

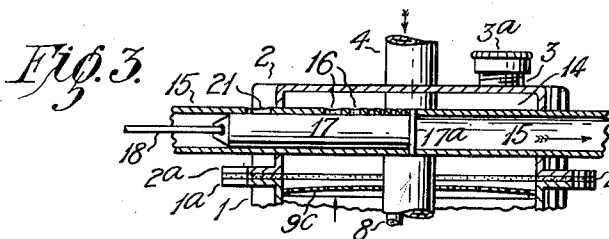
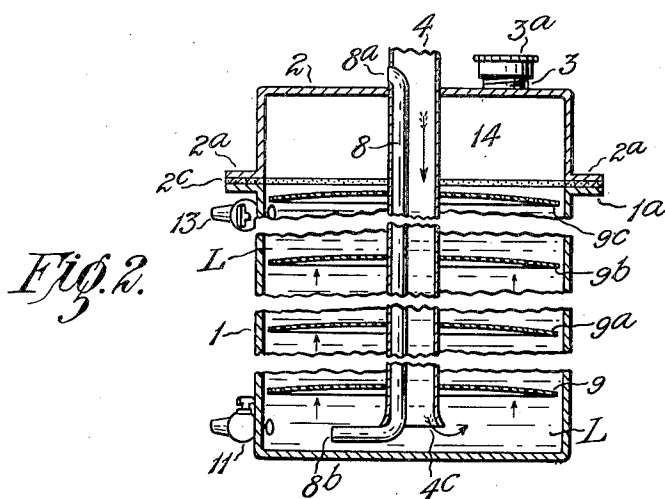
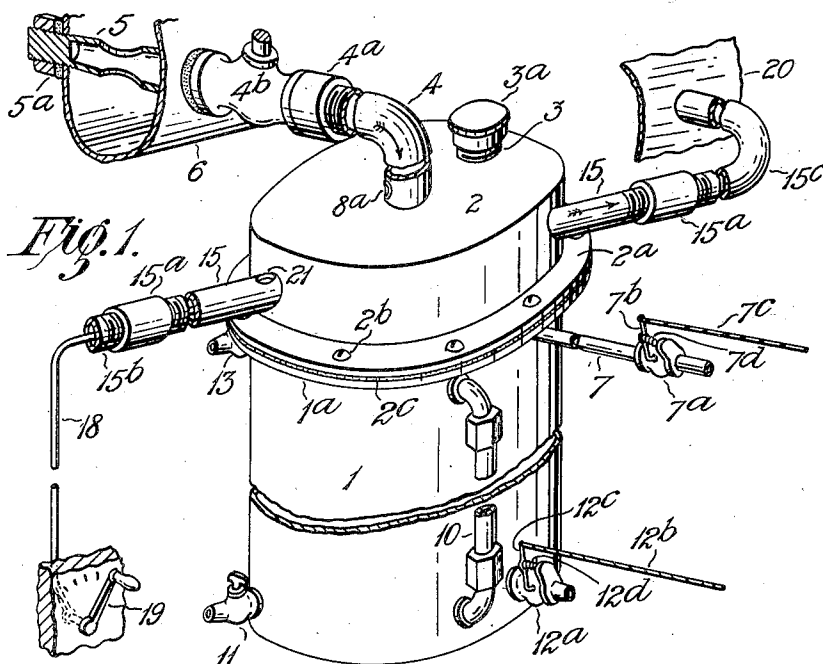
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CHARGE FORMING DEVICE FOR INTERNAL COMBUSTION ENGINES

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CHARGE-FORMING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

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My invention is of that class in which apparatus is provided to utilize portion of the exhaust from an internal combustion engine with the object of modifying it and adding the modification to the carburetted fuel which is on its way to the engine cylinders or cylinders. By so doing, greater engine power will be developed than when travelling on the carburetted fuel alone. I also find that the engine cylinders, when my invention is used, keep free, or nearly free, from carbon deposits. The utilization is preceded by splitting up of the exhaust, and by washing it in heated liquid (which may be boiling water). This frees it from matter which is detrimental relatively to the utilization—and ensures humidification of the exhaust which rises above the liquid into a space in the exhaust receiver head, from which it, with a proportion of any steam present, is drawn through a conductor to an intake manifold and mixed with the carburetted fuel, the whole passing to one or more of the engine cylinders. The feed of the humidified and washed exhaust can be regulated; that is the rate of supply of the humidified exhaust will be varied as the engine user (such as a motor car driver) may desire, and he will thus vary the power the engine exerts, and secure the power at approximately a minimum of fuel cost.

I illustrate construction according to my invention, but various details may be different while features hereinafter claimed are retained.

In the drawings, Figure 1 is a perspective view of my apparatus, diagrammatically shown with means of connection to an exhaust manifold on the left, and an intake manifold on the right, of an internal combustion engine.

Figure 2 is a diagrammatic view of this apparatus in section through inlet and vent tubes.

Figure 3 is a sectional view showing regulating devices. Arrows indicate directions of exhaust movement.

I provide an exhaust receiver 1 of any suitable size, shape and material, which will withstand any steam pressure arising within it. As an exhaust inlet to this receiver, a tube as 4 extends through the cover 2 to which it is at will secured by welding, a coupling 4^a facilitating outside disconnection. This tube extends deeply into the re-

ceiver, its lower part being much submerged; and outside the receiver the tube has control means as a cock 4^b, and connects with an entrance plug 5, which, in any suitable manner, as by clamp 5^a, is connected to the exhaust manifold 6.

The receiver cover is shown with a flange 2^a secured to a flange 1^a on the receiver by bolts 2^b; and 2^c is a gasket to ensure gas-tightness of the flange joint. The receiver has filling means, a neck 3 with a cap 3^a being shown on the cover; but a tube 7 with cock 7^a is also shown, and is of use to allow of distant control, 7^b being a plug lever, 7^c a pulling connection, and 7^d a cock closing means, shown as a spring.

The container has a safety outlet, shown as a tube 8, part of which is open to the atmosphere, its top 8^a being so shown, so that the internal pressure shall not exceed a predetermined limit. This tube extends sufficiently deeply into the receiver, as nearly to its base. A safety valve would function similarly, however. Tube 8 is, when it is desired that it be compactly located, set within tube 4, its lower end 8^b being extended, horizontally for example, to avoid undue proximity to the base 4^c of tube 4.

To ensure thorough splitting of the exhaust gas in the receiver, I provide a suitable number of baffles, shown apertured,—plates of wire cloth, perforated metal, or the like being usable, these extending across the receiver and being marked 9, 9^a, 9^b, 9^c. The top plate 9^c is not immersed, but the others are immersed in liquid L. Plate 9^c prevents splashing of the liquid upwardly.

Any means desired is used to allow of observation of the level of liquid in the receiver; thus 10 is a gauge. A pressure gauge is not illustrated, but its utility and applicability will be well understood.

The receiver is shown with an outlet cock 11 to allow of drawing off liquid for any purpose, a space of suitable size being necessary above the liquid for the cleansed exhaust, and for steam when the latter occurs. It is an advantage to connect the baffles to pipe 4, so that cover removal will also remove the piping and the baffles as a unit, allowing of easy cleaning of the receiver.

Liquid may be drawn off through a cock 12^a which will be controlled from a distance by a connection 12^b to a handle 12^c, a cock

closing means being indicated by a spring 12^a. A liquid outlet 13 is located at a height such that, by opening this cock, surplus liquid will discharge, and the liquid level will be left suitable for general use.

The temperature within the receiver will be high when the engine is running fast, and will partly depend upon the exhaust, but can be regulated, as for example by or discharging water, provided a supply be available. The air at 14 above the liquid will be displaced by the altered exhaust gas which, to the extent to which it is allowed to do so, will be sucked out or delivered through piping such as 15, which is perforated, and which enters space 14, at one side, and emerges from that space at the opposite side, or a like suitable point. This pipe as illustrated is secured to the cover by welding, but this mechanical detail is one of those allowing of variation. Holes or perforations 16 are shown in pipe 15 and allow the altered exhaust gas mixed with moisture, and frequently with steam, and in a heated condition, to enter the pipe, except in so far as the holes are closed by a plunger 17. These holes are advantageously made progressively larger in the direction in which the plunger is to be moved to increase the hole area open. The holes enable the feed through them to the pipe to be very fine at first, or when little petrol is being consumed, and to be finely regulated according to the local circumstances from time to time. Plunger 17 will be moved by a connection to a control. Thus for a distant control 18 is a connection to an operator's lever 19, which could be in the case of a motor car, on the steering column. The stroke of the plunger 17 is limited. Thus a stop pin 17^a is shown crossing the tube 15. Pipe 15 is shown with unions 15^a to pipes 15^b and 15^c, 15^b being a conduit for a connection 18, while pipe 15^c extends to the intake manifold, part of which is shown marked 20.

The pipe has means for communication from the receiver to the air. This is shown by a hole 21 which is normally closed, but which is openable; and in the case illustrated the opening will be due to moving the plunger 17 well outward. Hole 21 will be more or less opened by the driver, when he wishes to allow of escape to the atmosphere of some of the contents of space 14 to vary the engine action; or when the engine is stopped or about to stop, he may thus allow the said space to become empty.

In using this invention a portion of the exhaust is guided into the receiver 1, entering its liquid from the outlet 4^c of pipe 4. The exhaust then splits into many fine streams or bubbles, and rises into space 14, though the rise is delayed and obstructed by the baffles, which cause the exhaust to spread laterally and to deposit much of its

solid carbon and oily matter upon the surfaces it comes into contact with, these surfaces being extensive for that purpose. The exhaust becomes cleansed, and humidified, and in that state collects in the space 14, from which, with some steam, it will issue in a volume regulated by the area made available by whatever holes in pipe 15 are left open by plunger 17. When a large hole area is left open there will be a full and strong flow from the receiver into the manifold 20. When the driver of a motor car or engine fitted with my apparatus decides to increase the speed, he will increase the carburetted fuel supply, and will also cause plunger 17 to open a relatively large hole area. The mixture which will therefore occur in manifold 20 may be promoted by mixing devices, which I do not show, as gas mixing means are well known.

I claim:—

1. A charge forming device for internal combustion engines, comprising the combination of an exhaust receiver to contain water and having an enclosed space above the water, means extending from the exhaust manifold of the engine and interiorly traversing the receiver to near the bottom thereof to supply the exhaust from the engine directly to the receiver well below the water surface in the latter, means to wash, divide, spread and humidify the exhaust which will rise to the enclosed space from the said supply means, means to feed said risen exhaust and any steam which may be present from the enclosed space to the intake of the engine, and means to regulate the amount of said feed.

2. A charge forming device for internal combustion engines, comprising the combination of an exhaust receiver adapted to contain water and having an enclosed space above the water, a conduit extending from the exhaust manifold of the engine and interiorly traversing the receiver to near the bottom thereof, means secured to the conduit for spreading the exhaust within the receiver, and a removable cover for the receiver, said cover being secured to said conduit whereby said cover, conduit and spreading means may be removed as a unit from the receiver.

3. A charge forming device for internal combustion engines, comprising the combination of an exhaust receiver, a conduit through which exhaust from the engine may pass to the exhaust receiver, said conduit extending from the engine and interiorly traversing the receiver to near the bottom thereof, and a gas discharge pipe through which gaseous matter contained in or formed by the exhaust and directed to the exhaust receiver by said conduit may be discharged, said pipe traversing said conduit lengthwise and having one end opening into the re-

ceiver near the bottom thereof and its other end opening at atmosphere beyond the receiver.

4. A charge forming device for an internal combustion engine, comprising an exhaust receiver having an enclosed space at the top thereof, means for conveying exhaust from the engine to the receiver, means for supplying carbureted fuel to the engine means within said enclosed space to feed part of the contents of the exhaust receiver to the carbureted fuel, said last named means having closable apertures, and means controllable at a distance whereby the open area of the apertures is regulatable.

5. A charge forming device for an internal combustion engine, comprising an exhaust receiver having an enclosed space at the top thereof, means for conveying exhaust from the engine to the receiver, means for supplying carbureted fuel to the engine, means within said enclosed space to feed part of the contents of the exhaust receiver to the carbureted fuel, said last named means having closable apertures of progressively increasing area, and means whereby the smaller apertures will be opened first.

6. A charge forming device for an internal combustion engine, comprising an exhaust receiver adapted to contain water and having an enclosed space at the top thereof, means for conveying exhaust from the engine to the receiver, and means within the receiver for dividing and spreading the exhaust therein, said last named means comprising plates of finely apertured material spaced one above another with the uppermost plate above the water to prevent splashing thereof above said plate.

7. A charge forming device for an inter-

nal combustion engine, comprising an exhaust receiver having an upper enclosed space, means for conveying exhaust from the engine to the receiver and in which receiver the exhaust rises to said enclosed space, means for supplying carbureted fuel to the engine, means having apertures of progressively increasing size to feed the risen exhaust to the carbureted fuel, a plunger to regulate the aperture area opening, and means to move the plunger to open or close the apertures.

8. A charge forming device for internal combustion engines, comprising the combination of an exhaust receiver to contain water, and having an enclosed space above the water, means to supply the engine exhaust well below the water surface, means to spread and humidify the exhaust which will rise to the enclosed space from the said supply means, means controllable from a distance to raise or lower the level of the water in the receiver, means to allow of escape to the atmosphere of vapor from the enclosed space when required, means to open a passage from the enclosed space to feed vapor therein to the said carburetted fuel, and means to regulate the amount of the said opening.

9. The combination according to claim 8,—with the means for regulating the feed to the carburetted fuel controllable from a distance, and adapted to supply the vapor in very small quantity initially, with means to increase the rate of subsequent supply progressively according to increase in supply of carburetted fuel to the engine.

In witness whereof I have hereunto set my hand.

MICHAEL HEFFERNAN.