April 28, 1931. W. G. CRITCHLOW 1,803,097

HUMIDIFYING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 7, 1928 3 Sheets-Sheet 1

Fig. 1.

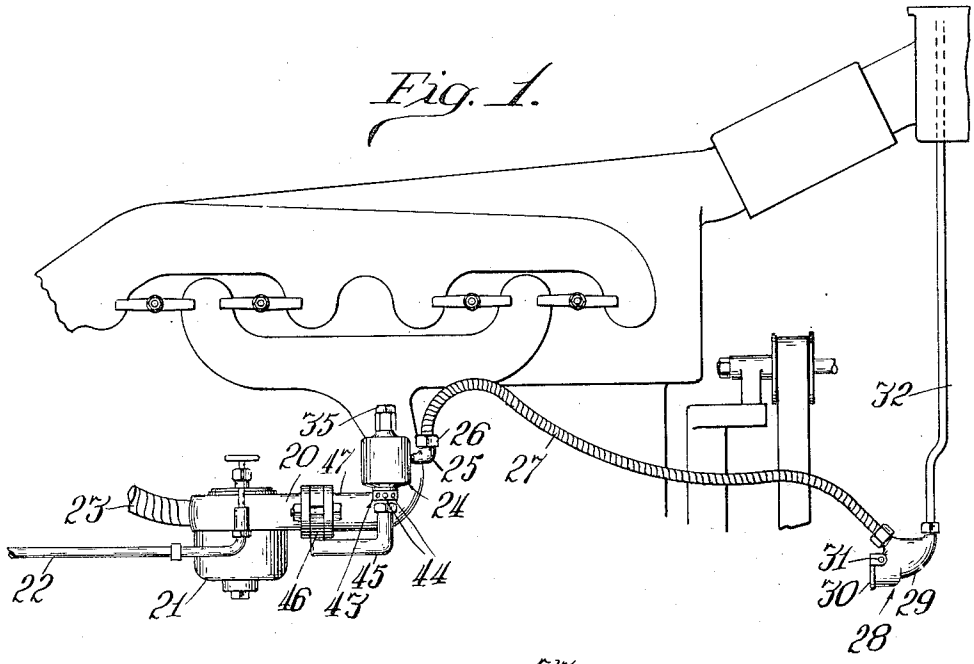


Fig. 4.

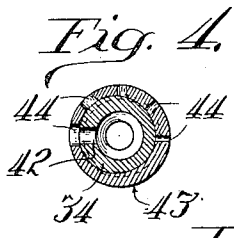
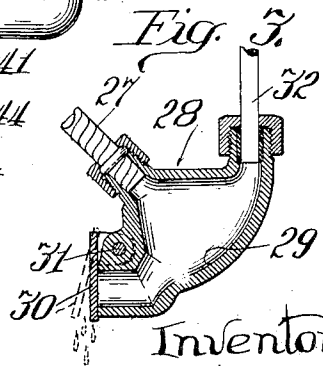


Fig. 2.

Fig. 3.



Inventor.

Walter G. Critchlow,

By George Heidmann

Attorney

Witnesses

Milton Senoir

A. O. Glorell

April 28, 1931. W. G. CRITCHLOW 1,803,097

HUMIDIFYING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 7, 1928 3 Sheets-Sheet 2

Fig. 5.

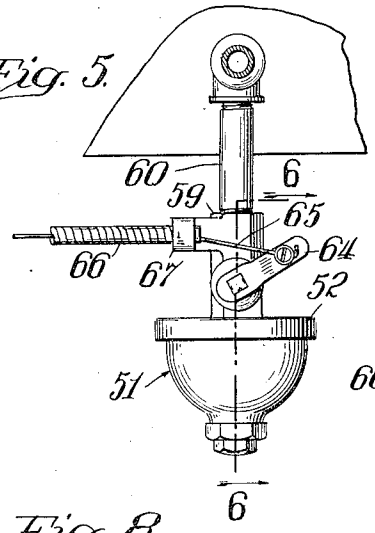


Fig. 6.

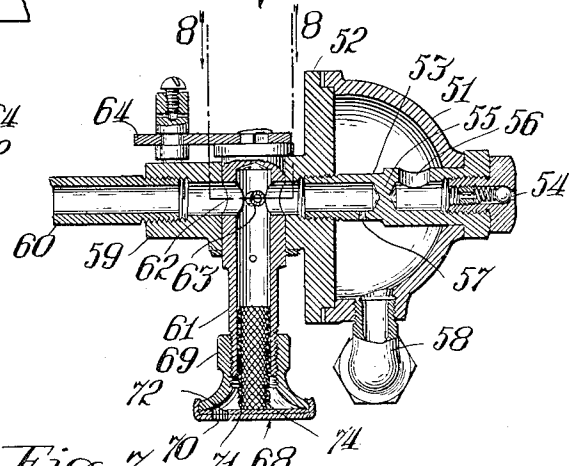


Fig. 8.

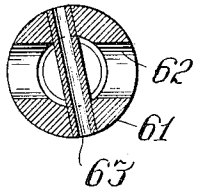


Fig. 7.

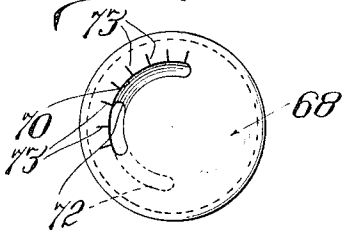
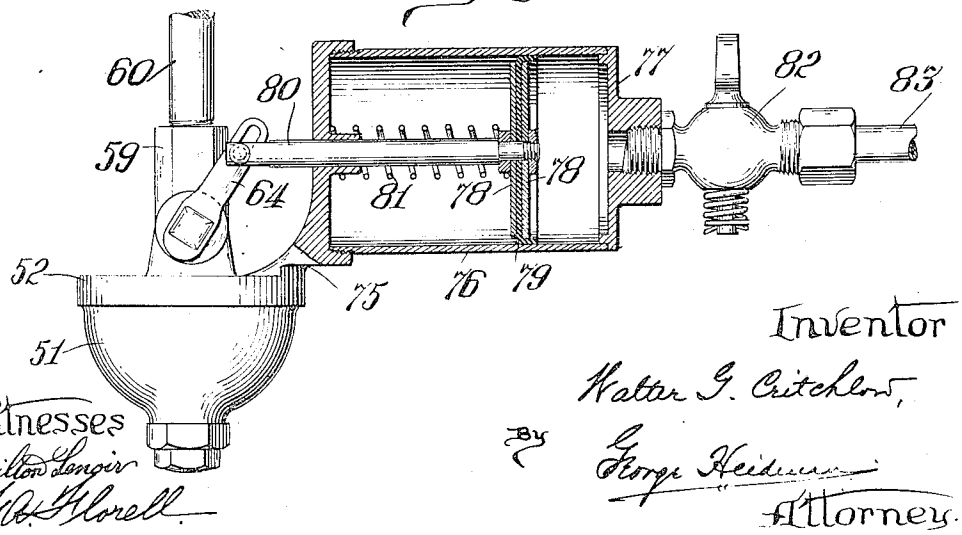


Fig. 9.



Witnesses
Milton Langer
J. R. Glorell

Inventor
Walter G. Critchlow,
By George Heidemann
Attorney.

April 28, 1931. W. G. CRITCHLOW 1,803,097

HUMIDIFYING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 7, 1928 3 Sheets-Sheet 3

Fig. 10.

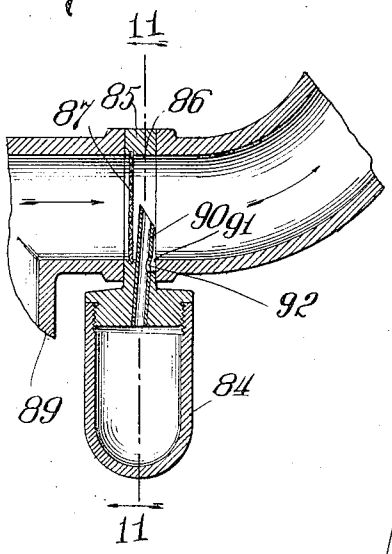


Fig. 11.

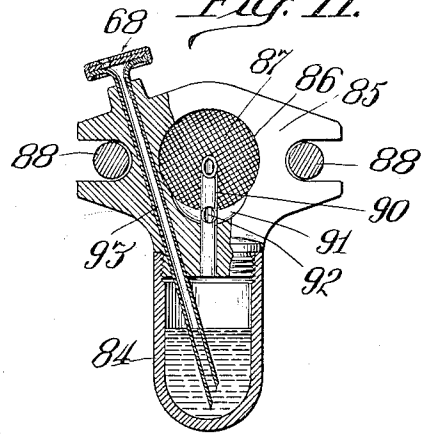


Fig. 13.

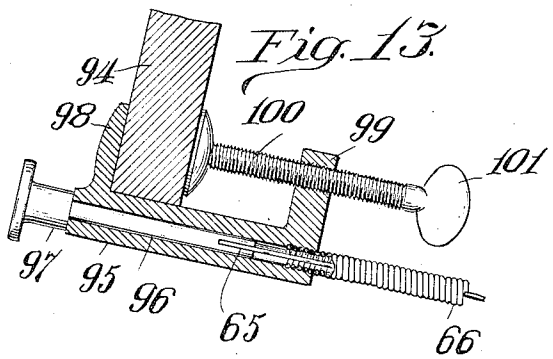
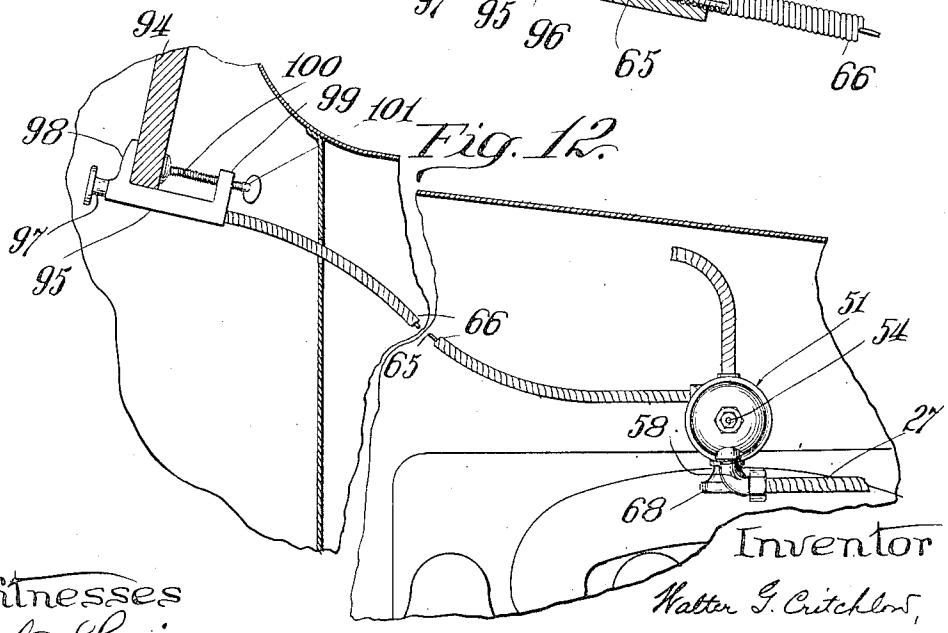


Fig. 12.



Witnesses
Milton Lenoir
E. B. Merrell

Inventor
Walter G. Critchlow,
By George Heidweiler
Attorney

Patented Apr. 28, 1931

1,803,097

UNITED STATES PATENT OFFICE

WALTER G. CRITCHLOW, OF WHEATON, ILLINOIS

HUMIDIFYING DEVICE FOR INTERNAL-COMBUSTION ENGINES

Application filed January 7, 1928. Serial No. 245,119.

My invention relates to means whereby the character of mixture admitted to the intake manifold of an internal combustion engine may be controlled to provide a mixture in keeping with the speed of operation, a great saving in fuel consumption obtained and the deposit of hard carbon in the cylinders eliminated.

The invention contemplates self regulating means as well as automatically and manually controlled means adapted to various types of engines and hook-ups, to suit the desires of the user and the particular requirements of conditions of the engine.

The objects of my invention and the advantages will be more readily apparent from the detailed description of the accompanying drawings, wherein:—

Figure 1 is a side elevation of portions of an engine, illustrating the application of one form of my invention.

Figure 2 is a sectional view of the form of my invention shown in Figure 1.

Figure 3 is a sectional view of the moisture trap as employed in the hook-up shown in Figure 1.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 2.

Figure 5 illustrates a modified form of my improved fuel control means, shown applied to a portion of an engine intake manifold.

Figure 6 is a sectional view taken on the line 6—6 of Figure 5 and which, for convenience, and for certain hook-ups, may be disposed horizontally as shown.

Figure 7 is a detail plan view of the air control shown in Figure 6.

Figure 8 is a detail sectional view taken on the line 8—8 of Figure 6.

Figure 9 is a partial elevation and partial sectional view of an automatically controlled embodiment of the invention.

Figure 10 is a sectional view of a portion of the engine intake and connected outlet end of a carburetor, illustrating another form of my invention.

Figure 11 is a vertical sectional view taken substantially on the line 11—11 of Figure 10.

Figure 12 illustrates my improved manual control of the valve mechanism as employed in the embodiment shown in Figures 5 and 6; portions of the dash and part of the engine being shown.

Figure 13 is a longitudinal section of the dash clamp portion of the control shown in Figure 12.

The embodiment of my invention shown in the first four figures of the drawings, involves means for admitting a small amount of moist air, in regulable quantities, to the ingoing charge of fuel coming from the carburetors of the engine; the device functioning in keeping with a preselected setting or adjustment.

My improved means in all of its embodiments is intended to be installed intermediate of outlet end 20 of the carburetor indicated at 21, having the fuel feed-line 22 and air conduit 23, and the intake of the engine.

As my invention does not relate to the carburetor, a further description of the latter is unnecessary.

The vapor mixer comprises the bowl 24, one side whereof is shown provided with an elbow or other suitable connection 25 shown threaded to receive a suitable coupling 26 whereby the end of the vapor supplying flexible conduit 27 is connected to the bowl 24.

The conduit 27 at its other end is connected to a moisture trap 28. The trap 28 is preferably of the shape shown with a downwardly sloping bottom 29 so as to cause a flow of excess moisture toward the lower end which is normally closed by the gravity controlled gate or valve 30 pivotally mounted adjacent to its top as shown at 31. The manner of operation of this valve for discharging excess moisture is shown in dotted lines in Figure 3.

The top of the trap 28, namely to the right of the point of connection of conduit 27, is provided with an opening to receive the lower end of the usual overflow pipe 32 of the radiator of the engine; the upper end of the overflow pipe 32 usually extends up into the radiator above the normal water level.

The bowl 24 is shown provided with a tube 33 extending vertically therethrough, see Figure 2, and threaded on its lower end to re-

ceive the threaded sleeve or coupling member 34 which extends upwardly through the bottom of the bowl 24. The upper end of the tube 33 is shown enlarged and counterbored and internally threaded to receive the apertured nut member 35 which contains a spring controlled check valve 36 which normally closes the air port 37. The counterbore of the enlarged end of tube 33 is also preferably provided with ported spring-seat member 38.

The check air valve 36 is a relief valve and operates merely when the suction within the bowl increases beyond a predetermined point and is adapted to admit an added amount of air sufficient to relieve the excess pressure from becoming effective in the radiator through conduit 27, trap 28 and overflow pipe 32.

The tube 33 intermediate of its ends is provided with a diaphragm or partition 39 arranged intermediate of the large port 40 and the minute port 41, which are preferably arranged at opposite sides of tube 33 as shown in Figure 2; with the minute port 41 preferably arranged opposite the vapor admitting connection 25 and therefore at a distance above the bottom of the bowl 24.

The sleeve or coupling member 34 intermediate of its ends and to the exterior of the bowl is provided with a large air port 42; and this part of the coupling member 34 is preferably externally threaded to receive the interiorly threaded ring valve 43 which is provided with a plurality of circumferentially spaced ports of varying sizes as shown at 44 and more clearly disclosed in Figure 4. It is apparent that proper rotation of the ring valve 43 will bring the selected port 44 into register with port 42 and thus allow inflow of the required quantity of air.

The lower end of the sleeve coupling 34 receives the upturned end of the hollow arm 45, thereby bringing the bore of the arm 45 in alignment with the end of tube 33 but in spaced relation therewith so as to provide the air receiving chamber therebetween as shown in Figure 2.

The opposite end of the arm 45 is also shown turned upwardly and terminates in a laterally spreading flange portion or head 46 which is intended to be firmly secured between the outlet end 20 of the carburetor 21 and the intake manifold 47 of the internal combustion engine.

The flanged head 46 is provided with a small duct 48 communicating with the bore of the arm 45 and terminating at top in a slight depression 49; the duct 48 being on the intake manifold side of the head. The side of the head 46, disposed toward the carburetor, is shown provided with a suitable mesh screen 50 which tends to break up the fuel issuing from the carburetor and thereby induces better vaporization immediately adjacent to the point of admission of the moist air resulting from my improved means heretofore described.

With the duct 48 terminating at the upper end in the shallow depression 49, the condensed fuel in intake manifold 47, resulting when the engine is shut off and generally referred to as re-run, will flow down from the manifold and be trapped by the shallow groove or depression 49 and made to flow down duct 48 into the horizontal portion of the arm 45, where it is retained as a priming medium for the next starting of the engine. Immediately upon the first turn-over of the engine shaft, air entering through ports 44, 42 into arm 45, will force the fuel from arm 45 up through duct 48 and into the engine; thus automatically supplying a rich or raw fuel charge in advance of the charge from the carburetor of a vaporized gas.

In Figures 5 to 7, I illustrate a modification of the invention adapted for manual control from the seat of the operator.

This embodiment comprises a suitable bowl 51 preferably provided with a removable cover 52 which is shown with a threaded opening to receive the threaded end of tube 53 which is substantially the same as to purpose and operation as tube 33 of the previous construction. The outer end of the tube 53 is provided with a check-valve 54, which is maintained on its seat by the spring as shown in Figure 2. The valve 54, like valve 36 in the previous construction, is a relief valve adapted to relieve excessive pressures and prevent same becoming effective in the radiator of the engine. The tube 53 has a partition 55; a large air port 56 on one side of the partition and a small port 57 on the opposite side of the partition. The side of the bowl 51 is provided with a coupling or elbow 58 whereby a vapor line, like vapor line or conduit 27, is connected to the bowl for admitting vapor from the overflow pipe of the radiator of the engine.

The top 52 of the bowl is shown provided with a stem 59, threaded at its outer end to receive a tube 60 which connects with the intake manifold of the engine.

The stem 59 is provided with a transversely disposed tube 61 adapted to rotate in the opening through the stem and is provided with a number of openings 62, 63, extending transversely therethrough to register, respectively, with the bore of stem 59 when the tube 61 has been properly positioned or rotated. As shown in Figure 6, the large opening 62 is in register with the bore of stem 59, while the small port or hole 63 is out of register with the bore of stem 59.

The tube 61 is closed at one end and there provided with an arm 64, to the outer end whereof is secured an operating wire 65 which passes through a protecting flexible cable 66 secured in the guide piece 67 secured to stem 59.

The operating wire 65 and cable extend to a suitable place on the dash of the vehicle where it is in easy reach of the operator to enable him to rotate tube 61 to meet conditions of operation.

The other end of tube 61 is provided with an air control cap 68 which is provided with a sleeve 69 threaded on the end of tube 61.

The cap comprises the outer portion provided with an arcuate slot 70 (see Figure 7) and an inner portion 71 which is likewise provided with an arcuate slot 72 of equal length. The outer portion of the cap having slot 70 is intended to be rotated, while portion 71 remains stationary with the sleeve 69.

By rotating the outer portion with its slot 70 in clockwise direction as viewed in Figure 7, the slot 70 may be moved entirely out of register with inner slot 72; Figure 7 showing a partial registration of the slots to the extent of the first three indicating degrees shown at 73.

These slots control the amount of air to be admitted into tube 61 and to be discharged in the path of the vapor admitted by connection 58 into bowl 51 and allowed to flow through the bore of stem 59 when the ports or openings 62 or 63 are placed in register with the bore in stem 59, thus permitting a predetermined amount of vapor and air to be taken into the intake manifold during the intake strokes of the pistons in the cylinders of the engine.

The air admitting end of tube 61 is shown provided with a tubular or small roll of screen 74 through which the air admitted by ports 70, 72 is made to pass. This prevents small particles of dust or grit passing into the intake of the engine.

With the device set as shown in Figure 6, a maximum amount of air and vapor is taken into the engine.

In Figure 9 I illustrate an automatic control of the tube 61, instead of the manual control shown in Figures 5 and 6.

It will be understood that the bowl 51 and its associated elements may be identical with those previously described, except that the cover 52 is shown provided with an integral bracket 75 for holding a cylinder 76; the bracket 75 also constituting an end wall for the cylinder; the opposite end being closed by the wall 77.

The cylinder 76 contains a piston composed of the disc 78, 78, between which a suitable gasket 79 is arranged to provide a snug fitting relation with the wall of the cylinder 76. The piston is secured to a stem 80 which extends through a suitable opening in bracket head 75 and is adjustably connected with the arm 64 which controls the tube 61 as previously described and shown in Figures 5 and 6.

The stem 80 is encircled by a spring 81 which tends to force the piston toward head 77 and also move the tube 61 therewith. The head 77 has a tapped opening to receive the threaded nipple of a valve 82 arranged in a tube 83 which connects with the exhaust manifold of the engine; the valve permitting control of the pressure admitted to the cylinder.

As the pressure in the exhaust manifold increases, namely after the speed of the motor increases, pressure will build up in cylinder 76 sufficiently to overcome the pressure exerted by spring 81 and cause piston 78, 79 to move against the spring 81, thereby oscillating arm or lever 64 and turn tube 61 so as to regulate the amount of vapor and air to be admitted into the intake of the engine.

With the construction shown in Figure 9, the character of mixture is automatically controlled and regulated in keeping with the work required or power to be exerted by the engine.

In Figures 10 and 11 I illustrate a simple embodiment of the invention, which consists of the bowl 84 which is preferably removably secured by threading the same on the flanged head 85. The head 85 is provided with the large opening 86 therethrough in which is located a wire screen 87. The sides of the flanged head 85 are apertured or slotted to receive the bolts 88, 88 whereby the head is secured in place between the flanged outlet of the carburetor (a portion whereof is shown at 89) and the inlet end of the intake manifold 47, with the opening 86 in the head 85 registering with the bores of the carburetor outlet and the intake manifold as shown in Figure 10.

The head 85 is provided with a small tube 90 which extends approximately to the center of the opening 86 where its end is preferably beveled on the side disposed toward the intake manifold; while the lower end of the tube terminates at the bottom of the head so as not to extend into the bowl 84. The bottom of opening 86 is shown preferably slightly dished at 91, see Figure 11, so as to direct the condensed fuel in the intake manifold toward the small opening 92, formed in the side of the tube 90 and thus allow a re-run of fuel into the bowl 84 when the engine is shut off.

The head 85 is also provided with a tube 93 which extends through the top of the flanged head 85 and to one side of the opening 86 therein. By reason of the confined space, the tube 93 is arranged at an inclination so as to permit it to extend beyond the bottom of the flanged head and into the bowl 84, with the lower end adjacent to the bottom of the bowl and preferably beveled as shown in Figure 11 so as to prevent closure of the tube when the bowl is completely screwed onto the head. The upper end of the tube (the tube being held against rotation) is provided with a slotted air admitting cap or

valve 68 similar to that shown in Figures 6 and 7 and previously described.

When the engine is in operation, the suction in intake manifold 47 causes the fuel, coming from the carburetor, to pass through the screen 87 and thereby be broken up into minute particles enhancing vaporization. This suction across the tip or upper end of the tube 90 causes a small amount of rich fuel to be withdrawn from bowl 84 through tube 90, in advance of the vapor from the carburetor, to act as a primer for the cylinders and also enriching the mixture ultimately coming from the carburetor.

The bowl 84 may initially be supplied either with water, gasoline, alcohol, or other suitable medium. It is apparent from the construction that the suction or intake stroke of the pistons in the cylinders will induce air, in keeping with the previous setting of the air valve or cap 68, to be drawn in through tube 93 into the bottom of the bowl 84; the air bubbling upward through the fluid in the bowl, and the vapor discharged through tube 90 into the intake manifold; while the condensed vapor or fuel in the intake manifold, when the engine is shut off, will flow back toward the opening 92 and be returned to the bowl 84 as a priming charge when the engine is again placed in operation.

In Figures 12 and 13 I have illustrated my improved means for providing for dash control of the mixture admitting tube shown, for example, in Figures 5 and 6; my improved means permitting of such control without necessitating drilling of the dash for the control wire 65 shown in Figure 5. In the exemplification, a portion of the dash is shown at 94, to which my improved means is clamped. This means consists of the elongated member 95 provided with an opening 96 extending longitudinally therethrough in which the headed plunger or stem 97 is slidably mounted; the inner end of the stem 97 having the control wire 65 secured thereto; while the tubular casing 66 for the wire is secured in the lower end of the bore or opening 96 in the member 95, as shown in Figure 13.

The ends of the member 95 are provided with the parallel and laterally disposed lugs 98 and 99; the lug 98 being intended to fit against the operator's side of the dash; while the lug 99 has a threaded hole to receive the threaded stem of the clamp screw or member 100 whose upper end is preferably enlarged to engage the forward side of the dash 94; the lower end having a suitable finger-grasp 101. It is apparent that the means may be readily clamped onto the dash by simply screwing up screw member 100; and the operator may adjust the mixture control tube 61 by either pulling on the headed end of plunger 97 or pushing the same inward, as the case may be, so as to provide a greater or lesser amount of mixture in keeping with the needs of the engine and operating conditions.

By arranging the moisture or vapor discharge tubes with the surrounding bowls or receptacles, with inlets of said tubes above the bottom of the bowls, it is apparent that condensate and any entrained dirt may accumulate in the bowls without passing into the tubes and into the intake manifold.

Furthermore, the creation of too great a suction in the radiator is prevented by the relief or check-valves heretofore described; while at the same time admission of water, in the event of overflow through the radiator overflow pipe, is prevented by my improved trap shown in Figure 3. The shutter or gate 30 is so pivoted that excess water in the trap will flow out of the lower end of the trap 29; the gate or shutter 30 being held closed by gravity and being maintained in closed position by the suction set up in the intake manifold by the pistons of the cylinders.

The exemplifications of the invention as herein described are believed to be the simplest embodiments of the invention and these embodiments have been described in terms employed merely as terms of description and not as terms of limitation as structural modifications are possible and may be made without, however, departing from the spirit of my invention.

What I claim is:—

1. A humidifying device comprising, in combination with the carburetor, the intake manifold and the water cooling system of an internal combustion engine, a receptacle having moisture conveying connection with the water cooling system and provided with a cored discharge head adapted to be interposed between the carburetor and the intake manifold, a screen arranged in the core of the head, an outlet conduit from the receptacle with its orifice disposed above the bottom of the receptacle and terminating on the intake manifold side of said screen, the discharge end of said conduit being formed to receive the back-flow of condensed vapor or fuel along the lower wall of the intake manifold.

2. A humidifying device comprising, in combination with the intake manifold and the water cooling radiator of an internal combustion engine, a receptacle arranged in communication with the intake manifold and with the radiator, a ported tube in the receptacle intermediate of the said points of communication, with the ports of the tube arranged above the bottom of the receptacle, regulable air admitting means communicating with the discharge end of said tube, and automatic means secured at one end of said tube for relieving excess suction in said receptacle.

3. Means comprising, in combination with

the intake manifold and the water cooling radiator of an internal combustion engine, a receptacle arranged in communication with the intake manifold and with the radiator, a tube intermediate of said points of communication and provided with ports in its sides intermediate of the ends, regulable air admitting means communicating with the outlet end of said tube, automatic means connected with the opposite end of the tube for relieving excess suction in said receptacle, and automatic means in the communication between the receptacle and the radiator for preventing excess moisture flowing into the receptacle.

4. In a humidifying device, a receptacle adapted to be placed in communication with the intake manifold and with the radiator of an internal combustion engine, a tube disposed through said receptacle intermediate of said points of communication, said tube having ports in its sides intermediate of its ends, regulable means secured at the outlet end of the tube for admitting air in advance of the point of communication with the intake manifold, and a trap in the communication between the receptacle and the radiator provided with a sloping side wall opposite to the point of connection leading to said receptacle, said trap at its lower end adjacent to said receptacle connection having a vertically swinging gate pivoted at its upper end for discharging excess moisture from said trap.

5. In a humidifying device for internal combustion engines, a closed receptacle provided with a tube disposed therethrough, said tube having a partition intermediate of its ends, ports arranged on opposite sides of the partition and communicating with the receptacle interior, a discharge member leading from one end of said tube to the intake manifold of an internal combustion engine, a pressure relief valve at the opposite end of said tube, a vapor line connected with said receptacle and in communication with the water cooling system of the engine, and regulable means for controlling the amount of air admitted at the discharge end of said tube.

6. In a humidifying device for internal combustion engines, a condensate receiving chamber provided with a tube disposed therethrough and having a vapor inlet port above the bottom thereof and adapted to be placed in communication with the intake manifold of an internal combustion engine, regulable air admitting means at the discharge end of said tube adapted to cause the air to mingle with the medium discharging through said tube, and air screening means in the path of the inflowing air.

7. In a humidifying device, a receptacle arranged in communication with the overflow pipe of the radiator of an internal combustion engine, a moisture and air conveying connection between said receptacle and the intake manifold of the engine, regulable means for separately controlling the amount of air admitted, adjustable means for controlling the flow through said connection, and means, operable from the dash of the vehicle, for manually controlling said last means and comprising a hollow member provided at opposite ends with parallel laterally disposed lugs, one of which has a tapped opening, an adjustable screw threaded through said tapped opening, said screw and the other lug being adapted to engage opposite sides of the dash of the vehicle, and a plunger slidable in the hollow member and operatively connected with said adjustable means.

8. In a humidifying device of the character described, a moisture line, a trap in said line comprising a casing of substantially sectoral shape in cross-section, the top radial wall at opposite ends being provided with tube receiving openings, while the bottom of the casing at the lower end of the arcuate wall is provided with an opening disposed toward one side of the casing; a closure member for said last mentioned opening pivotally secured adjacent its upper end so as to swing laterally and normally close through the action of gravity, said member being adapted to permit discharge of excess moisture from the casing.

WALTER G. CRITCHLOW.