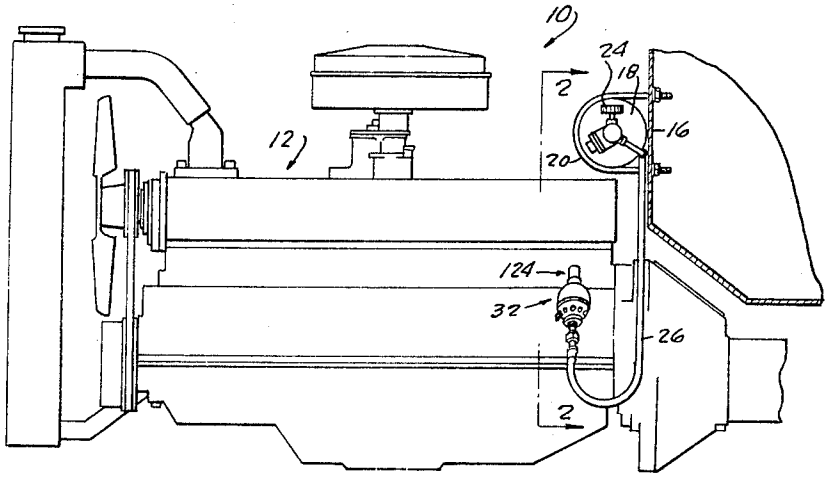
Oct. 11, 1966 R. H. RYALS ETAL 3,277,886

GAS-FIRED LIQUID HEATER

Filed May 15, 1964 2 Sheets-Sheet 1

FIG. 1.



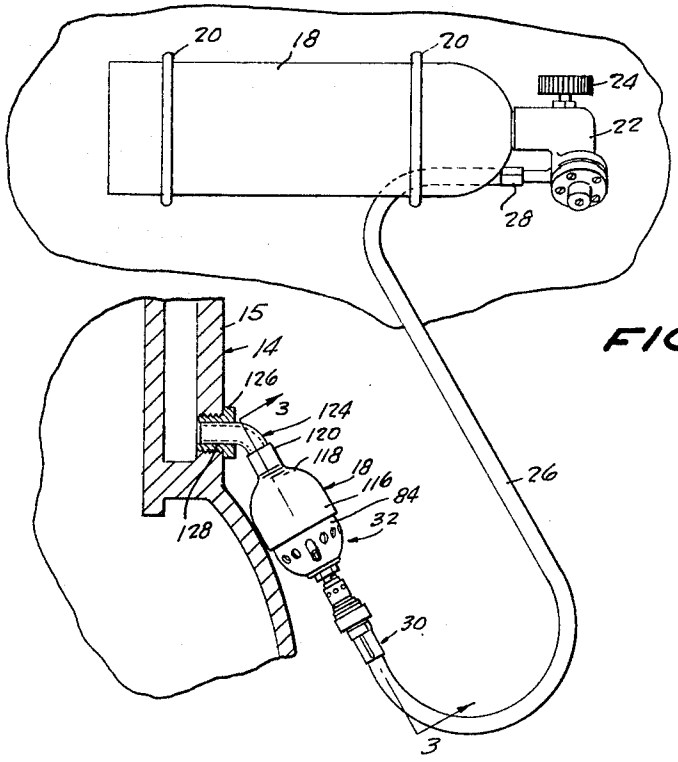


FIG. 2.

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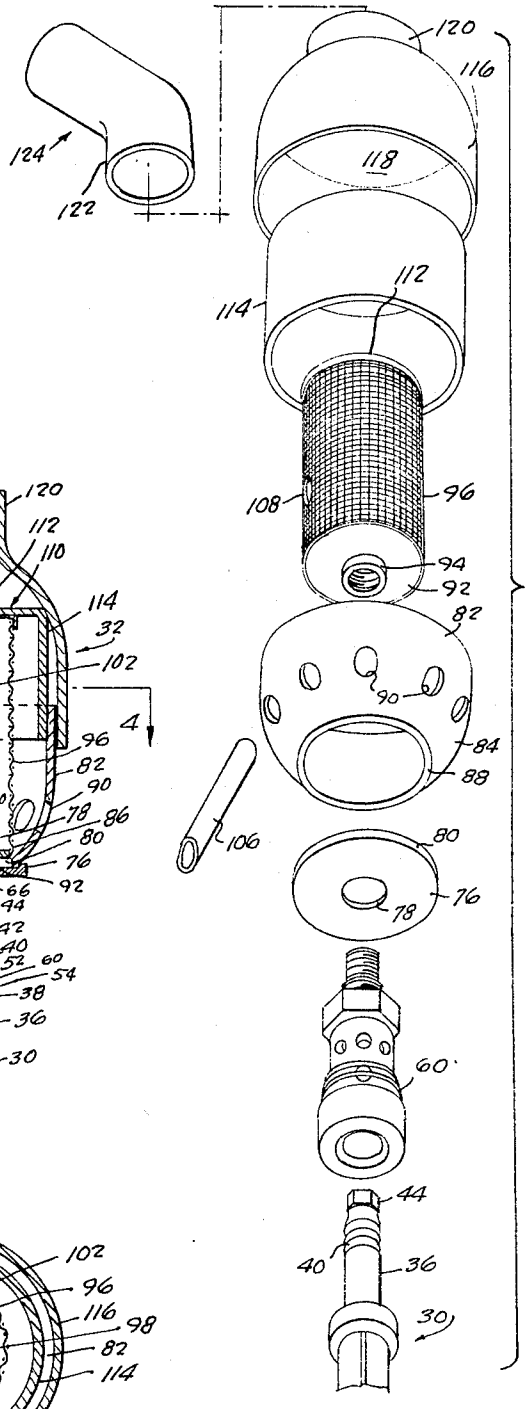


FIG. 5.

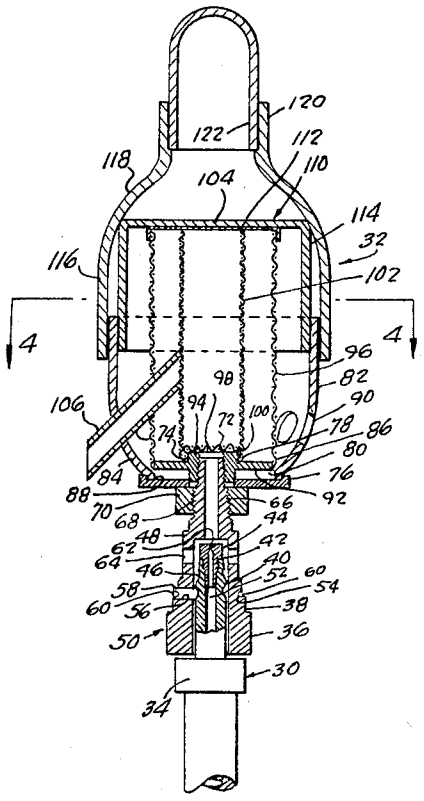


FIG. 3.

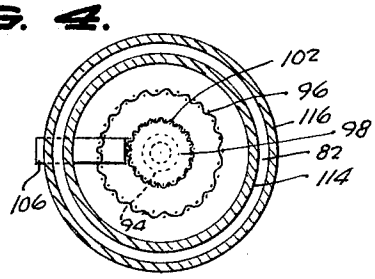


FIG. 4.

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3,277,886

GAS-FIRED LIQUID HEATER

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Filed May 15, 1964, Ser. No. 367,667
10 Claims. (Cl. 126—350)

This invention relates to heat exchange devices and, more specifically, the instant invention pertains to a gas-fired heating device having special application to use in conjunction with internal combustion engines, but is not limited thereto.

One of the primary objects of this invention is to provide a gas-fired heating device for use with water-cooled internal combustion engines when it is necessary that the same be operated in extremely cold regions which necessarily makes the starting of a cold engine quite difficult and causes considerable wear to those elements of the engine which must move relative to one another during the starting operation.

A further object of this invention is to provide a gas-fired heating device which may be easily connected with the water jacket of an internal combustion engine whereby the water generally employed as the liquid coolant for the engine may be quickly warmed to a temperature sufficiently high as to raise the temperature of the engine block, the lubricants utilized therein and the lubrication system to their proper operating temperature, whereby friction between the moving parts of the starting mechanism and of the engine is greatly reduced.

It is still a further object of this invention to provide a gas-fired heating device for use in connection with an internal combustion engine, the device being readily disassembled for inspection and repair, and easily reassembled for installation on an internal combustion engine.

This invention contemplates, as a still further object thereof, the provision of a gas-fired heating device which is non-complex in construction and assembly, inexpensive to manufacture and maintain, and which is durable in use.

Other and further objects and advantages of the instant invention will become more evident from a consideration of the following specification when read in conjunction with the annexed drawings, in which:

FIGURE 1 is a fragmentary side elevational view of a conventional automobile and showing the gas-fired heating device constructed in accordance with this invention in its operative associated position relative to the internal combustion engine;

FIGURE 2 is an enlarged fragmentary cross-sectional view, FIGURE 2 being taken substantially on the vertical plane of line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is an enlarged detail, medial longitudinally-extending cross-sectional view of the heating device, FIGURE 3 being taken substantially on the inclined plane of line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is a detail cross-sectional view, FIGURE 4 being taken substantially on the horizontal plane of line 4—4 of FIGURE 3, looking in the direction of the arrows; and

FIGURE 5 is an enlarged exploded perspective view of the gas-heating device according to this invention.

Referring now more specifically to the drawings, reference numeral 10 designates, in general, a conventional automotive vehicle having an internal combustion engine 12 and provided with a water jacket 14 which includes an outer sidewall 15. Reference numeral 16 denotes the usual upright firewall which is disposed in juxtaposition relative to the rear end of the engine or motor 12.

An elongated substantially hollow cylindrical container 18 for a combustible gaseous medium is secured to the front face of the firewall 16 by a plurality of substantially U-shaped bolts 20. The container 18 may be filled with any suitable combustible gas, such as butane, for example, or any L.P. gas, as desired. One end of the container 18 is provided with the usual gas discharge cap 22 provided with a gas-control valve (not shown) operated through a handle 24. One end of an elongated substantially hollow tubular and flexible gas-conducting conduit 26 is coupled at 28 to the cap 22, and the other end has fixed thereon an elongated substantially hollow cylindrical coupler indicated, in general, by reference numeral 30. The coupler 30 constitutes one element of a gas-fired heating device 32 constructed in accordance with the teachings of this invention.

The coupler 30 comprises an enlarged substantially hollow cylindrical head 34 having an axially-elongated, substantially hollow tubular stem 36 projecting from one end thereof, the stem 36 being provided with an axial bore 38 which extends throughout its length. The stem 36 is formed, intermediate its ends, with a circumferential groove 40 (to which further reference will be made below), and is internally-threaded as at 42 adjacent one of its ends to receive an exernally-threaded cap insert 44 having an axial bore 46 in open communication with the bore 38 at one of its ends, and an extremely fine orifice 48 at its other end in open communication with the bore 46.

Fitted over the stem 36 is an axially-elongated, substantially hollow cylindrical nozzle 50 having a necked-down portion 52 intermediate the ends thereof. The necked-down portion 52 includes a circumferential groove 54 which is intersected by a radial passage 56 in which is slidably mounted a substantially cylindrical detent 58. Reference numeral 60 denotes an annular resilient spring which is adapted to seat within the circumferential groove 54 and to engage against the outer end of the detent 58 which is slotted to releasably receive the same. As is seen in FIGURE 3 of the drawings, the circumferential groove 40 is disposed in confronting relation relative to the radial passage 56 whereby the detent 58 is releasably engaged within the groove 40 and is constantly biased for movement therein by the spring 60. This arrangement effects a detachable connection between the stem 36 and the nozzle 50.

The nozzle 50 is formed with a second necked-down portion 62 in which are formed a plurality of circumferentially-spaced air-admitting apertures 64, the latter being disposed in proximity to the outer end of the cap insert 44, but spaced inwardly therefrom.

The nozzle 50 is formed with a third necked-down portion 66 adjacent its outer end, the third necked-down portion 66 being externally-threaded as at 68 to threadedly receive a nut 70 thereon. The outer or terminal end of the nozzle 50 terminates in a fourth necked-down portion 72 which is externally-threaded as at 74 to serve a function to be described.

Reference numeral 76 indicates a substantially cylindrical disc having a centrally-located opening 78 extending transversely therethrough, and as is seen in FIGURE 3, the terminal end 72 of the nozzle 50 is received through the opening 78 in such a manner as the underside of the disc 76, as illustrated in this figure, engages against the upper side of the nut 70. Projecting upwardly from the upper side of the disc 76 is a circumferential, cylindrical flange 80.

Reference numeral 82 denotes, in general, an axially-elongated, substantially hollow metallic cylindrical base having an integrally-formed, substantially semispherical lower end 84 apertured as at 86 adjacent its apex. As

is seen in FIGURE 3, the apertured end terminates in an outwardly-turned, substantially cylindrical lip **88** which is adapted to seat on the disc **76** and engage against the cylindrical flange **80**. The semispherical end **84** is provided with a plurality of circumferentially-spaced, transversely-extending air openings **90**.

A second substantially cylindrical disc is indicated by reference numeral **92**, the disc **92** having integrally-formed therewith a centrally-located, substantially hollow, internally-threaded hub **94**. The hub **94** projects on opposite sides of the disc **92** and is threadedly engaged on the external threads **74** of the fourth necked-down portion **72** of the nozzle **50**. As is seen in FIGURE 3, this end of the hub **94** fits snugly within the opening **78** formed in the cylindrical disc **76**.

Reference numeral **96** designates a vertically-elongated screen having the lower end thereof fixedly secured to the periphery of the disc **92**. The screen **96** projects upwardly from the disc **76** surrounding the upper end of the hub **94** in spaced relationship relative thereto and extends above the other or upper end of the cylindrical base **82**. The lower end of the screen **96** is adapted to bear against the semispherical end **84** adjacent the lip **88** when the hub **94** is tightened upon the necked-down portion **72**. The nut **70** is adapted to be tightened against the underside of the disc **76**, whereby the lip **88** is clampingly secured against the upper side of the disc **76**.

A substantially cylindrical screen disc **98** having a mesh finer than the screen **96** extends across the open upper end of the hub **94** and is formed with a downwardly-extending, substantially hollow cylindrical sidewall **100** at its circumferential marginal edge, the sidewall **100** engaging and being fixedly secured to the upper end of the hub **94**. The lower end of a vertically-elongated, substantially hollow, cylindrical screen **102** is fixedly secured over the sidewall **100** and extends upwardly therefrom beyond the open upper end of the cylindrical base **82**. The upper ends of the screens **96**, **102** are coplanar, and the screen **102** is preferably of the same mesh as the screen **98**. A substantially cylindrical cap **104** extends across the screens **96**, **102** and is fixedly secured by conventional means to the screen **96**.

Reference numeral **106** denotes an elongated, substantially hollow, oval-shaped air duct having an end thereof extending through a suitable opening formed in the semispherical end **84** of the cylindrical base **82** and in which the same is fixedly secured. The aforementioned end of the duct **106** extends through an opening **108** formed in the screen **96** and terminates in tangential engagement with the screen **102** intermediate the ends of the latter.

Reference numeral **110** indicates, in general, a substantially hollow cylindrical heat-conducting casing having an end wall **112** supported on the cap **104** and an integrally-connected cylindrical and depending sidewall **114** disposed in spaced relation relative to the screen **96**. The lower end of the sidewall **114** is fixedly secured as by sweating to the upper end of the cylindrical base **82** at the inner side thereof.

Reference numeral **116** designates an axially-elongated, substantially hollow cylindrical housing having an open lower end which is fixedly secured, as by sweating, to the exterior side of the open upper end of the cylindrical base **82**. The upper end of the housing **116** continues into a substantially semispherical upper end wall **118** which, adjacent the apex end thereof, is interrupted to form an upwardly-extending, substantially hollow cylindrical neck **120**. Sweated, or otherwise fixedly secured in the neck **120** is one end **122** of an elongated substantially hollow cylindrical elbow **124**, the other end of the elbow **124** being connected with a substantially hollow cylindrical coupler **126** threaded as at **128** (see FIGURE 2) to open into the water jacket **14** through the sidewall **15**.

In operation, and assuming that it is desired to start the internal combustion engine **12** of the automotive vehicle **10** under cold weather conditions, the operator will actuate the valve handle **24** to open the valve in the gas-discharge cap **22** to permit gas under pressure to escape from the container **18** and pass through the conduit **26** for admission to the stem **36**. The gas passes through the bore **38** formed in the stem **36** and is forced through the bore **46** of the cap insert **44**. From the cap insert **44** it is discharged at a relatively high velocity through the orifice **48** and draws with it a sufficient amount of air through the apertures **64** which mixes therewith in such amounts as to support the combustion thereof. The gas and air entrained therewith passes through the threaded end of the nozzle **50** and discharges against the screen **98** at which point the same is diffused and spreads upwardly through the hollow cylindrical screen **102**. A match or other similar igniting means is now held against the outer end of the duct **106**, and the flame thereof is drawn upwardly therethrough toward the screen **102**, causing ignition of the gases thereon. The gases within the hollow cylindrical screen also become substantially simultaneously ignited therewith and burn with high intensity. The heat created by the ignited gases causes the space between the screen **102** and the screen **96** to become highly heated and by heat of radiation and conductivity, the screen **96** becomes highly heated. The products of the combustion are exhausted, of course, through the openings **90**.

As the screens **96**, **102** become heated, the cap **104** is similarly raised in temperature, and through heat of conduction, the end wall **112** and the sidewall **114** are raised in temperature.

The end wall **112** which makes line contact with the semispherical end wall **118** of the cylindrical housing **18** now heats the water (not shown) from the water jacket **14** in contact therewith, and through the heat of conductivity, the remaining water within the jacket **14** becomes heated, whereby lubricants used in connection with the pistons of the vehicle **10** and other lubricated elements associated with the engine or motor **12** are converted from a substantially solid state to a normal liquid or semi-liquid condition, thus, facilitating the starting of the engine.

When the water in the jacket **14** has been heated to the desired temperature, the valve handle **24** is actuated to close the valve in the cap **22**, thereby cutting off the supply of gas to the conduit **26** to extinguish the flame at the orifice **48**.

While the instant invention has been described in conjunction with an internal combustion engine for the purposes of heating the water contained in the water jacket thereof, it will be understood by those skilled in the art that this invention finds utility in other fields wherein it is desired to quickly heat any fluid medium.

Having described and illustrated one embodiment of this invention in detail, it will be understood that the same is offered merely by way of example, and that this invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. A heating device for heating water in a water jacket comprising an elongated substantially hollow cylindrical base having opposed open and closed ends, a heat-conducting casing comprising an elongated substantially hollow cylindrical sidewall having an end thereof fixedly secured to the open end of said base and a closure wall extending across the other end of said sidewall, heat means disposed in said base and casing, an elongated substantially hollow housing having opposed open ends, means fixedly connecting one end of said housing with said open end of said base with said closure wall making line contact with said housing intermediate the ends of the latter, and means connecting the other end of said housing with said water jacket to receive water therefrom.

2. A heating device for heating the water in the water jacket of an internal combustion engine comprising an elongated substantially hollow cylindrical base having a substantially hollow semispherical end wall at one end

thereof, said semispherical end wall having a plurality of circumferentially-spaced openings extending transversely therethrough, said semispherical end wall having an aperture at the apex thereof, a disc extending across said aperture and closing the same, means releasably securing said disc on said semispherical end wall, a heat-conducting casing comprising a substantially hollow cylindrical sidewall having an end wall at one end thereof and having an opposed open end, said open end of said casing sidewall being telescoped within and fixedly secured to the open end of said base with said end wall of said casing being spaced from said end wall of said base, an elongated substantially hollow cylindrical housing having an open end and a semispherical end wall at the other end thereof, said open end of said housing being telescoped over the open end of said base with said semispherical end wall of said housing making line contact with said end wall of said casing, means fixedly securing said open end of said housing to said open end of said base, means connecting said semispherical end of said housing to said water jacket to receive water therefrom, and means extending through said disc to introduce a combustible gas in the space confined by said base and said casing.

3. A heating device as defined in claim 2, and means extending through said base to effect ignition of said gas in said base and casing.

4. A heating device for heating the water in the water jacket of an internal combustion engine comprising an elongated substantially hollow cylindrical base having a substantially hollow semispherical end wall at one end thereof provided with a plurality of circumferentially-spaced openings, said base having an opposed open end, said semispherical end wall having an aperture at its apex and an outwardly-turned lip at the circumferential marginal edge of said aperture, a disc extending across said aperture and having a circumferential flange telescoped over said lip, said disc having an aperture formed therein aligned with said aperture formed in said sidewall of said base, a second disc disposed within said base and having a centrally-located substantially hollow hub integral therewith and having ends projecting beyond opposite sides thereof, one end of said hub being disposed within said aperture formed in said disc, a screen extending transversely across and being fixedly secured to the other end of said hub, a first elongated substantially hollow cylindrical screen having one of its ends connected on said other end of said hub, the other end of said first screen extending away from said hub and beyond the other end of said base, a second elongated substantially hollow cylindrical screen having an end thereof fixedly secured to the periphery of said second disc, said end of said second screen engaging against the semispherical end of said base adjacent said lip, the other end of said second screen projecting away from said second disc and extending beyond said other end of said base, said other ends of said screens being substantially coplanar, said first and second screens being concentrically spaced from one another, a casing comprising an elongated substantially hollow cylindrical sidewall having an end wall at one end thereof and an opposed open end, said casing sidewall surrounding said second screen in spaced relation relative thereto and having its open end telescoped within and fixedly connected to the other end of said base, said end wall of said casing extending across and engaging the other ends of said first and second screens, an elongated cylindrical housing having a semispherical end wall and an opposed open end, means fixedly connecting said open end of said housing with said open end of said base with the end wall of said housing making line contact with the end wall of said casing, conduit means opening into the apex end of said semispherical end wall of said housing and opening into said water jacket, nozzle means extending through said aperture formed in said first disc and said base and projecting into said hub to conduct a combustible gas into the space confined by said base and casing, and means mounted on said nozzle operable to clamp said lip between said first and second discs.

5. A heating device as defined in claim 4, and a gas-ignition tube extending transversely through said base and said second screen and having its inner end in tangential engagement with said first screen.

6. A heating device as defined in claim 5, wherein said nozzle comprises an elongated substantially hollow tubular cylindrical element, said element having a plurality of circumferentially-spaced openings extending transversely therethrough intermediate its ends, an elongated hollow tubular stem disposed within said nozzle and having a closed inner end, an orifice extending transversely through said closed inner end, and said orifice being disposed adjacent said openings formed in said nozzle.

7. A heating device as defined in claim 6, and means detachably connecting said stem within said nozzle.

8. A heating device as defined in claim 7, wherein said closed inner end of said nozzle includes an elongated hollow tubular member inserted within said inner end of said stem, said insert terminating in a cap at its outer end, and said orifice extending transversely through said cap.

9. A heating device as defined in claim 8, and means detachably connecting said insert in said stem.

10. A heating device as defined in claim 9, and a cap interposed between said other ends of said screens and the adjacent side of said end wall of said casing.

References Cited by the Examiner

UNITED STATES PATENTS

470,530	3/1892	Wirz	122—234
907,590	12/1908	Gibson	126—350
1,014,968	1/1912	King	126—350
2,514,270	7/1950	Williams	126—350
3,219,025	11/1965	Webster	158—99

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