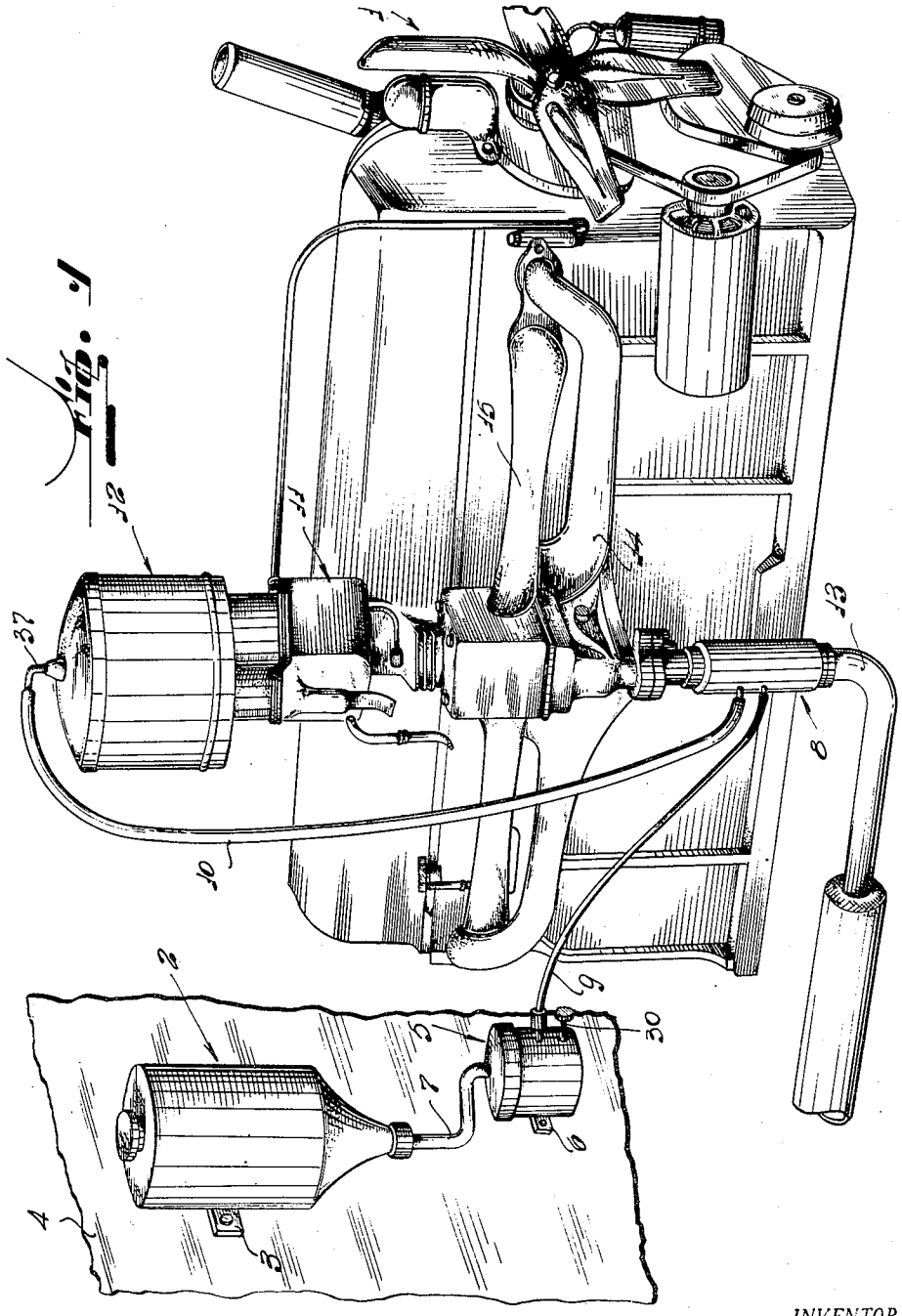
Oct. 29, 1957 W. SPILLMANN 2,811,146

CHARGE FORMING DEVICE

Filed May 19, 1954 4 Sheets-Sheet 1



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CHARGE FORMING DEVICE

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Fig. 2

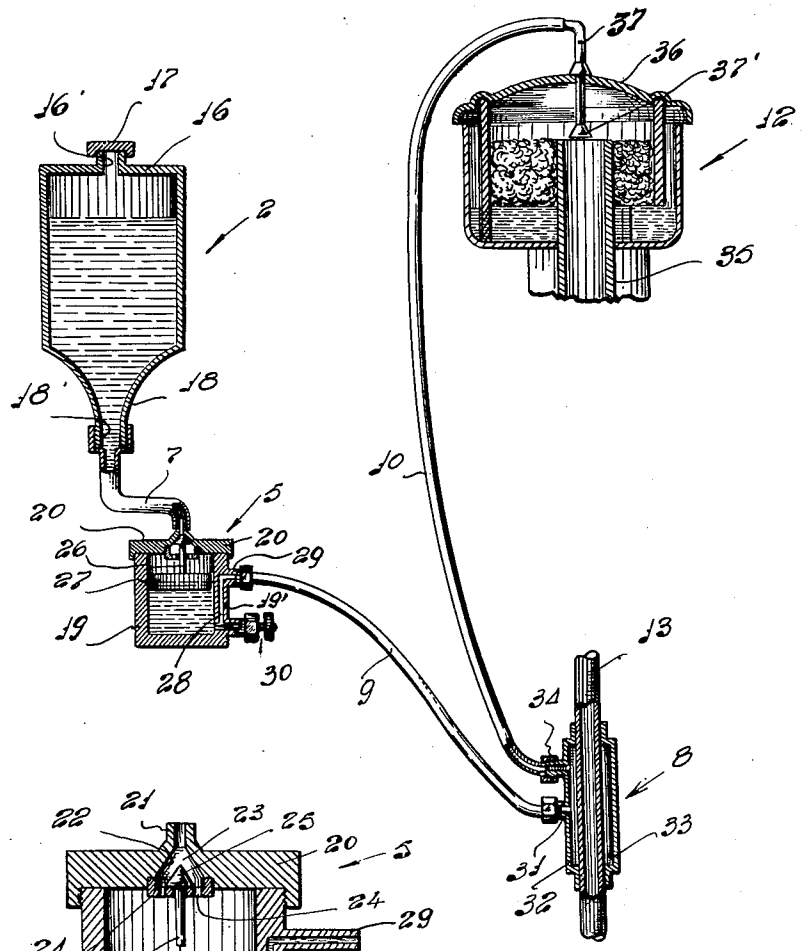

Fig. 3

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Fig. 5

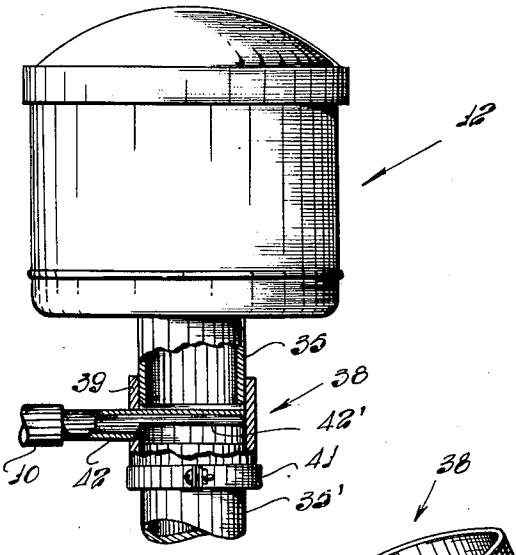

Fig. 4

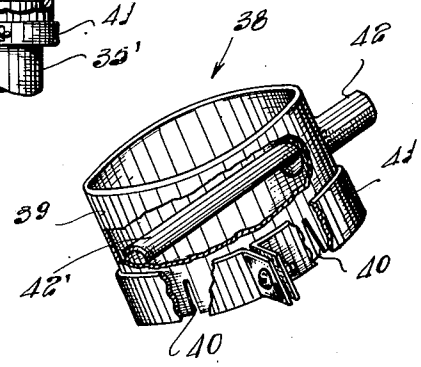

Fig. 6

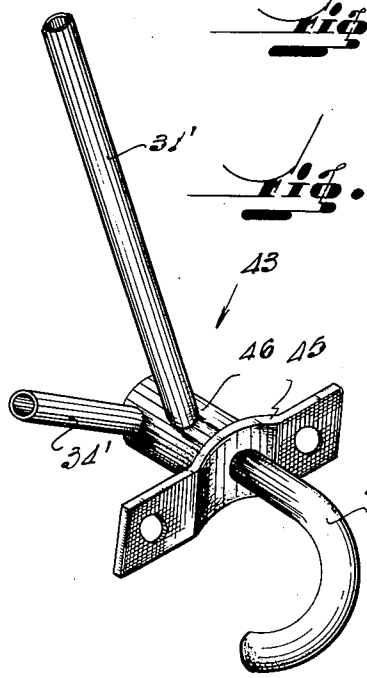

Fig. 7

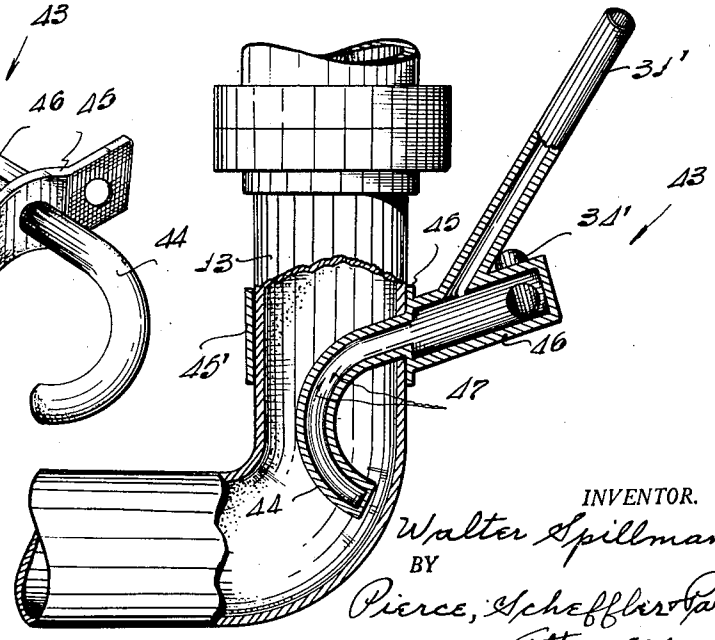

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Fig. 8

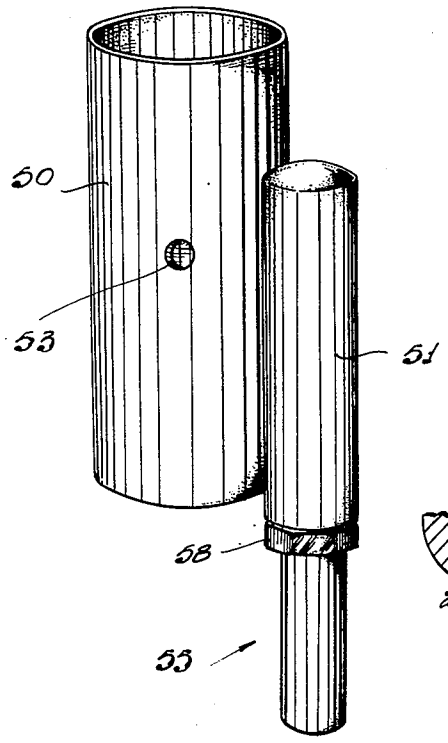


Fig. 10

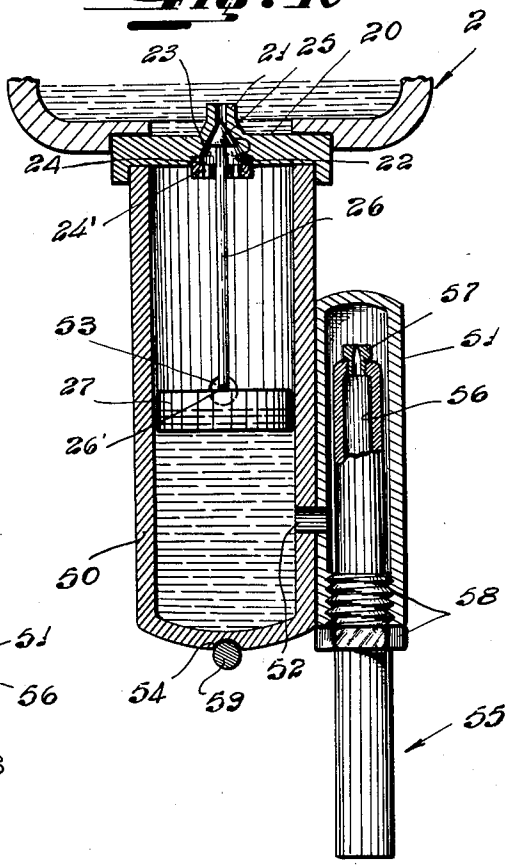
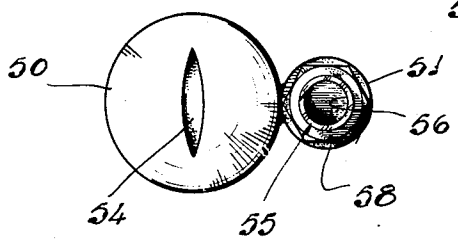


Fig. 9



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2,811,146

CHARGE FORMING DEVICE

Walter Spillmann, Cordoba, Argentina

Application May 19, 1954, Serial No. 430,960

10 Claims. (Cl. 123—25)

The present invention relates to a charge forming device for use in connection with the fuel supply for internal combustion engines and more particularly it relates to such a device as described in my copending application Serial No. 384,784, filed April 14, 1953, now abandoned and of which the present case is a continuation-in-part application.

More particularly the present invention relates to a charge forming device of the type supplying steam formed from water, or vapor from alcohol or a mixture of both, to the fuel, in order to obtain a better output as to the power supplied by internal combustion engines.

Hitherto several types of device have been provided for that purpose amongst which some are directly connected to the exhaust manifold by means of tubing coiled about said manifold for not only vaporizing a liquid but for converting the liquid into steam or vapor so that a greater quantity of the liquid in the form of hot vapor or steam is ordinarily employed than required. Valves have been employed in connection with such devices in attempting to control the quantity of such steam or vapor admitted to the combustible mixture but such regulation has been ineffective because of the fact that the operator of a car cannot always determine from a mere inspection of the operation of the engine whether the proper quantity of the vapor or steam is being used for a particular operation of the engine.

Later on it has been intended to control the water and/or alcohol supply by means of the exhaust gases, which has however the drawback that the control is not carried out by the "demanding factors" of the engine, that is to say what the engine requires next, but by the "performed factors," that is to say what the engine has already performed in foregoing cycles.

In all of these known embodiments the steam or vapor is produced in a boiler wherein a regular large quantity of water and/or alcohol is housed and which boiler is heated by means of the exhaust gases. This procedure has two important drawbacks, of which the first is that the production of vapor or steam cannot be controlled and even if the engine has been stopped said vapor or steam production carries on for a while, and consequently in many embodiments water will condense in the cylinders whilst the engine is inoperative. In order to overcome this difficulty, valve arrangements have been proposed which however is a rather poor solution in that if the valve arrangement becomes injured the cylinder will be damaged. The second drawback is that this type of embodiment becomes only operative once the boiler starts to produce the required amount of vapor or steam, which always is after a certain time the engine has been started.

A further feature of these known embodiments is that if a mixture of water and alcohol is used, the vapors have not constantly the same proportion of alcohol and water due to their different distilling points. This drawback can only be overcome if instead of a boiler a substantially instantaneous evaporator is used, as herein proposed, and as will be later seen.

Still a further drawback of these known arrangements is that the steam of vapor supplied is usually connected to the intake manifold so that when the engine should deliver a large amount of power and consequently requires a large amount of fuel only a relatively small amount of water and/or alcohol steam or vapor, respectively may simultaneously enter the cylinders with the fuel; and if on the other hand the engine should deliver only a small amount of power and thus requires only a small amount of fuel, a large amount of water and/or alcohol steam or vapor, respectively, will enter the cylinders. This "inverse relationship" between fuel supply and water and/or alcohol steam or vapor supply is precisely the opposite of what is really suitable.

In the course of the following description the water and/or alcohol liquid will be called "anti-knock liquid" and the water steam, alcohol vapor or water and alcohol vapor will be indistinctly called "anti-knock vapor." Furthermore it is understood that the anti-knock liquid or vapor is not only an "anti-knock agent" but also a general improver with regard to the engine's output as stated at the beginning of this specification.

Bearing in mind the foregoing drawbacks a charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe has been conceived, comprising an anti-knock liquid tank, a constant level reservoir having a bottom and connected to said tank, level control means in said reservoir adapted to control the flow of said anti-knock liquid from said tank into said reservoir and the anti-knock liquid level in said reservoir, a discharge conduit connected to said bottom and having a discharge duct including at least a portion located substantially above the normal liquid level determined by said level control means, a substantially instantaneous vaporizer associated in heat exchange relationship with said exhaust pipe of the engine, said vaporizer chamber being further connected to said discharge duct and said air intake of said carburator.

It is therefore an object of the present invention to provide a charge forming device where the internal combustion engine is able of demanding from the charge forming device the exact amount of anti-knock vapor in accordance with the power which the engine shall deliver in each stroke. In other words, the larger the power required and consequently the amount of fuel supplied, the larger the amount of anti-knock vapor will be, that is to say a "direct relationship."

Another object is to provide a charge forming device where the required amount of anti-knock vapor is substantially instantaneously vaporized at the moment the engine requires it, so that as a consequence there is no evaporation out of time and consequently it is not possible that water condenses in the cylinder and furthermore since the evaporation is substantially instantaneous there is no dissociation or disproportion between alcohol and water, in case such a mixture is used, and therefore the proportion of these two ingredients of the anti-knock vapor remains stable.

Still another object is to provide a charge forming device where the anti-knock vapors will be supplied to the internal combustion engine through the air intake of the carburator so that fuel will mix with the mixture of air and anti-knock vapors.

A further object is to provide a charge forming device which is so constructed that when the engine runs idle no anti-knock liquid will be normally supplied to the vaporizer and consequently no anti-knock vapor will be supplied to the engine.

Still another object is to provide a charge forming device which will immediately operate upon starting the car,

since the vaporizer is heated to vaporizing temperature whilst the engine runs idle.

Another object is to provide a charge forming device of simple structure and a minimum of movable mechanisms.

Still a further object is to provide a charge forming device which may be adapted to the existing engines without requiring to modify parts of said engine.

These and further objects and advantages of the present invention will become more apparent during the course of the following description in which by way of example several embodiments have been shown.

In the drawings:

Figure 1 is a perspective view of an internal combustion engine of the type used in automobiles and to which a charge forming device in accordance with a first embodiment of the present invention, has been applied to.

Figure 2 is a side elevation, partially in section of the charge forming device shown in Figure 1.

Figure 3 is a longitudinal section of the constant level reservoir with the anti-knock liquid level below the normal level and the control valve open.

Figure 4 is a perspective view, partially in section, of a second embodiment of an anti-knock vapor connecting element for the air intake of the carburator.

Figure 5 is a side elevation partially in section, showing the anti-knock vapor connecting element applied to an air filter and air intake of a carburator.

Figure 6 is a perspective view of a second embodiment of a substantially instantaneous vaporizer.

Figure 7 is a side elevation, partially in section, of said vaporizer shown in Figure 6, as applied to the exhaust pipe of an internal combustion engine (not shown).

Figure 8 is a perspective view of another embodiment of a constant level reservoir.

Figure 9 is a plan view of Figure 8.

Figure 10 is a longitudinal section of the constant level reservoir shown in Figure 8 as applied to an anti-knock liquid tank.

As may be seen in Figure 1, wherein a rough sketch of an internal combustion engine **1** has been shown which however is considered for the purpose of this invention, a charge forming device in accordance with the present invention is applied thereto and comprises an anti-knock liquid tank **2** suitably supported by a bracket **3** on wall **4**, a constant level reservoir **5** suitably supported by its bracket **6** also for instance on wall **4** and connected to said anti-knock liquid tank **2** by means of supply pipe **7** and to a substantially instantaneous vaporizer **8** by means of feeding pipe **9**. An anti-knock vapor pipe **10** connects the vaporizer **8** to the air intake of the carburator **11**, in this particular embodiment to the top of the air filter **12**, as will be later more specifically seen.

The vaporizer **8** is in heat exchange relationship with the exhaust pipe **13** connected to the exhaust manifold **14**. For purposes of orientation the inlet manifold has been identified with reference numeral **15**.

Analyzing now more particularly the structural details of the charge forming device herein above referred to and with reference to Figure 2 it may be seen that the anti-knock liquid tank **2** comprises a top **16** with a charge opening **16'** and a cover **17** and also a bottom **18** with a discharge opening **18'** to which one end of said supply pipe **7** is connected.

The constant level reservoir **5** comprises a container **19** with a lid **20** having a nipple **21** (see also Figure 3) to which the other end of said supply pipe **7** is connected. The nipple **21** is connected to a valve seat **22** defined in said lid **20** and further defining a conical valve space **23** with its apex directed towards said nipple **21**. The base portion of said valve space **23** is delimited by a valve head supporting plate **24** having perforations **24'** and supported by said lid. Inside said valve space **23** a conical valve head **25** is housed, integral with a valve

stem **26** passing through said plate **24** and entering said container **19**. Obviously the apex of the valve head **24** is so arranged in the valve space **23** that it may close the connection between the anti-knock liquid tank **2** and the inner of the container **19**, as shown in Figure 2, and as will be later explained.

Inside container **19** a float **27** is housed, which when the anti-knock liquid reaches a certain level higher than that shown in Figure 3 and lower than that shown in Figure 2, enters in contact with the free end **26'** of valve stem **26** and as the liquid level rises the valve stem **26**, valve head **25** will be pushed upwardly until finally closing the connection with anti-knock liquid tank **2**, as shown in Figure 2.

A discharge conduit **28** is formed in the side wall **19'** of container **19** and connects the inner bottom portion of container **19** with a discharge duct **29** located at such a height of the container **19** that it is in functional relationship with the level control means formed by valve arrangement **22** to **26** and float **27**. In fact, the length of valve stem **26** is such that valve head **25** will close the connection with tank **2** when the liquid level in reservoir **19** is slightly below discharge duct **29**, as shown in Figure 2, so that the anti-knock liquid will not be able to flow by gravity into vaporizer **8** through feeding pipe **9**.

A needle valve arrangement **30** enables to set the flow ratio from the container **19** towards the vaporizer **8**, as will be later seen. As such, the needle valve arrangement **30** is well known in the art and therefore it is considered that no specific description thereof is necessary for understanding the present invention.

It is obvious that the discharge conduit **28** may as well be arranged inside or outside container **19** and that the needle valve arrangement **30** may be substituted by any other known flow control, or may not be supplied at all, if the device is to be constructed for one type of engine only.

The feeding pipe **9** is connected to the discharge duct **29** at one end and to inlet nipple **31** at the other end (see Figure 2). Inlet nipple **31** is integral with a casing **32** hermetically surrounding exhaust pipe **13** and thus defining a vaporizing chamber **33**. Said casing **32** further comprises an outlet nipple **34** to which one end of anti-knock vapor pipe **10** is connected the other end of which is connected to the air filter **12**.

It has to be pointed out that casing **32** may as well only partially surround exhaust pipe **13** as long as a correct heat exchange relationship exists between the exhaust pipe **13** and the vaporizer **8**.

The air filter **12** may be of any of the known structures and always comprises an air intake **35** to which the anti-knock vapor pipe **10** is connected. In the particular embodiment shown in Figure 2, the cover **36** supports a duct **37** the free end **37'** of which is slightly enlarged so that the free section of air intake **35** is reduced, thus forming a "Venturi," or in other words an increased suction effect on duct **37**, when the engine carries out its intake stroke.

The operation of the charge forming device is as follows; Supposing that tank **2** has been charged with anti-knock liquid through charge opening **16'**, said anti-knock liquid will flow by gravity through discharge opening **18'**, supply pipe **7** into the constant level reservoir **5** entering nipple **21**, and passing by valve head **25** resting on valve head supporting plate **24** and through perforations **24'** into container **19**, wherein the level of the anti-knock liquid will rise together with float **27** until the latter closes valve head **25** on valve seat **22**, as previously explained. The charge forming device is now set for operation.

Upon starting the internal combustion engine **1**, and whilst the latter runs idle, the charge forming device will not operate, but as soon as greater power is desired, the amount of air passing through air filter will increase

and thereby a suctioning effect is produced on the free end 37' of duct 37 which is sufficient to rise the anti-knock liquid level in conduit 28 so that said anti-knock liquid will be drawn into the substantially instantaneous vaporizer 8 through feeding pipe 9. The amount of anti-knock liquid is rather small in relation to the volume of vaporizing chamber 33, so that as soon as said anti-knock liquid enters chamber 33 it is practically instantaneously vaporized and enters as vapor through anti-knock vapor pipe 10 and duct 37 into air intake 35 where it is mixed with air and this mixture then enters the carburator where it is mixed with fuel, and the "anti-knock fuel" enters then the inlet manifold 15.

It may thus be seen that there is a "direct relationship" between the amount of anti-knock liquid and the fuel, as pointed out previously. Also it will now be understood that as soon as the engine stops or runs idle no sufficient suction effect is produced on free end 37' to be able to produce an anti-knock liquid flow into vaporizer 8.

However if desired the anti-knock liquid may even flow into vaporizer 8 when the engine runs idle, to which effect for instance the length of the valve stem 26 has to be varied accordingly. As such the needle valve arrangement 30 enables to produce a standard type of charge forming device for different engines, so that said needle valve arrangement 30 will be suitably set for each type of engine when supplied.

As soon as the liquid level decreases in the constant level reservoir the level control means 22 to 26 and 27 enables tank 2 to supply an additional quantity of anti-knock liquid.

In the above described embodiment it is however necessary to insert duct 37 in cover 36 of air filter 12, which means certain structural modifications, which can however be avoided if the anti-knock vapor connecting element 38 (see Figure 4) is used. The latter consists of a ring 39 having preferably in its lower portions a plurality of spaced slits 40 which make said lower portion elastic and which is surrounded by a clamp 41. A duct 42 is connected to said ring 39 and enters said ring 39 but with the lower half cut away so as to form a baffle 42'.

As may be better seen in Figure 5, the connecting element 38 is mounted on the lower portion 35' of the air intake directly connected to the carburator (not shown) by means of its elastic portion and clamp 41. The anti-knock vapor pipe 10 is connected to duct 42, and the upper portion 35 of the air intake, which is integral with filter 12 is connected to the upper portion of ring 39. The operation of element 38 is identical as duct 37 in the other embodiment, since the air passing baffle 42' produces a suction on pipe 10; the effect is also the same since element 38 is located above the carburator and more particularly above the fuel intake (not shown).

If it is desired to replace casing 32 by a more standard structure, vaporizer 43 may be used (see Figure 6), which may be connected to any size of exhaust pipe 13 (see Figure 7).

Vaporizer 43 consists of a curved hollow tube portion 44 having for instance a bracket 45 separating the curved tube portion 44 from for instance a straight portion 46 to which an inlet nipple 31' and an outlet nipple 34' are connected. Vaporizer 43 defines thus a vaporizing chamber similar as in the other embodiment.

By making a hole into the exhaust pipe 13 the curved portion 44 may be downwardly inserted into said exhaust pipe 13, until bracket 45 may be fixed to said exhaust pipe 13 such as by means of complementary bracket 45'. Feeding pipe 9 is to be connected to inlet nipple 31' and anti-knock vapor pipe 10 is to be connected to outlet nipple 34', to establish a similar circuit as the one shown in Figures 1 and 2. The anti-knock liquid enters straight portion 46 and advances due to gravity force into curved portion 44 where it is immediately vaporized and enters outlet nipple 34', as indicated by arrows 47.

Obviously the curved portion 44 enables to enter a larger tube portion into exhaust pipe 13, but this is not to be considered as a limiting feature since other shapes will also correctly perform this function.

The constant level reservoir hereinbefore described may be replaced by another embodiment also identified by reference numeral 5, which is of cheaper construction and does not require a valve needle arrangement 30, but is provided with an interchangeable nozzle so that the right type of nozzle will be used for each type of engine.

As may be seen in Figures 8 and 10, it consists of a main container 50 and a supply container 51 connected to the main container 50 by a connection 52 in the bottom portions of both containers. The main container 50 also comprises a weir 53 formed of a pair of diametrically opposed perforations.

The outer face of the base of the main container 50 comprises a cut-in portion 54, whilst the upper end is provided with a lid 20 similarly as in the first constant level reservoir and having the same constant level valve controlling means which will therefore not be described again and which valve means have the same reference numerals.

Inside the supply container 51 a discharge duct 55 is used consisting of a tube 56 the upper end of which is provided with an inlet nozzle 57. A screw-nut device 58 arranged in the middle outer portion of tube 56 enables to screw the upper portion of tube 56 into the supply container 51, so that the free end portion of nozzle 57 will be housed above the weir 53.

As may be specifically seen in Figure 10 the lid 20 in this embodiment forms directly a base portion of the anti-knock liquid tank 2 and consequently the nipple 21 is directly housed in said tank 2 and thereby the supply pipe 7 is not necessary. The float 27 is in such an operative relationship with the valve stem 26 that the maximum anti-knock liquid level as indicated in Figure 10 is below the weir 53. The free end of discharge duct 55 is again connected to feeding pipe 9 (not shown). The operation of the constant level reservoir is identical with the other embodiment, that is to say when a suction is produced by the engine the liquid level in the main container 50 will lower whilst in the supply container 51 said liquid level will rise and the anti-knock liquid will enter through nozzle 57 into discharge duct 55 from where it will be supplied through feeding pipe 9 into the vaporizer 8 (not shown). The control of the maximum anti-knock liquid level is carried out by float 27 and valve stem 26 in the manner as previously described. Weir 53 assures that even if the float 27 or valve 25 becomes inoperative that the level of the anti-knock liquid may not rise above nozzle 57 when the engine does not ask for it and thereby supply liquid into vaporizer 8 when not desired.

In order to assure that the constant level reservoir 5 is correctly connected to the anti-knock liquid tank 2, a clamp such as a wire 59 surrounds in form of a U-shaped member the main container 50 and in order to avoid slippage part of the wire being housed in the cut-in portion 54, as may be seen in Figure 10.

This embodiment is always to be supplied with the correct nozzle 57 for each type of the engine, as previously stated.

I claim:

1. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a constant level reservoir connected to said tank, level control means in said reservoir adapted to control the flow of said anti-knock liquid from said tank into said reservoir to maintain a predetermined level of the anti-knock liquid in said reservoir, a discharge conduit connected at one end to the bottom portion of said reservoir and having an outlet at the other end located substantially above the

normal liquid level determined by said level control means, a substantially instantaneous vaporizer associated in heat exchange relationship with said exhaust pipe of said engine, said vaporizer being further connected to said discharge conduit and said air intake of said carburator, and suction means for drawing said anti-knock liquid from said reservoir into said vaporizer.

2. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a connection, a constant level reservoir having a bottom and a top, said top being connected through said connection to said tank, level control means in said reservoir adapted to control the flow of said anti-knock liquid from said tank into said reservoir and the anti-knock liquid level in said reservoir, said level control means consisting of a valve capable of closing said connection, a valve stem having a free end and integral with said valve, a float in said constant level reservoir and capable of entering in contact with said free end of said valve stem and rising said valve stem to close said connection, a discharge conduit connected to said bottom and having a portion located substantially above the normal liquid level determined by said level control means, a substantially instantaneous vaporizer associated in heat exchange relationship with said exhaust pipe of said engine, said vaporizer being further connected to said discharge conduit and said air intake of said carburator.

3. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid for covering said container, a nipple integral with said lid, said supply pipe being connected to said nipple and said tank, a substantially conical valve space in said lid and having an apex directed towards said nipple, said valve space being connected to said nipple, a valve head supporting plate supported by said lid and defining the base of said valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to close said nipple, a discharge conduit having an opening at said side wall into the bottom portion of said container, said conduit including a portion located slightly above the uppermost liquid level determined by said float when closing said nipple through said valve head, a manually operable needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer associated in heat exchange relationship with said exhaust pipe of said engine, said vaporizer being further connected to said discharge conduit and said air intake of said carburator.

4. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a sde wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank beng connected to said constant level reservoir through the connection of said supply pipe to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said side wall into the bottom portion of said container, said discharge conduit including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a casing mounted on said exhaust pipe and defining a vaporizing chamber, an inlet nipple and an outlet nipple integral with said casing and connected to said vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, said anti-knock vapor pipe connecting said outlet nipple with said air intake of said carburator.

5. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank being connected to said constant level reservoir through said supply pipe connected to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said valve seat, a discharge conduit opening at said side wall into the bottom portion of said container, said discharge conduit including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a manually adjustable needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a casing mounted on said exhaust pipe and defining a vaporizing chamber, an inlet nipple and an outlet nipple integral with said casing and connected to said vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, said air intake of said carburator being connected to an air filter having a cover, a duct having an enlarged free end, said duct being supported by said cover and said enlarged free end entering said air intake, said anti-knock vapor pipe connecting said duct with said outlet nipple.

6. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburetor with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank being

connected to said constant level reservoir through said supply pipe connected to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said valve seat, a discharge conduit opening at said side wall into the bottom portion of said container, said discharge conduit including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a casing mounted on said exhaust pipe and defining a vaporizing chamber, an inlet nipple and an outlet nipple integral with said casing and connected to said vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, an anti-knock vapor connecting element comprising a ring having a lower portion with slits, a clamp surrounding said lower portion, a duct connected to said ring and entering said ring in form of a baffle, said lower portion of said ring being connected to said air intake of said carburator an air filter connected to said ring above said baffle, said anti-knock vapor pipe connecting said duct with said outlet nipple.

7. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank being connected to said constant level reservoir through said supply pipe connected to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said valve seat, a discharge conduit opening at said side wall into the bottom portion of said container including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a manually adjustable needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a curved tube portion and a straight tube portion, a bracket integral with one of said tube portions, an inlet nipple and an outlet nipple connected to said straight tube portion, said curved portion being adapted to be housed in said exhaust pipe, said curved and straight tube portions defining a vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, said anti-knock vapor pipe connecting said outlet nipple with said air intake of said carburator.

8. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank being connected to said constant level reservoir through said supply pipe connected to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said valve seat, a discharge conduit opening at said side wall into the bottom portion of said container including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a manually adjustable needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a curved tube portion and a straight tube portion, a bracket integral with one of said tube portions, an inlet nipple and an outlet nipple connected to said straight tube portion, said curved portion being adapted to be housed in said exhaust pipe, said curved and straight tube portions defining a vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, said air intake of said carburator being connected to an air filter having a cover, a duct having an enlarged free end, said duct being supported by said cover and said enlarged free end entering said air intake, said anti-knock vapor pipe connecting said duct with said outlet nipple.

9. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a supply pipe, a feeding pipe, an anti-knock vapor pipe, a constant level reservoir comprising a container having a bottom portion and a side wall, a lid covering said container, a nipple integral with said lid, said anti-knock liquid tank being connected to said constant level reservoir through said supply pipe connected to said tank and said nipple, a substantially conical valve space defined in said lid and having an apex directed towards said nipple connected to said valve space and defining adjacent said nipple a valve seat, a valve head supporting plate supported by said lid and defining the base of said conical valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, said valve head being capable of closing the connection through said nipple by sitting on said valve seat, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to seat said valve head on said valve seat, a discharge conduit opening at said side wall into the bottom portion of said container including a portion located slightly above the uppermost liquid level determined by said float when seating said valve head on said valve seat, a manually ad-

justable needle valve arrangement connected to said discharge conduit adjacent said bottom portion, a substantially instantaneous vaporizer comprising a curved tube portion and a straight tube portion, a bracket integral with one of said tube portions, an inlet nipple and an outlet nipple connected to said straight tube portion, said curved portion being adapted to be housed in said exhaust pipe, said curved and straight tube portions defining a vaporizing chamber, said feeding pipe connecting said discharge conduit with said inlet nipple, an anti-knock vapor connecting element comprising a ring having a lower portion with slits, a clamp surrounding said lower portion, a duct connected to said ring and entering said ring in form of a baffle, said lower portion of said ring being connected to said air intake of said carburator, an air filter connected to said ring above said baffle, said anti-knock vapor pipe connecting said duct with said outlet nipple.

10. A charge forming device for use in connection with the fuel supply for internal combustion engines having a carburator with an air intake and an exhaust pipe and comprising an anti-knock liquid tank, a constant level reservoir comprising a main container and having a bottom portion and a weir, a supply container having a bottom portion, said main container being connected to said supply container through their respective bottom portions, a lid covering said main container, a nipple integral with said lid, said nipple entering said anti-knock liquid tank, a substantially conical valve space in said lid and having an apex directed towards said nipple, said valve space being connected to said nipple, a valve head supporting plate supported by said lid and defining the base of said valve space, said supporting plate being perforated, a conical valve head housed in said valve space and having an apex directed towards said nipple, a valve stem integral with said valve head and passing through said supporting plate and entering said container, said valve stem having a free end, a float in said container and capable of entering in contact with said free end of said valve stem and capable of rising said valve stem to close said nipple, said float defining a maximum normal anti-knock liquid level in said main container below said weir, a tube having an inlet nozzle at least partially housed in said supply container and at a level above the maximum of said liquid level of said main container, said tube being spaced apart from said supply container so that said anti-knock liquid may pass by said tube in said supply container and enter said tube through said nozzle, said tube having a free end discharge portion, a substantially instantaneous vaporizer associated in heat exchange relationship with said exhaust pipe of said engine, said vaporizer being connected to said free end discharge portion of said tube and to said air intake of said carburator.

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