T. A. EDISON, JR.

FUEL SUPPLYING MEANS.

APPLICATION FILED JULY 25, 1912.

1,160,585.

Patented Nov. 16, 1915.

2 SHEETS—SHEET 1.

Fig. 1

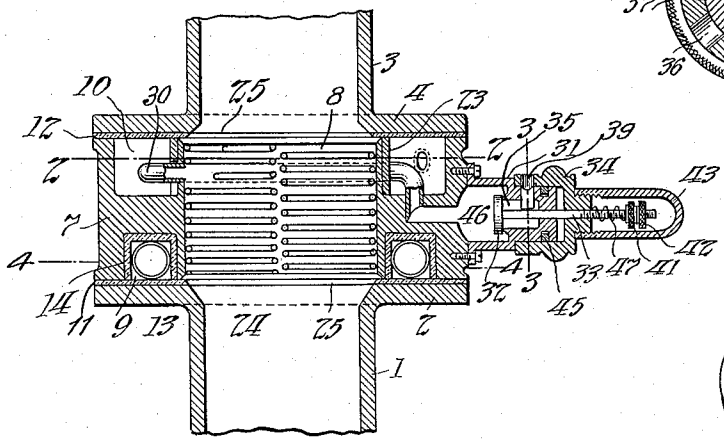


Fig. 3

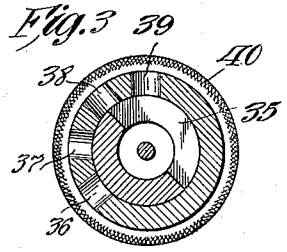


Fig. 5

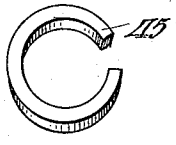


Fig. 7

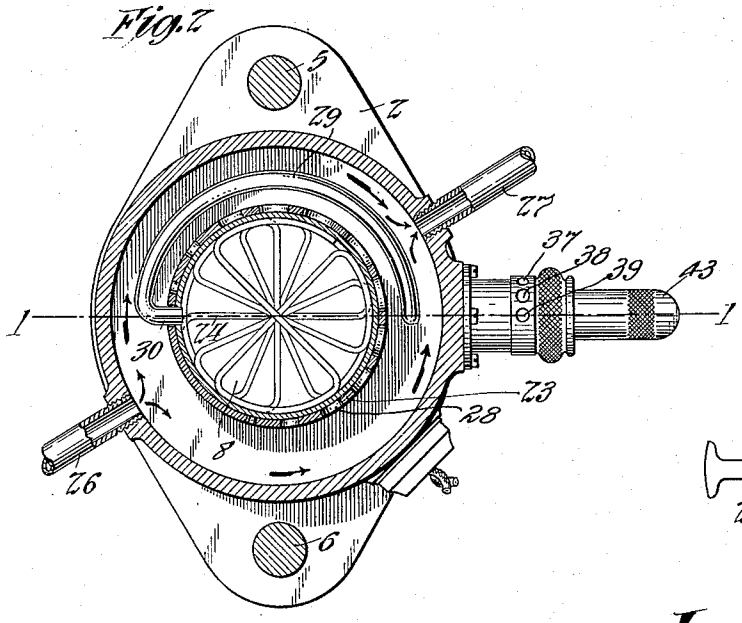
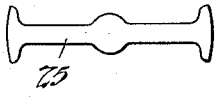


Fig. 6



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2 SHEETS—SHEET 2.

Fig. 4

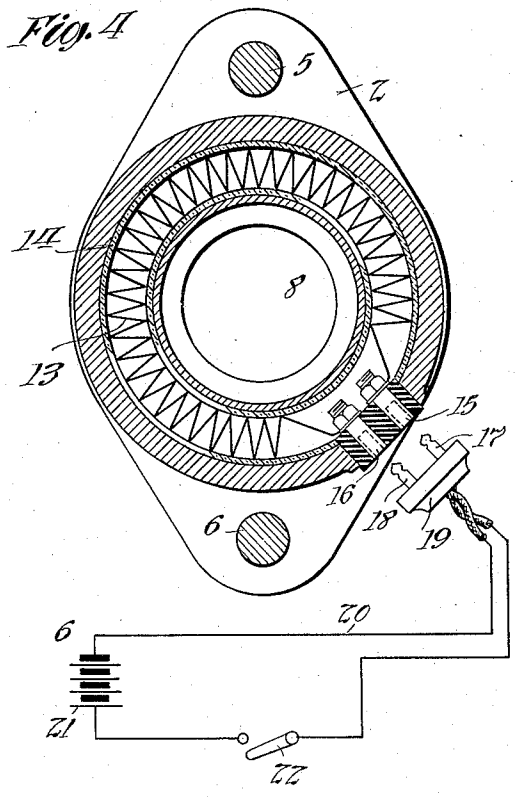


Fig. 7

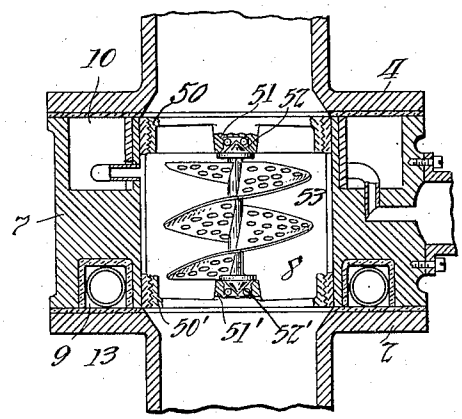
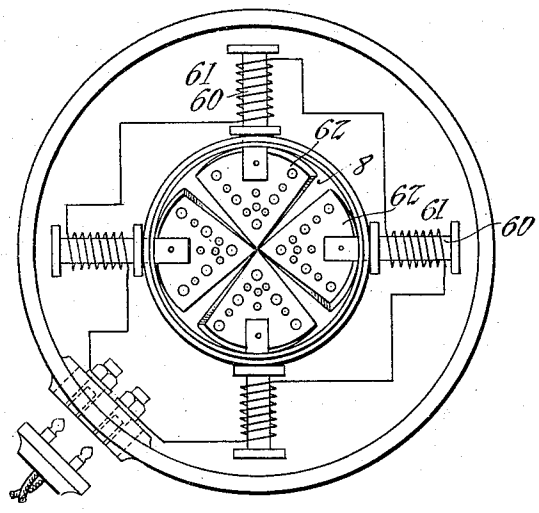


Fig. 8



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, JR., OF BURLINGTON, NEW JERSEY.

FUEL-SUPPLYING MEANS.

1,160,585. Specification of Letters Patent. Patented Nov. 16, 1915.

Application filed July 25, 1912. Serial No. 711,398.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, Jr., a citizen of the United States, and a resident of Burlington, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Fuel-Supplying Means, of which the following is a description.

My invention relates to improvements in fuel supplying means, and particularly to improvements in means for supplying the mixture of vaporized gasolene or other fuel to internal combustion engines.

In starting internal combustion engines, particularly in cold weather, difficulties are frequently encountered in vaporizing the fluid fuel to an adequate extent to cause the mixture to be exploded when the spark is passed.

My invention includes improved means for aiding the vaporization of the fuel, both during starting and when running, for increasing the temperature of the mixture, and also means for introducing additional air into the mixture under favorable conditions so as to economize in the fuel consumed.

My improved apparatus is particularly adapted to be manufactured as an attachment for internal combustion engines now in use.

My invention includes also the combinations of parts and details of construction hereinafter described more fully and claimed.

For the further description of my invention, reference is had to the drawings accompanying and forming part of this specification and in which—

Figure 1 is a sectional view of apparatus embodying my invention, the section being taken on the line 1—1 of Fig. 2. Figs. 2, 3 and 4 are sectional views taken respectively on the lines 2—2, 3—3, and 4—4 of Fig. 1. Figs. 5 and 6 are views of details of construction. Fig. 7 is a sectional view of a modified form of apparatus embodying my invention; and Fig. 8 is a partly diagrammatic view of a modified form of electrical heater and deflecting means adapted for use in apparatus embodying my invention, instead of the corresponding parts illustrated in the preceding figures.

My improved apparatus is located in the conduit leading from the carbureter to the cylinders of the engine, and I have illustrated my invention as an attachment adapted to be secured between the carbureter flange and the flange of the induction pipe.

Referring particularly to Figs. 1 to 6 inclusive, at 1 is shown the neck of the carbureter or pipe leading therefrom, and at 2 the flange of the same. At 3 is shown the induction pipe and at 4 the flange of the same. A casting 7 is provided having extending therethrough a cylindrical opening 8 of somewhat greater cross section than the cross section of the carbureter neck and induction pipe, and adapted to be secured between the carbureter flange and the induction pipe flange with the opening 8 in line with the carbureter neck and the induction pipe so as to constitute a conduit connecting the two. In the casting 7 and surrounding the opening 8 and separated therefrom by a thin wall is an annular opening 9 which is adapted to receive an electric heating coil 13. The opening 9 is adjacent to the carbureter flange 2. Adjacent to the induction pipe flange 4 is an annular opening or chamber 10 surrounding the opening 8 and separated therefrom by a thin wall. The electrical heating coil 13 and the chamber 10 adapted to receive heated fluid are therefore in thermal relation to the opening 8. The casting 7 is secured between the induction flange 4 and the carbureter flange 2 by bolts 5 and 6 or other suitable means, and gaskets 11 and 12, preferably of asbestos, are provided between the casting 7 and the carbureter flange 2 and induction pipe flange 4 respectively. The electric heating coil 13 is insulated from the casting 7 by means of the insulating material 14, which is preferably asbestos. The coil 13 is provided with terminals 15 and 16 which may be in the form of sockets adapted to coöperate with the plug contacts 17 and 18 mounted in the plug 19, said plug contacts 17 and 18 being connected in an electrical circuit 20 containing a source of current, such as a battery 21, said circuit 20 being provided with a switch 22 for controlling the same.

Surrounding the thin wall of the casting 7 between the opening 8 and the annular opening or chamber 10 is an annular baffle plate 23 provided with openings or cutaway portions arranged in a manner hereinafter described. The opening 8 is pro-

vided with wires or metallic filaments 24 so disposed as to have large portions of the same in contact with the walls of the casting 7 surrounding the opening 8. A single wire may, of course, be used. This mass of wire is held in place between members 25 extended across the ends of the opening 8 and secured in any suitable manner. I have illustrated the opening 8 as slightly beveled at its ends, and the members 25 correspondingly beveled at their ends and held between the casting 7 and the gaskets 11 and 12 by the pressure produced by the flanges 2 and 4. An inlet pipe 26 is provided leading into the chamber 10 through its outer wall and located diametrically opposite thereto is an outlet pipe 27 leading from the chamber 10 through its outer wall. The pipe 26 is adapted to be connected to the exhaust of the engine or to be fed with water which has been heated by cooling the engine. The exhaust gases or heated water enter through the pipe 26, pass through the chamber 10 on both sides of the annular baffle plate 23, and flow out through the outlet pipe 27, the path of the heated fluid being indicated by the arrows in Fig. 2. The portion of the casting 7 containing the chamber 10 may be designated as a fluid heater. The openings 28 in the baffle plate 23 are so arranged that they increase in size in passing through a point opposite the inlet pipe 26 around the two halves of the baffle plate to a point opposite the outlet pipe 27. Or, the holes may be of the same size, but increasing in number from a point opposite the inlet pipe 26 to a point opposite the outlet pipe 27. The heated gas or water which enters through the pipe 26 has its maximum temperature at this point and has become cooled somewhat before flowing out through the pipe 27. The arrangement of openings in the baffle plate 23 causes the inner wall of the casting 7 to be heated uniformly and causes a uniform distribution of heat through the deflecting wire or wires 24. An air inlet 46 is provided in the casting 7 at a point remote from the inlet pipe 26. From the air inlet 46 a pipe 29 leads through the chamber 10 throughout substantially one half of the same to a point substantially diametrically opposite the inlet 46, and leads into the opening 8 through the baffle plate 23 and the inner wall of the casting 7 at 30. Surrounding the air inlet 46 and secured to the casting 7 is a hollow member 31 provided on its interior with a port adapted to be closed by the valve 32 and provided also with an opening 35 extending about half way around its circumference and communicating with the port. When the valve 32 is closed, no air can enter through the opening 35 into the space communicating with the opening 46. Surrounding the portion of the member 31 containing the opening 35 is a cup-shaped member 34 mounted on the member 31 so as to be rotatably adjustable and having openings 36, 37, 38 and 39, one or more of which may be brought into communication with the opening 35 by adjusting the member 34 on the member 31. The openings 36, 37, 38 and 39 communicate with the external atmosphere and by adjusting the member 34 so as to have a larger or smaller number of openings 36, 37, 38 and 39 communicating with opening 35, the supply of air which enters through the air inlet 46 and pipe 29 into the opening 8 may be controlled. The adjustably rotatable member 34 is provided with a knurled rim 40 to facilitate adjusting the same. The member 34 has an opening extending through it which serves as a guide for the stem 33 of the valve 32. The end of the stem is provided with a nut serving as an abutment 41 and a lock nut 42, and a coiled spring 47 is located between the nut abutment 41 and the stem guiding portion 34, serving normally to keep the valve 32 in closed position. A protecting cap 43 is screw threaded on the member 34 so as to protect the extended end of the valve stem 33, nuts 41 and 42, and the spring 47. A resilient open ring 45 shown in extended position in Fig. 5 is seated snugly in a groove circumferentially surrounding the stem guiding end of the member 31, and frictionally engages the inside of the member 34 and serving to hold it in adjusted position.

The operation of my improved apparatus is as follows:—Assuming that the plug contacts 17 and 18 are connected with the socket contacts 15 and 16, when it is desired to start the engine, the switch 22 is closed, which causes current to be supplied to the heating coil 13 from the battery 21 to heat the coil. The heat from the coil is transmitted through the thin inner wall of the casting 7 and to the portions of the wire or wires 24 in contact with the wall. The wires rapidly become heated and readily communicate their heat to the mixture of air and gasolene or other fuel which flows from the carbureter into the opening 8 on its way to the induction pipe. By having a mass of metallic material of considerable area distributed throughout opening 8, such as wires 24, substantially all of the fuel mixture comes in contact with a heating surface, and the mixture is adequately heated to enable the engine to be easily started. After the engine has gotten into operation, the switch 22 may be opened. The exhaust gases from the engine or the hot water from the cooling chambers flows in through inlet pipe 26 into chamber 10 around the baffle plate 23 on both sides thereof and contacts with the thin inner wall of the casting 7 at points where openings in the baffle plate occur. The exhaust gases or water flow out of the outlet pipe 27. The heat from the exhaust

gases or water is transmitted through the thin wall of the casting 7 to the wire mass within the opening 8 and aids in the vaporization while the engine is running. As the engine gets up to speed, the valve 32 opens and air is drawn through the opening 46 and pipe 29 to the opening 8. The pipe 29 being surrounded by hot gases or water, air is introduced into the mixture in heated condition, thereby adding materially to the efficiency and economy of operation of my apparatus. The cup-like member 34 is adjusted so that a sufficient number of openings 36, 37, 38 and 39 communicate with the opening 35 to furnish the necessary supply of air for this purpose.

In Fig. 7 I have illustrated a modification of my invention in which, instead of the wire mass 24, I employ a rotating helical device to throw the mixture carrying the fuel particles against the inner wall of the casting 7 to enable the heat from the same to be communicated to the mixture. In this modification, ring-like members 50, 50′ are threaded into the casting 7 at the two ends of the opening 8, the ring-like members 50, 50′ having bridging members 51, 51′ which serve as bearings for the cone-like ends 52, 52′ of the shaft carrying the helical member 53. Ball bearings may also be provided. The helical member 53 is provided with perforations. Under the influence of the draft of the mixture, the helical member 53 is caused to rotate on its bearings and the fuel particles are thrown against the inside wall of the casting 7 and heated. Otherwise than as illustrated and described, the construction of the apparatus shown in Fig. 7 is the same as that illustrated in the preceding figures.

In Fig. 8 I have illustrated a modified form of electrical heating device which may be utilized in any of the structures illustrated in the preceding figures. This form of electrical heater consists of a plurality of radially disposed metal pieces 60 having their ends extended into the opening 8 and the portions without the opening 8 surrounded by heating coils 61. The ends of the metal pieces 60 which extend into the opening 8 are provided with perforated deflecting members at an angle to the normal line of flow of mixture through the opening 8, the deflecting members 62 serving to communicate heat conducted from the heating coils to the mixture and also to deflect the mixture into contact with the walls of the casting 7.

Having now described my invention, what I claim as new therein and desire to protect by Letters Patent is as follows:—

1. In fuel supplying means, means for heating the fuel mixture comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture and provided with separate chambers in thermal relation to said opening, and an electric heater contained in one of said chambers, the other of said chambers being adapted to receive heated fluid, substantially as described.

2. In fuel supplying means, means for heating the fuel mixture having an opening therethrough for the passage of the fuel mixture and provided with separate chambers and having an electric heater contained in one of said chambers, the other of said chambers being adapted to receive heated fluid, and heat conducting material disposed in the path of the fuel mixture and in thermal relation to said chambers, substantially as described.

3. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater and an electrical heater, and means for supplying air to the mixture through one of said heaters, whereby the air thus supplied is heated, substantially as described.

4. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater and an electrical heater, and means for supplying air to the mixture through said fluid heater, whereby the air thus supplied is heated, substantially as described.

5. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater, an electrical heater, and heat conducting material in thermal relation to said heaters and interposed in the path of the fuel mixture, and means for supplying air to the fuel mixture through said fluid heater, whereby the air thus supplied is heated, substantially as described.

6. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater and an electrical heater, and adjustable means for supplying air to the mixture through said fluid heater, whereby the air thus supplied is heated, said adjustable means including an adjustable opening, substantially as described.

7. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater, an electrical heater, and heat conducting material in thermal relation to said heaters and interposed in the path of the fuel mixture, and adjustable means for supplying air to the fuel mixture through said fluid heater, whereby the air thus supplied is heated, said adjustable means including an adjustable opening, substantially as described.

8. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter, comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe,

said member having two independent chambers surrounding the opening for the passage of the fuel mixture, an electrical heater contained in one of said chambers, and the other of said chambers being adapted to receive heated fluid, and said opening having means therein for facilitating the transfer of heat from the heater and chambers to the fuel mixture, substantially as described.

9. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter, comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe, said member having therein an electrical heater and a chamber adapted to receive heated fluid, said electrical heater and chamber surrounding and being in thermal relation to the opening for the passage of the fuel mixture, said opening having means therein for facilitating the transfer of heat from the heater and chamber to the fuel mixture, comprising a mass of wire having a portion thereof in contact with the walls of the opening, substantially as described.

10. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe, said member having therein an electrical heater and a chamber adapted to receive heated fluid, said electrical heater and chamber being in thermal relation to the opening for the passage of the fuel mixture, and means for supplying air to said mixture through said chamber, whereby the air thus supplied is heated, substantially as described.

11. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter, comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe, said member having therein an electrical heater and a chamber adapted to receive heated fluid, said electrical heater and chamber being in thermal relation to the opening for the passage of the fuel mixture, and adjustable means for supplying air to said mixture through said chamber, whereby the air thus supplied is heated, said adjustable means including an adjustable opening, substantially as described.

12. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe, said member having therein an electrical heater and a chamber adapted to receive heated fluid, said electrical heater and chamber being in thermal relation to the opening for the passage of the fuel mixture, and means for supplying air to said mixture through said fluid heater whereby the air thus supplied is heated, the operation of said means being controlled by the draft of the fuel mixture supplied to the engine, substantially as described.

13. In means for supplying fuel to an internal combustion engine, a device adapted to be located between the induction pipe and the carbureter comprising a heat conducting member with an opening therethrough for the passage of the fuel mixture from the carbureter to the induction pipe, said member having therein an electrical heater and a chamber adapted for the passage of heated fluid therethrough, said electrical heater and chamber surrounding and being in thermal relation to the opening for the passage of the fuel mixture, said chamber being provided with a baffle plate located along the chamber wall in proximity to the opening for the passage of the fuel mixture, said baffle plate having openings therein arranged so as to expose more and more of the chamber wall to the heated fluid as it passes from the inlet of the chamber to the outlet thereof, substantially as described.

14. In fuel supplying means, the combination of means for heating the fuel mixture including a fluid heater and an electrical heater, and means for supplying air to the mixture including an extended passageway in close thermal relation to one of said heaters, and throughout substantially the entire length of which air passes before entering the mixture, whereby the air thus supplied is preheated, substantially as described.

This specification signed and witnessed this 22nd day of July 1912.

THOMAS A. EDISON, JR.

Witnesses:

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A. W. DRESSER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."