the screen, which may be of ample area to avoid undesirable choking of the air supply. The air is thus purified and conditioned as and for the purposes already described in connection with Figs. 1 to 3.

In some cases, as also shown in Fig. 4, I may place at the bottom of the tubular screen 20*a* an absorbent body 54 of cotton waste, felt or other suitable material, which may be held in place by wire screens 55 and 56. This absorbent and more or less permeable filling may be employed, for example, where the intake suction of the engine is above the normal or average, and tends to retard the passage of air through or into the bottom of the tubular screen, and also retards excessive rise of liquid into the tubular screen under the influence of engine suction. This fitting also acts, when the liquid level in the container falls to a

low point (nearly to the bottom of the container), to prevent or retard the drawing of air up through the bottom of the tubular screen.

I claim:

1. Air and charge conditioning apparatus for internal combustion engines, comprising a liquid container having an air inlet at its top, a screen therein having capillary means by which liquid from the container is distributed through the screen, means for connecting the container to the air intake fitting of a carbureter, said means also supporting the screen in the path of air passing through the container to direct air entering the container and passing through the screen, to said carbureter intake fitting.

2. In combination with a carbureter, an air conditioning appliance comprising a cup to hold a conditioning liquid, a tubular fitting for connecting the cup and associated parts to the intake fitting of the carbureter, a cover supported above the cup to provide an opening for air entrance, and a screen connected to the anterior end of the attachment fitting and immersed in the liquid in the cup and arranged to compel passage through it of air going to the carbureter.

3. In combination with a carbureter, an air conditioning appliance comprising a cup to hold the conditioning liquid, a tubular fitting for connecting the cup and associated parts to the intake fitting of the carbureter, a cover supported above the cup to provide an opening for air entrance, and a cylindrical screen connected to the anterior end of the attachment fitting and immersed in the liquid in the cup and arranged to compel passage through it of air going to the carbureter.

4. In combination with a carbureter, an air conditioning appliance comprising a cup to hold a conditioning liquid, a tubular fitting for connecting the cup and associated parts to the intake fitting of the carbureter, a cover supported above the cup to provide an opening for air entrance, and a screen conneccted to the anterior end of the attachment fitting and immersed in the liquid in the cup and arranged to compel passage through it of air going to the carbureter, the screen comprising a plurality of foraminous layers.

5. In combination with a carbureter, an air conditioning appliance comprising a cup to hold a conditioning liquid, a tubular fitting for connecting the cup and associated parts to the intake fitting of the carbureter, a cover supported above the cup to provide an opening for air entrance, and a screen connected to the anterior end of the attachment fitting and immersed in the liquid in the cup and arranged to compel passage through it of air going to the carbureter, the screen comprising a plurality of layers of mesh fabric, certain of the layers having relatively large mesh and providing effective capillary action.

6. Air and charge conditioning apparatus for internal combustion engines, comprising a liquid container having an air inlet adjacent its top, a screen therein interposed in the path of air passing through the container and having capillary means by which liquid from the container is distributed through the screen, means for connecting the container to the air intake fitting of a carbureter, the screen being of generally annular form and located around the attachment fitting below the air inlet and above the liquid level in the cup, and an auxiliary screen of capillary mesh fabric connected to the periphery of the main screen and immersed in the liquid.

7. The combination of a carbureter having a throttle arm and an air conditioning appliance including a tubular portion providing an air passage and connected to the carbureter air intake, a valve in said tubular portion, and a connection therefrom to the throttle arm, providing for opening of said valve when the throttle is in nearly or fully wide open positions, for supply of outside air directly to the carbureter intake and avoidance of choking effect.

8. The combination of a carbureter having a throttle arm and an air conditioning appliance including a tubular portion providing an air passage and connected to the carbureter air intake, a valve in said tubular portion, and a connection therefrom to the throttle arm, providing for opening of said valve when the throttle is in nearly or fully wide open positions, for supply of outside air directly to the carbureter intake and avoidance of choking effect, said connection including a lost motion device.

9. The structure defined in claim 3 with the addition of a filling of absorbent material at the lower end of the screen.

10. Air conditioning apparatus for carbureters of internal combustion engines, comprising a liquid container, a conduit extending into the container and leading from the interior thereof above the level of liquid in the container to the air intake of the carbureter, a screen mounted between the fitting and inner walls of the container above the liquid level therein across all space between said fitting and the container walls, means extending from the screen into the liquid to feed liquid to the screen, and an air inlet leading into the container above said screen.

11. Air conditioning apparatus for carbureters of internal combustion engines, comprising a cup shaped container for liquid, a tubular fitting leading to the air intake of the carbureter from a point above the liquid level in the container, means connecting the walls of said container to the tubular fitting, a foraminous screen supported by said means between the walls of the container and the periphery of the fitting above the liquid level, a cover surrounding said fitting and spaced above the top of the container to provide an air passage and means for feeding the liquid to the screen by capillary action.

12. The structure of claim 11 wherein the means connecting the container and fitting comprise radial arms in spaced relation to each other and the screen is composed of layers of foraminous metal and mesh fabric.

13. The structure of claim 11 wherein the cover is provided with a depending flange beyond the walls of the casing in spaced relation thereto and a depending flange surrounding the fitting.

14. Air conditioning apparatus for carbureters of internal combustion engines, comprising a liquid container, a conduit leading from the interior of the container to the air intake of a carbureter and terminating above the level of the liquid in the container, a screen composed of layers of foraminous metal and mesh fabric surrounding the inner end of the fitting within the container and extending into the liquid, a cover for the container engaging the top end of the screen, and means securing said container and screen to the fitting.

15. Air conditioning apparatus for carbureters of internal combustion engines, comprising a liquid container, a conduit leading from the interior of the container to the air intake of a carbureter and terminating above the level of liquid

in the container, a cover for the container supported by said conduit in spaced relation to the container, and a screen within the container surrounding said conduit and through which air entering said container through the space between it and the cover must pass to enter the conduit.

16. The structure of claim 15 wherein means is provided for feeding the liquid in the container to the screen to form a film in the mesh of the screen.

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