W. P. DEPPÉ.

HEATER AND MIXER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED OCT. 14, 1914.

1,189,797.

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Fig. 1.

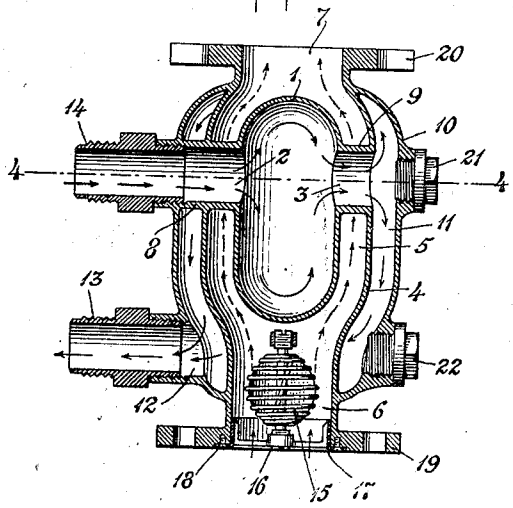


Fig. 2.

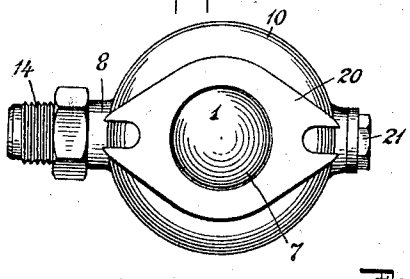


Fig. 3.

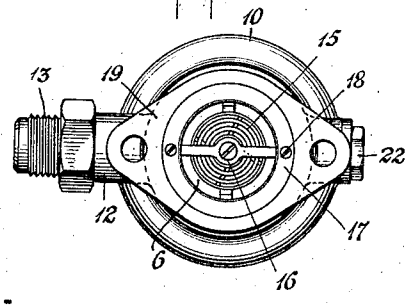
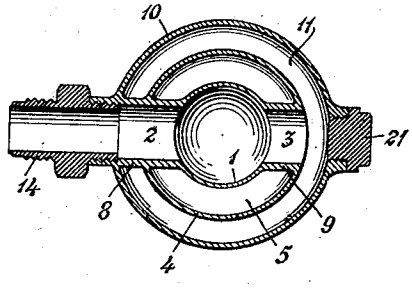


Fig. 4.



WITNESSES

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HEATER AND MIXER FOR INTERNAL-COMBUSTION ENGINES.

1,189,797. Specification of Letters Patent. Patented July 4, 1916.

Application filed October 14, 1914. Serial No. 866,603.

To all whom it may concern:

Be it known that I, WILLIAM P. DEPPÉ, a citizen of the United States, and resident of Bay Shore, county of Suffolk, and State of New York, have invented certain new and useful Improvements in Heaters and Mixers for Internal-Combustion Engines, of which the following is a specification.

My invention relates more particularly to an improvement in the type of heater shown and described in my pending application Serial No. 832,209, filed April 16, 1914.

I have found that the best results are to be obtained by combining a mechanical mixer with the heater and heating the mixing chamber. I have found it more satisfactory from a practical standpoint to arrange the interior bulbous heating member and the outer jacket so that the heating fluid, exhaust gases or the like, are passed therethrough in series. Preferably the heating gases are caused to enter the interior bulbous member first, for, since its heating surface is less, its temperature should be greater than that of the surrounding tubular wall, which is heated by the gases passing through the cavity of the jacket, so that the fuel mixture in passing through the heater may become thoroughly heated inside and out.

My heater is adapted to be inserted in the connections between the carbureter, and the manifold or inlet openings of an internal combustion engine and exhaust gases from the engine are preferably passed through the heater in the manner hereinafter described to heat the same.

In using my heater as shown in my application Serial No. 832,209 it is found that the fuel mixture passing from the carbureter to and through the heater has not vaporized or gasified with sufficient rapidity and thoroughness especially when the heavier oils are used. Low grade oils, some of which may have a boiling point up to 600° F., are not gasified readily by heat alone unless the particles are broken up into very small particles or atoms capable of being suspended in and carried along with the air currents. Such oils when drawn from the carbureter are carried along in more or less large particles as long as the air is moving swiftly but owing to the surging of the fuel mixture during the operation of the engine the speed of the moving gases varies and during the lull the heavier particles drop out and striking the inner surfaces of the tubes or pipes stick there and coalesce. When such particles strike the heated inner bulbous surfaces they tend to form a thin film thereon which, experience has shown, is not readily vaporized, and, furthermore, acts as an insulator to prevent proper heating of the column of moving gases. On the other hand when the heavy oil particles are thoroughly atomized so that it has the appearance of a white vapor cloud, it will maintain its position in the gaseous column and passing in sheet form between the heated metal surfaces, which will be clean and free of oil films, will be thoroughly evaporated and gasified. I obtain this highly satisfactory result by mechanically breaking up the larger particles of oil before they reach the heated surfaces. I have, therefore, in the present invention added a mixing chamber provided with a mechanical mixer of the rotating type. It is found that by placing a mechanical mixer between the carbureter and the heated bulbous member the minute drops of oil projected into and carried along by the air from the carbureter are more thoroughly broken up and mixed with the air before contact with the heated surfaces. This breaking up of the particles and mixing with the air, facilitates rapid vaporization as the column passes, in sheet form, between the bulbous heating surfaces. By this means complete gasification of the mixture is insured by the time it leaves the heater and enters the intake of the engine. This breaking up or atomizing of the fuel mixture by the mechanical mixer tends to increase vaporization and hence is a cooling process. For this reason I have provided means for heating the mixing chamber by extending the jacket to cover the outside thereof.

In my improved device the structure is preferably an integral casting so that there is no possibility of leakage between the circulating heating fluid (exhaust gases or the like) and the fuel mixture being heated.

In the accompanying drawings I have illustrated one form of my improved heater and mixer, of which—

Figure 1, is a vertical cross-section; Fig. 2 a top plan view, Fig. 3 a bottom view and Fig. 4 a transverse section in the plane of line 4—4 of Fig. 1.

Referring to the drawings 1 represents a hollow bulbous or cylindrical member having bulging ends and provided at 2 with an

inlet opening and at 3 with an outlet opening. The bulbous member 1 is surrounded by a tubular bulbous member 4 which is arranged concentric with the member 1 and spaced therefrom to leave an annular channel at 5, the tube being constricted at each end so that the inlet end 6 and outlet end 7 thereof are substantially equal in cross-section to the cross sectional area of the annular channel 5. The two members 1 and 4, as will be seen from the drawing, are integrally connected by means of pipes 8 and 9 the former being extended outward from the inlet opening 2 while the latter is connected with the outlet opening 3 of the inner bulbous member 1. The tubular member 4 is surrounded and inclosed by a jacket member 10 which is spaced therefrom to leave a cavity 11 which is connected by means of the pipe 9 with the interior of the hollow bulbous member 1 substantially as shown in Figs. 1 and 4 of the drawings. The tubular connection 8, to the inlet of the bulbous member 1, is continuous through the cavity of the jacket and preferably being cast integral therewith prevents any leakage of gases or fluids from one channel to the other. The jacket cavity 12 is provided with an outlet opening or tubular nipple for completing the circuit of the heating fluid which preferably may be the exhaust gases of the engine.

Suitable connection nipples 13 and 14 are screwed into the outlet nipple 12 and the inlet tube 8 substantially as shown in the drawings. The inlet pipe or nipple 14 is adapted to be connected with the exhaust pipe of an internal combustion engine substantially as shown and described in my application Serial No. 832,209 while the nipple 13 may be connected in a similar manner with the muffler or may exhaust directly into the air as desired. The object of this connection is to insure a complete closed circuit for the exhaust gases passing through the heater, the gases taking a course substantially as indicated by the arrows in Fig. 1 of the drawing passing through the two heating chambers in series. By using the exhaust gases for the heater it follows that heat will be automatically supplied according to the requirements of the engine. The tubular member 4 is elongated at its lower or inlet end 6 to form a mixing chamber for the fuel mixture which is to be gasified. After being broken up and thoroughly mixed with the air the fuel mixture is passed on and heated by being spread out and passed between the highly heated surfaces on either side of the annular channel and recombined without expansion before it enters the intake ports of the engine.

Any suitable mechanical mixer may be used, but preferably the rotating mixer illustrated in drawing is used. The mixer is well known on the market and is shown in Patent No. 1,007,010 to C. Schlayer, October 24, 1911, and need not be specifically described here; it comprises a rotating spiral bladed helicoidal member 15 mounted in a frame 16 so as to be rotated at high speed by the passage of a fuel mixture therethrough. The frame 16 is preferably secured to a base plate 17 which may be screwed to the end of the tubular member 4 by screws 18 or otherwise as desired.

The ends of the tubular member 4 are preferably provided with transverse flanges 19 and 20 whereby the heater may be connected to the outlet of a carbureter and to the intake or manifold of an engine. It will be understood that the lower end, having the flange 19, is to be connected to the carbureter and the device is particularly adapted to be used in connection with my carbureter shown and described in my application Serial No. 854,924 filed August 4, 1914, although it will be understood that it may be used with other types of carbureters. When so used in connection with a carbureter the fuel mixture will be sprayed upward from the carbureter by the passage of the air therethrough in the usual manner and this fuel mixture will be carried up through the mixing chamber, where, by means of the mechanical mixer 15, the particles of fuel oil will be thoroughly broken up and more thoroughly mixed with the air so that when it reaches the annular channel 5 the heating surfaces of the inner bulbous member and the outer jacket member will more readily evaporate and gasify the oil particles of the mixture so that when it passes out at 7 to enter the manifold or intake of the engine it will be at a high temperature and practically a complete gaseous mixture.

From the description of the construction of my device it will be seen that the heating jacket 10, surrounding the tube 4, extends downward to cover the mixing chamber of the intake end 6 so as to keep this at a temperature sufficiently high to aid in breaking up and mixing the gases and atoms of oil before the same are carried upward to the surfaces of the annular channel which are more highly heated. Preferably the upper end of the heater is maintained at a higher temperature, this being facilitated by the arrangement of the intake pipe 8 entering the bulbous member 1 near the upper end thereof, this arrangement permitting the gasified mixture to leave the heater at very high temperature. This is desirable because it is thus more likely to reach the engine cylinder in condition for instant ignition.

As previously stated the device shown is preferably cast as an integral structure. In the drawings plugs 21 and 22 are shown screwed into openings opposite the inlet opening 2 and outlet opening 12: the open-

ing closed by these plugs being required during the casting process for the removal of the cores.

From the description of the device given it will be seen that hot fluids, such as the exhaust gases of the engine, are passed through the pipe 8 into inner bulbous member 1 and from there through the tubular connection 9 to the cavity 11 between the jacket and the tube 4 and pass from the cavity or chamber 11 out through the opening 12 in the jacket to the air or to the exhaust pipe or muffler as desired. Thus the gases pass through the heater in series and heat the same substantially as described. The fuel mixture to be heated is passed up into and through the bulbous tubular member 4 and by means of the mechanical mixer is broken up and then by means of the bulbous member 1 is spread out into comparatively thin annular sheet and heated both inside and out. After passing through the device the heated gasified mixture is reunited at the outlet 7 without expansion being allowed to take place in the act of reuniting the sheeted mixture column into a round column, and passed on through the manifold to the intake of the engine.

Various modifications of the specific details of construction may be made without departing from the spirit and scope of the invention.

I claim:

1. A heater for low grade fuel mixtures as produced by and after delivery from a carbureter, adapted for insertion between the carbureter and intake valve of an internal combustion engine, comprising an unobstructed, substantially straight conduit of uniform cross sectional area throughout, the inlet end portion of said conduit being cylindrical, the portion of the conduit immediately following said cylindrical portion being adapted to sheet the mixture, a rotary mechanical mixer within said cylindrical portion of the conduit adapted to atomize the mixture and direct it into said sheeting portion, and means for simultaneously heating the outside of said cylindrical portion of said conduit and the sheeting portion inside and out, whereby a substantially dry gaseous mixture is delivered to the engine.

2. A heater for low grade fuel mixtures as produced by and after delivery from a carbureter, adapted for insertion between the carbureter and intake valve of an internal combustion engine, comprising an unobstructed, substantially straight conduit of uniform cross sectional area throughout, the inlet end portion of said conduit being cylindrical and the adjacent portion of the conduit being annular, means in said inlet portion thereof for breaking up the mixture and swirling it into said annular portion, and means for heating the annular portion of said conduit inside and out and simultaneously heating the outside of the inlet portion thereof whereby a substantially dry gaseous mixture is delivered to the engine.

3. A heater for low grade fuel mixtures as produced by and after delivery from a carbureter, adapted for insertion in the manifold of an internal combustion engine between the carbureter and the intake valve of the engine comprising a substantially straight continuous conduit of uniform cross sectional area throughout, a portion of the conduit being adapted to sheet the mixture, the inlet portion being cylindrical and elongated, a longitudinally extending rotary mechanical mixer axially mounted within said cylindrical portion and means for heating the outside of said cylindrical portion of the conduit and for heating the sheeting portion thereof inside and out whereby a dry gaseous mixture is delivered to the engine.

4. A heater for low grade fuel mixtures as produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake valve of the engine comprising a continuous, unobstructed substantially straight conduit of uniform area throughout the inlet end of which is adapted to contain a rotary mechanical mixer and to be connected to the outlet of the carbureter, the portion of the conduit immediately following the inlet end portion being annular, a rotary mechanical mixer concentrically mounted in said inlet end, and means provided for heating the annular portion of said conduit inside and out and for simultaneously heating the outside of the inlet end portion whereby the fuel mixture received from the carbureter is transformed into a substantially dry gaseous mixture for delivery to the engine.

5. A heater for low grade fuel mixtures as produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake valve of the engine, comprising a continuous, unobstructed, substantially straight conduit of uniform area throughout, the inlet end being provided with a rotary mechanical mixer and adapted to be connected to the outlet of the carbureter, a portion of the conduit being double walled and means for heating the outside of said conduit and simultaneously the inner wall of said double walled portion whereby the fuel mixture received from the carbureter is transformed into a substantially dry gaseous mixture for delivery to the engine.

6. A heater for fuel mixtures produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake of the engine comprising a tubular member, rotary means therein for atomizing the mixture, means

for sheeting the atomized mixture and means for heating the mixture during atomization and for heating the sheeted mixture on both sides, whereby the fuel mixture is converted into a dry gaseous mixture for delivery to the engine.

7. A heater for fuel mixtures produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake of the engine comprising a substantially straight conduit of uniform cross sectional area, rotary means in the inlet end of said conduit for atomizing the mixture and delivering it to the succeeding portion of said conduit which is annular and adapted to sheet the atomized mixture, and means for heating the inside of said annular portion and the outside of the conduit including the inlet end thereof, substantially as and for the purpose described.

8. A heater for fuel mixtures produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake of the engine comprising a tubular member, a hollow bulbous member therein and spaced therefrom to form an annular conduit, the inlet end of said tubular member being of reduced diameter, rotary means within said inlet end for atomizing the mixture and directing it into said annular conduit, and means for heating said bulbous member and for heating the outside of said tubular member, said bulbous member being maintained at a higher temperature than the outside of the tubular member.

9. A heater for fuel mixtures produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake of the engine comprising a substantially straight conduit of uniform cross sectional area, one portion of said conduit being annular, the inlet end being cylindrical and provided with rotary means for atomizing the mixture and directing it into said annular portion, means for heating said annular portion of said conduit inside and out and the outside of said cylindrical portion, a higher temperature being maintained at the outlet end of said annular portion of the conduit than at the inlet end thereof.

10. A heater for fuel mixtures produced by the carbureter of an internal combustion engine, adapted for insertion between the carbureter and the intake of the engine comprising a substantially straight conduit of uniform cross sectional area, means in the inlet end thereof for atomizing the mixture as delivered from the carbureter, means for sheeting the atomized mixture and means for heating the mixture during its passage through the conduit, the temperature increasing toward the outlet end thereof, whereby the atomized fuel mixture is converted into a dry gaseous mixture for delivery to the engine.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM P. DEPPÉ.

Witnesses:
M. H. Lockwood,
Fred A. Klein.