April 23, 1929. A. B. MODINE 1,709,863

COOLING APPARATUS

Filed Sept. 25, 1925 2 Sheets-Sheet 1

Fig. 1.

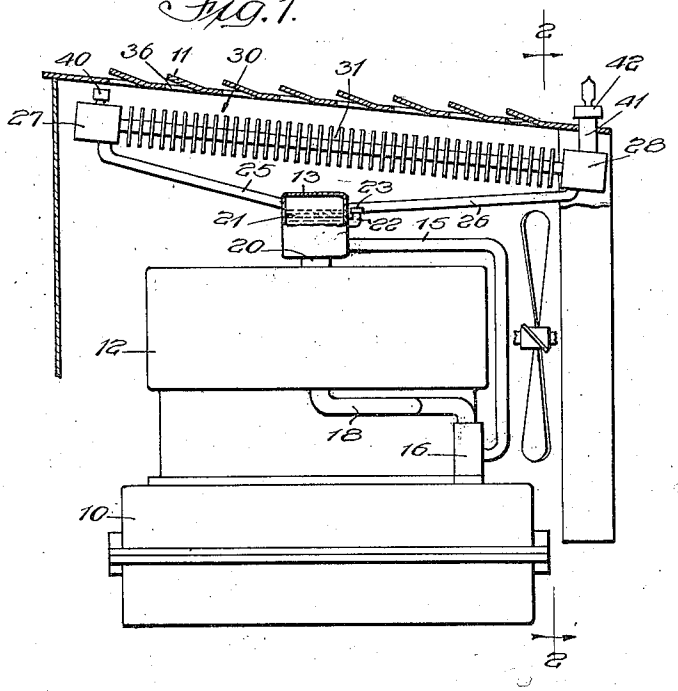
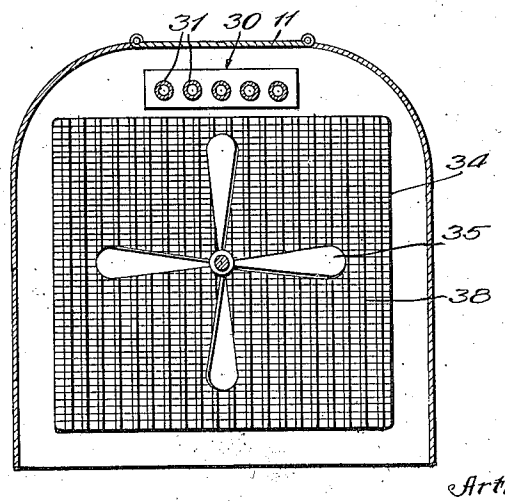


Fig. 2.



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Fig. 3.

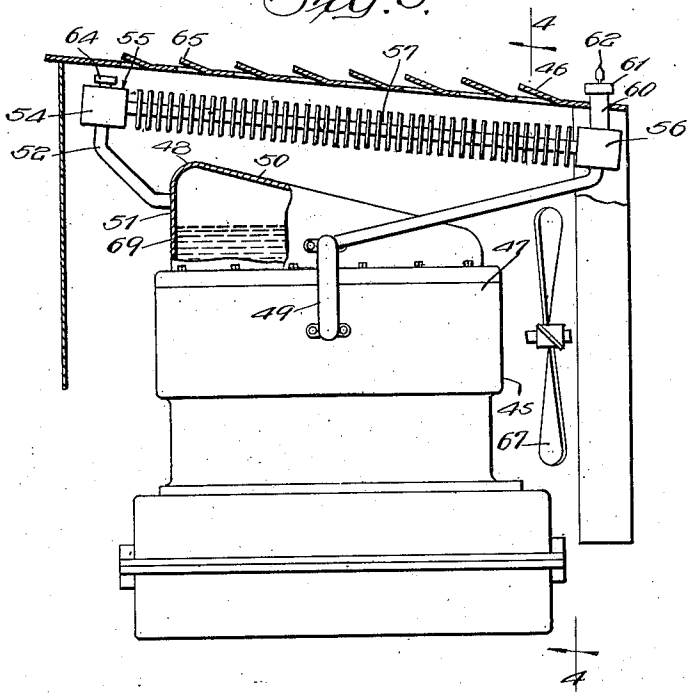
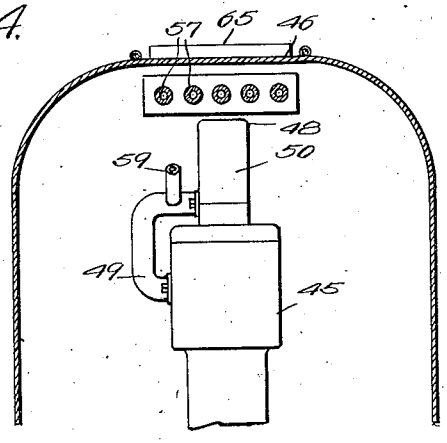


Fig. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR B. MODINE, OF RACINE, WISCONSIN.

COOLING APPARATUS.

Application filed September 25, 1925. Serial No. 58,544.

My invention relates to cooling apparatus and particularly to cooling apparatus for internal combustion engines and the like. The invention has among its other objects the production of apparatus of the kind described which is simple, convenient, compact, durable, reliable, efficient and satisfactory for use wherever found applicable. A particular object of the invention is to provide apparatus of the kind described wherein the cooling medium will be maintained at substantially a constant temperature when the apparatus is in use. Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a vertical section taken through the hood of an automobile and illustrates one form of my invention in connection with an internal combustion engine positioned within the hood;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken in the same manner as Fig. 1 illustrating another form of the invention; and

Fig. 4 is a section taken on line 4—4 of Fig. 3.

While I prefer to disclose my invention in connection with an internal combustion engine forming part of an automobile, it will become apparent as this description progresses that I am not limited to this particular use of the improved apparatus. The invention may be embodied in apparatus for cooling compressors or the like and various other devices. Therefore, I am limited to the illustrated use only in so far as defined in the appended claims.

Referring for the present to Figs. 1 and 2, the reference character 10 designates an internal combustion engine disposed within the usual hood 11 of an automobile. The internal combustion engine 10 comprises a water jacket 12 through which a cooling medium may be passed to keep the cylinders of the engine at a working temperature. Preferably disposed above the engine 10 is a receptacle 13 which may be of any suitable size and shape. The receptacle 13 is connected by a pipe 15 to the intake of a suitable pump 16 which is driven in the usual manner by the engine 10. The outlet of the pump 16 is connected by a pipe 18 to the water jacket 12, the water jacket 12 being connected by a pipe 20 to the receptacle 13. Obviously, when the pump 16 is in operation any cooling fluid disposed in the system will circulate from the receptacle 13 through the pipe 15, the pump 16, the pipe 18, the water jacket 12 and back through the pipe 20 to the receptacle 13. The level of the cooling fluid in the receptacle 13 is preferably maintained at a height indicated by the dotted line 21. For this reason I provide the receptacle 13 with a filling spout 22 so positioned that the receptacle cannot be filled above the line 21. The filling spout 22 is normally sealed by a cap 23. Communicating with the portion of the receptacle 13 above the line 21 are a plurality of tubes 25 and 26, the tube 25 connecting the receptacle with a header 27 and the tube 26 connecting the receptacle 13 with a header 28. The headers 27 and 28 form parts of a condenser designated in its entirety by the reference character 30. The condenser 30 may be a radiator of the type generally provided in automobiles and the like. In this instance I have shown the condenser 30 as comprising a plurality of tubes 31 connecting the headers 27 and 28.

If water is employed as the cooling medium, it is readily understood that the water will circulate in the manner above described and that no appreciable amount of it will enter the condenser 30. Also as the water does not pass through a condenser or a radiator it is obvious that the temperature thereof will quickly rise to the boiling point which is the temperature at which I prefer to operate the internal combustion engine 10. As the water continues to boil, the steam generated therefrom flows through the tubes 25 and 26 into the condenser 30, wherein it is subjected to the cooling effect of air flowing past the tubes 31. The steam then condenses and gravitates through the tubes 25 and 26 to the receptacle 13.

To maintain the draft through the hood 11, I preferably provide an opening 34 in the front wall thereof through which a fan 25 may draw air to be discharged through vents

36 provided in the upper wall of the hood. A fan 35 may be driven by the internal combustion engine 10 in the usual manner. As shown in Figs. 1 and 2, the air discharged through the vents 36 must pass through and around the condenser 30 in such manner that the tubes 31 are continuously cooled.

A grating or a plurality of bars 38 may be provided in the opening 34 to protect the fan 35. In cold weather the opening 34 may be closed or partially closed in the usual manner to prevent excessive cooling of the cooling medium. However, in any weather the apparatus will function at a substantially constant temperature and so insure sufficient operation of the internal combustion engine 10. To prevent injury to the apparatus in the event an excessive amount of steam is generated therein, I preferably provide a safety valve 40 upon the header 27 which will automatically relieve the pressure in the steam when it rises above a predetermined point. A second filling spout 41 may be provided upon the tank 28, as a filling spout so positioned is more assessible than the filling spout 22. When the cooling fluid is introduced into the receptacle 13 from the filling spout 41, the cap 23 is preferably removed from the filling spout 22 so that the cooling fluid will be maintained at the predetermined level indicated by the dotted line 21. The usual cap 42 may be provided for the filling spout 41.

A feature of this invention is that the condenser 30 will be drained of all fluids when the automobile is not in use or when the engine is not running. This insures that the relatively expensive condenser will not be injured during cold weather.

In Figs. 3 and 4 I have illustrated another form of the invention wherein apparatus is provided for controlling the temperature of an internal combustion engine 45, the engine being disposed within a hood 46 of an automobile. The engine comprises a water jacket 47, the upper end of which is closed by a hood or housing 48. Communicating with the interior of the housing 48 and with the water jacket 47 is a U-shaped pipe 49. As shown, the hood or housing 48 comprises a top wall 50 which slopes downwardly toward the front end of the housing. Secured in the rear wall 51 of the housing 48 is one end of a conduit 52, the other end of which communicates with a header 54 forming part of a radiator or condenser 55, the condenser 55 also comprising a header 56 and a plurality of tubes 57 which communicate with the headers 54 and 56. Communicating with the header 56 is a conduit 59 which also communicates with the upper leg of the U-shaped pipe 49. A filling spout 60 is preferably provided upon the header 56, the spout being provided with a closure member 61. A valve 62 of well-known construction may be mounted in the member 61 to permit air to escape from the cooling system. A safety valve 64 is preferably provided so that any excessive pressure in the steam will be immediately relieved. The upper wall of the hood 46 may be provided with a plurality of vents 65 to permit a draft to be maintained through the hood by means of the usual fan 67.

In practice, the water jacket 47 and the housing 48 are preferably filled with water to a level indicated by the dotted line 69. When the engine is operated the heat therefrom causes the water to boil and the generated steam passes through the conduit 52 to the condenser 55. The steam is condensed as it passes through the condenser, and is returned to the U-shaped pipe 49 by way of the conduit 59. Obviously, as the condensed water will be cooler than the water in the housing 48, it will flow downwardly through the pipe 49 and directly into the water jacket 47.

It will be noted that in the latter form of the invention, I have not provided a pump or any other means for producing a forced circulation through the cooling system. It will also be noted that the condenser 55 will always be drained of liquid when the automobile is not in use. Obviously, in the latter form of the invention, as well as in the first described form thereof, the engine may be readily maintained at a temperature corresponding to the boiling point of the liquid employed in the cooling system.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating with said jacket, said chamber being positioned directly above said water jacket, a condenser normally closed to the atmosphere and positioned above the level of the liquid in said chamber, said condenser lying in a plane slightly inclined to the horizontal and being adapted to receive vapors from said chamber, means for returning condensate from said condenser to the liquid in said cooling apparatus and means for preventing the filling of said apparatus with liquid above said chamber.

2. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating with said jacket, said

chamber being positioned directly above said water jacket, means including a pump for withdrawing liquid from said chamber and discharging it into the lower end of said jacket, a condenser normally closed to the atmosphere and positioned above the level of the liquid in said chamber, said condenser lying in a plane slightly inclined to the horizontal and being adapted to receive vapors from said chamber, and means for returning condensate from said condenser to the liquid in said cooling appartus and means for preventing the filling of said apparatus with liquid above said chamber.

3. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating with said jacket, said chamber being positioned directly above said water jacket, a condenser normally closed to the atmosphere and positioned above the level of the liquid in said chamber, said condenser lying in a plane slightly inclined to the horizontal and being adapted to receive vapors from said chamber, means for returning condensate from said condenser to the liquid in said cooling apparatus, and means for permitting the escape of vapor therefrom when the pressure within said apparatus exceeds a predetermined value.

4. In an automobile having a hood, an internal combustion engine in said hood, said engine having a water jacket, a chamber disposed above said engine and communicating directly with said jacket, said chamber being positioned directly above the water jacket, means whereby liquid withdrawn from said chamber is discharged into the lower end of said jacket, a condenser disposed in said hood above the engine and above said chamber, said condenser comprising tubular means disposed at a relatively small angle to the horizontal, and means operatively connecting the condenser with said chamber.

5. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating directly with said jacket, said chamber being positioned directly above said water jacket, a filling tube communicating directly with said chamber and adapted to prevent the filling of said apparatus with liquid above the level of said chamber, a condenser positioned above the level of the liquid in said chamber and adapted to receive vapors from said chamber, means for returning condensate from said condenser to the liquid in said cooling apparatus, and a second filling tube communicating directly with said condenser.

6. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating directly with said jacket, said chamber being positioned directly above said water jacket, a tubular condenser normally closed to the atmosphere and positioned above the level of the liquid in said chamber, said condenser lying in a plane slightly inclined to the horizontal and having a header at each end thereof, means for conveying vapors from said chamber to one of said headers, and means for returning condensate from the other of said headers to the liquid in said cooling apparatus.

7. Cooling apparatus of the kind described comprising a water jacket associated with the device to be cooled, a chamber positioned above the level of the liquid in said jacket and communicating directly with said jacket, said chamber being positioned directly above said water jacket, a tubular condenser normally closed to the atmosphere and positioned above the level of the liquid in said chamber, said condenser lying in a plane slightly inclined to the horizontal and having a header at each end thereof, means for conveying vapors from said chamber to one of said headers, means for returning condensate from the other of said headers to the liquid in said cooling apparatus, and means for preventing the filling of said apparatus with liquid above the level of said chamber.

In testimony whereof, I have hereunto signed my name.

ARTHUR B. MODINE.