May 10, 1927. 1,627,814

E. O. WEEKS

RADIATOR REFLOW DEVICE

Filed Jan. 21, 1921 2 Sheets-Sheet 1

Fig. 1

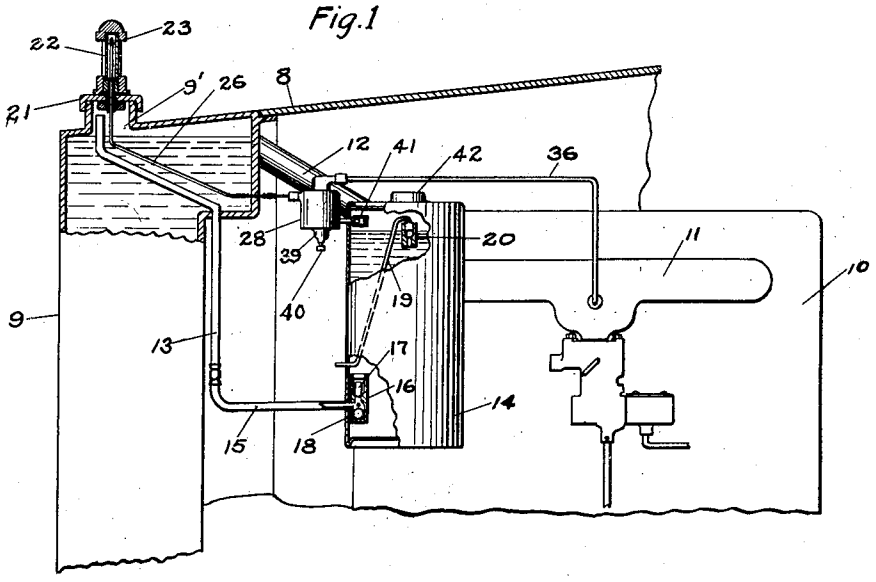

Fig. 2

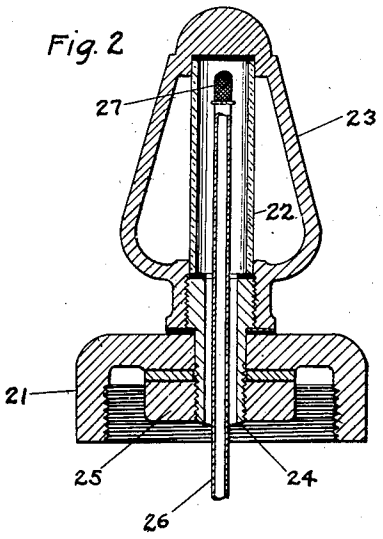

Fig. 4

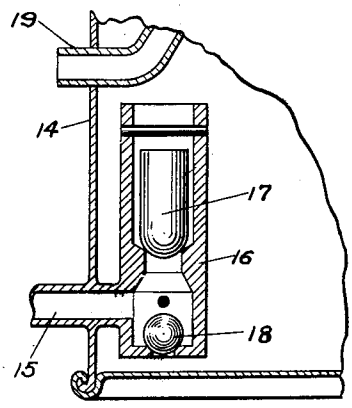

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Fig. 5

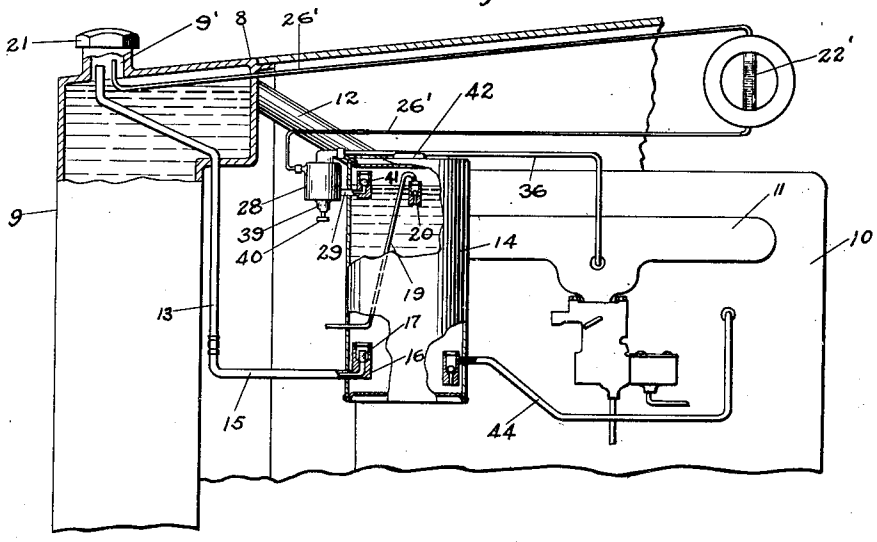
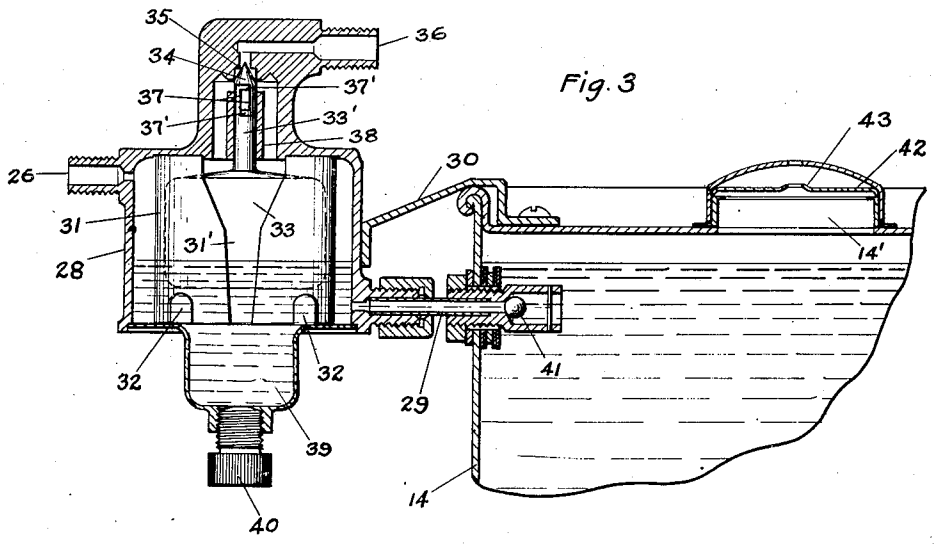


Fig. 3



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UNITED STATES PATENT OFFICE.

ELLING O. WEEKS, OF MILWAUKEE, WISCONSIN.

RADIATOR REFLOW DEVICE.

Application filed January 21, 1921. Serial No. 438,913.

This invention relates to improvements in radiator reflow devices, more particularly adapted for liquid cooled internal combustion engines of motor driven vehicles.

It is desirable to maintain the temperature of the walls of an internal combustion engine at a predetermined degree to operate the engine at the highest point of efficiency. Engines of this type are usually cooled with water which is circulated through a cooling radiator from the engine. In order to maintain the proper temperature of the engine, it is necessary to keep a predetermined level of water in the radiator without in any manner interfering with the circulation of the water between the radiator and the engine.

It is one of the objects of the present invention to provide a radiator reflow device which will accomplish the before mentioned desirable features in a very simple and efficient manner.

A further object of the invention is to provide a radiator reflow device which may be easily connected to automobile engines and radiators now in general use without impairing their appearance or interfering in any manner with the functions of the mechanism.

A further object of the invention is to provide a radiator reflow device having a means for receiving the overflow caused by expansion of the cooling medium within the radiator and returning it to the radiator when the cooling medium gets below a predetermined level.

A further object of the invention is to provide a radiator reflow device having a supplemental supply of cooling medium from which the radiator is automatically recharged from time to time to maintain a constant level of the cooling medium in the radiator.

A further object of the invention is to provide a radiator reflow device having means for connection with the intake manifold of the engine for producing a partial vacuum in the radiator and thereby return the cooling medium to the radiator.

A further object of the invention is to provide a radiator reflow device having a float means positioned outside of the radiator for automatically controlling the level of the cooling medium within the radiator and also for controlling the flow of moist vapor to the intake manifold of the engine.

A further object of the invention is to provide a radiator reflow device for supplying moist vapor to the intake manifold of the engine to improve the combustible quality of the motor fuel and to retard the formation of carbon in the cylinders of the motors.

A further object of the invention is to provide a radiator reflow device in which a visible means is provided for showing the reflow of the cooling medium to the radiator and an audible means provided for indicating a shortage of the cooling medium within the device.

A further object of the invention is to provide a radiator reflow device in which almost a constant circulation of the cooling medium is maintained between the radiator and the supplemental tank of the device to prevent freezing the medium in the tank or radiator in cold weather.

A further object of the invention is to provide a radiator reflow device which is of simple construction and efficient in operation, is strong and durable, and is well adapted for the purpose described.

With the above and other objects in view, the invention consists of the improved radiator reflow device and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a diagrammatic view, partly in section, of a portion of an automobile engine and radiator provided with the improved reflow device;

Fig. 2 is an enlarged view of the visual indicating means adapted to be mounted on the radiator cap of the automobile;

Fig. 3 is a vertical sectional view, on a larger scale, of the float chamber for automatically controlling the reflow of the medium to the radiator;

Fig. 4 is a detail sectional view of one of the supplemental tank valves; and

Fig. 5 is a diagrammatic view, partly in section, of a portion of an automobile engine and radiator provided with a modified form of reflow device.

Referring to the drawings, the numeral 8 indicates the front portion of an automobile which is provided with a radiator 9 and an internal combustion engine 10 having an intake manifold 11. The radiator is connected to the engine water jacket in the ordinary manner by tubes 12, only one of which is

shown, and is also provided with the usual overflow pipe or conduit 13 which extends within the radiator and near the upper portion thereof. The improved radiator reflow device comprises a supplemental tank or reservoir 14 which may be mounted on the engine as shown, or in any other convenient place. The supplemental tank has its lower portion connected to the lower end of the overflow pipe by a conduit 15 which forms a continuation of said overflow pipe, and the end of said conduit 15 within the tank is provided with a valve chamber 16 having a weighted intake valve 17 and an outlet valve 18. The valve 17 is opened by pressure in the radiator to admit the cooling medium from the overflow pipe to enter the tank 14 while the valve 18 is opened to permit atmospheric pressure to force the cooling medium from the supplemental tank 14 back through the overflow pipe to the radiator. The supplemental tank 14 is also provided with an overflow pipe 19 the outer end of which extends through a side portion of the tank and the inner end is provided with a check valve 20 for preventing the entrance of air through the said pipe.

The filling opening 9' is closed in the ordinary manner by a threaded cap 21 having a transparent sight tube 22 mounted on its upper portion.

The sight tube is mounted in a holding member 23 which is provided with a threaded tubular portion 24, and said threaded tubular portion extends through the cap and is locked thereto by a nut 25. Said threaded tubular portion 24 opens communication between the sight tube 22 and the interior of the radiator and preferably forms a convenient means for sealing the sight tube in the holding member. An air tube or conduit 26 extends through the inner wall of the radiator and upwardly into the upper end of the sight tube and its upper open end is covered by a wire screen cap 27 to prevent the entrance of foreign matter thereinto. The outer end of the air tube 26 extends to a float chamber 28 which is connected to the supplemental tank 14 by a tube 29 and a bracket 30. Said float chamber is formed with a cylindrical guide and deflector member 31 which is formed with a side opening 31' and lower edge openings 32 through which the cooling medium flows from the tube 29. A float 33 is guided in said deflecting member and carries a needle valve 34 at its upper end which closes a port 35 formed in the chamber 28. Said port 35 is in communication with the intake manifold 11 of the engine by a suction pipe 36 connected to the manifold and to the chamber. In order to permit the float 33 to play vertically a short distance without affecting the valve 34, both the valve and the float stem 33' are provided with coacting recessed portions 37 and shoulders 37' which permit loss movement between the two parts. The valve parts are held in engagement with each other by the tubular guide portion 38 of the float chamber. The float chamber is also provided with a depending sediment well 39 having a plug 40 threaded in its lower end to permit cleaning out the sediment.

The inner end of the tube connection 29 is provided with a valve 41 to prevent air entering the float chamber from the tank when a partial vacuum is created in the said chamber and the radiator.

The filling opening 14' of the tank is closed by a cap 42 which is provided with a whistle 43 adapted to make an audible sound when the cooling medium in the tank gets below the valve 18 so that the partial vacuum in the radiator will draw air through the cap whistle into the tank and from the tank through the overflow pipe to the radiator, thus producing an audible sound which will warn the driver that the tank needs refilling. When the system is filled with water and the engine started, the water or other cooling medium in the radiator will expand on being heated and overflow through the pipe 13 into the tank. If the water level in the radiator drops for any reason the suction of the intake manifold through the pipes 36 and 26 and the float chamber 28 will produce a partial vacuum in the radiator and cause atmospheric pressure to force water within the tank to raise the valve 18 and flow upwardly through the pipes 15 and 13 and into the radiator, and when the radiator is filled above its normal level as shown, the excess water will be drawn through the air pipe 26 and into the float chamber and raise the float and valve 34 to closed position and stop the suction from the intake manifold. When the vacuum in the float chamber is reduced, the valve 41 which has been held in closed position by the suction, will drop to open position and the excess water in the chamber above the level of the water in the tank will flow into the tank. While the water is entering the radiator from the overflow pipe, it will pass upwardly into the sight tube and be visible while flowing from the driver's seat of the vehicle. If the water in the cooling system gets too low, the whistle of the tank will sound a warning, and if the tank should be overfilled, the excess water will overflow through the pipe 19.

The suction of the intake manifold will also draw moisture from the float chamber into the said intake manifold and said moisture will mix with the incoming combustible vapor and improve the quality thereof, and in a measure eliminate the formation of carbon.

In normal use, the water is maintained in the radiator at the level shown in Fig. 1 and at which level the suction of the intake

manifold will draw steam or moist air from the upper portion of the radiator through pipe 26, valve chamber 28 and the pipe 36, and as soon as the vacuum caused by this intake manifold suction increases to an extent to permit the atmospheric pressure on the water in the tank 14 to act, the said pressure will force the valve 18 to open position and the water then will be forced up into the radiator through the pipes 15 and 13 and if the water entirely fills the radiator, it will then overflow and pass outwardly through the air tube 26 to the valve chamber 28 and the valve in said chamber will rise and cause the valve 34 to close and stop the suction from the intake manifold. With the stoppage of this suction, the water in the valve chamber 28 will flow outwardly through the pipe 29 back to the tank 14 and at the same time the water in the radiator above the tube 13 will overflow into said tube and out through the tube 15 and into the tank 14. The float valve 33 will, of course, drop, but until it drops down to the end of its stroke, the valve 34 will remain closed due to the lost motion between said valve and said float 33. The operation of the parts mentioned is practically continuous, so that there is almost a continuous suction and flow of water back and forth from the radiator to the tank 14 and during this movement of the water, the float is visible through the sight tube 22. During the period when the water in the radiator is below the upper end of the tube 13, and the valve 34 is in open position, moist air or steam can pass from said radiator to the intake manifold. Water can only be drawn through pipe 26 when the operation of the device has entirely filled the radiator up to the top of the tube 22.

In the modified form shown in Fig. 5, the radiator sight tube is omitted, and in lieu thereof, a sight tube 22′ is mounted on the instrument board of the vehicle and is connected in the loop of the air tube 26′ which extends from the upper portion of the radiator to the float chamber 28, so that the action of the water is visible at the dash. The lower portion of the tank is also connected to the water chamber of the engine by a valved pipe 44 to provide for a constant circulation of the water through the tank.

From the foregoing description, it will be seen that the invention is well adapted for the purpose described.

What I claim as my invention is:

1. An internal combustion engine having a liquid cooling system, a supply tank for maintaining a normal supply of liquid in the system, and a transparent tubular sight device visible from the driver's seat and included in the liquid circuit and through which the liquid flows from the tank to the system.

2. An internal combustion engine having a liquid cooling system, a transparent tubular sight device included within the liquid circuit of said cooling system and through which the liquid flows, and a tank for maintaining a normal supply of liquid in the system and which liquid is visible through the sight device when in movement.

3. An internal combustion engine having a liquid cooling system including a radiator provided with a capped filling opening, a transparent member mounted on said cap and in communication with the interior of the radiator, a tank, an overflow and reflow conduit connecting the upper portion of the radiator to the tank, a float chamber having a port, a float valve controlling said port, a conduit connected to the float chamber and extending into the upper portion of the transparent member, and another conduit connecting the port to the engine.

4. In combination with an internal combustion engine having an intake manifold and a radiator provided with an overflow pipe, a supplemental tank connected to the overflow pipe, a float chamber connected to the tank and having a port, a float valve controlling said port, a tube connecting the float chamber to the upper portion of the radiator, and a tube connecting the float chamber port to the intake manifold.

5. In combination with an internal combustion engine having an intake manifold and a radiator provided with an overflow pipe, a supplemental tank, a supply conduit connecting the overflow pipe to the tank, a float chamber connected to the tank and having a port, a float valve controlling said port, a conduit connecting the float chamber to the upper portion of the radiator, a conduit connecting the port to the intake manifold, and an overflow conduit for the tank.

6. In combination with an internal combustion engine having an intake manifold and a radiator provided with an overflow pipe, a supplemental tank, a conduit connecting the lower portion of the tank to the overflow pipe, a check valve controlling said conduit, a float chamber positioned adjacent the tank and having a port, a conduit connecting the float chamber to the upper portion of the tank and having a check valve controlling the flow therethrough, a float valve within the float chamber for controlling the port, a conduit connecting the float chamber to the upper portion of the radiator at a point higher than the upper end of the overflow pipe, and a conduit connecting the port to the intake manifold.

7. In combination with an internal combustion engine having an intake manifold and a radiator provided with an overflow pipe, a supplemental tank, a conduit connecting the lower portion of the tank to the overflow pipe, a check valve controlling said conduit, a float chamber positioned adjacent

the tank and having a port, a conduit connecting the float chamber to the upper portion of the tank and having a check valve controlling the flow therethrough, a float valve within the float chamber for controlling the port, a transparent tube extending upwardly from the upper portion of the radiator and in communication therewith, a suction pipe connected to the float chamber port and to the intake manifold and a conduit connected to the float chamber and extending into the radiator and upwardly into the upper portion of the transparent tube and in communication therewith.

8. In combination with an internal combustion engine having an intake manifold and a radiator provided with a capped filling opening and an overflow pipe, a supplemental tank, a conduit connecting the lower portion of the tank to the overflow pipe and provided with an inlet and an outlet check valve, a float chamber having a port, a float within said float chamber having a valve for controlling said port, said float having a predetermined amount of play without moving the valve, a transparent member mounted on the radiator cap and in communication with the interior of the radiator, an air pipe connected to the float chamber and extending within the radiator and upwardly through the filling opening and into the upper portion of the transparent member and having an open end, a suction pipe connected to the float chamber port and to the intake manifold, and an overflow pipe extending to the upper portion of the tank.

9. In combination with an internal combustion engine having an intake manifold and a radiator provided with an overflow pipe, a supplemental tank connected to the overflow pipe, a float chamber connected to the tank and having a port, a float valve controlling said port, a tube connecting the float chamber to the upper portion of the radiator, and a tube connecting the port to the intake manifold of the engine.

In testimony whereof, I affix my signature.

ELLING O. WEEKS.