Aug. 5, 1924. 1,503,905

M. MACKIE

ATTACHMENT FOR INTERNAL COMBUSTION ENGINES

Filed Aug. 26, 1922 2 Sheets-Sheet 1

Fig. 1.

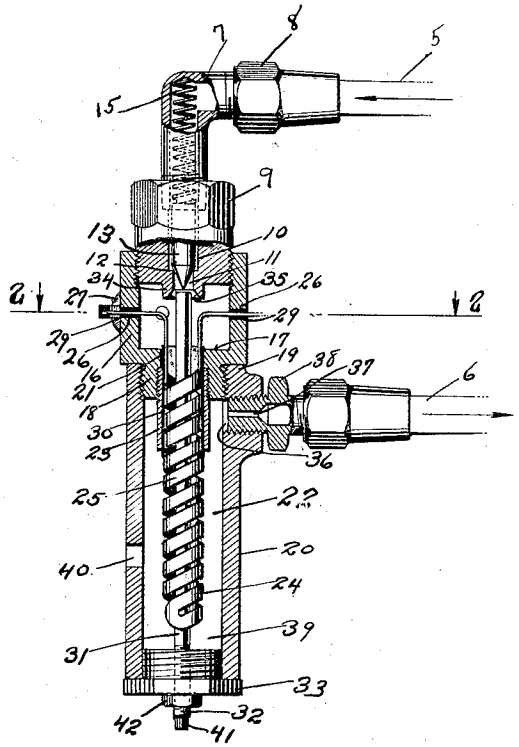
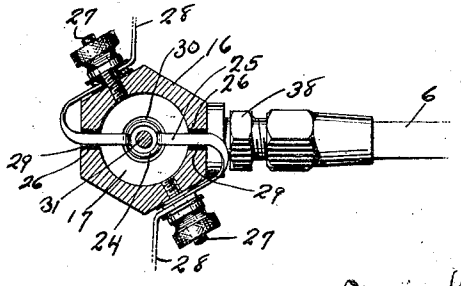


Fig. 2.



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Fig. 3.

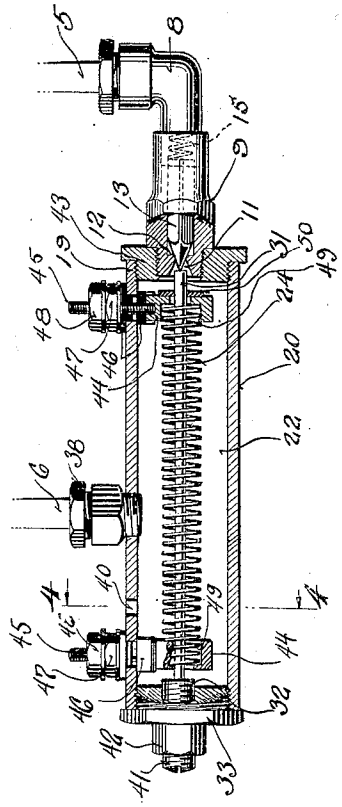
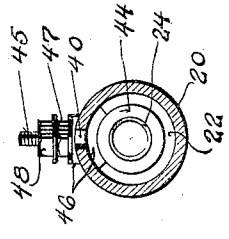


Fig. 4.



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UNITED STATES PATENT OFFICE.

MITCHELL MACKIE, OF WAUKESHA, WISCONSIN.

ATTACHMENT FOR INTERNAL-COMBUSTION ENGINES.

Application filed August 26, 1922. Serial No. 584,398.

To all whom it may concern:

Be it known that I, MITCHELL MACKIE, a citizen of the United States, and resident of Waukesha, in the county of Waukesha and State of Wisconsin, have invented new and useful Improvements in an Attachment for Internal-Combustion Engines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to a new and useful attachment for an internal combustion engine, and is more especially designed for use on engines of that type employed as a motive power for vehicles.

In the present type of automotive vehicle difficulty is experienced in starting the engine under all conditions, it being necessary to close the choke, or air inlet of the carbureter and thus draw the raw fuel into the cylinders. This manner of starting the engine, while apparently serving its purpose, is very injurious as but a very small fraction of the raw charge drawn into the cylinders is ignited, the unignited fuel leaking past the pistons and diluting the lubricating oil in the crank case. Not only is this manner of starting very injurious by reason of crank case dilution, but the raw fuel floods or dampens the spark oftentimes hindering, more than assisting, the starting operation.

The desirable manner of priming or starting an internal combustion engine is to first subject the initial or priming charge to heat sufficient to vaporize and break down the heavier particles thereof so that the charge becomes thoroughly atomized prior to entry into the cylinders, thus eliminating dampening of the spark and reducing crank case dilution to a minimum.

It is, therefore, an object of this invention to provide a device for reducing the initial or priming charge to a state where complete combustion is obtained and spark dampening or flooding and crank case dilution is practically eliminated.

Several devices have been placed on the market seeking to provide means for heating the initial or priming charge of an internal combustion engine, all of which are objectionable in that the energy consumed in proportion to the effective work produced is excessive, as a result of which the battery drain is severe and an over-load often produced, which is to be avoided at all times.

Having this in mind, it is another object of my invention to provide a device for heating the initial or priming charge of an internal combustion engine which is so constructed and designed as to insure the thorough vaporization or breaking down of the particles of the charge with a minimum expenditure of energy and to this end a heating element is provided having a maximum disengaging surface to permit the maintenance of the heating member, when in operation, at a comparatively low temperature.

It is another object of this invention to provide a guard to direct the fuel entering the device onto the coils of the heating member to insure the movement of the fuel along the coil for its length.

Another object of this invention resides in the provision of a valve controlled fuel inlet adapted to be actuated by a thermostatic member positioned within the range of influence of the heating member whereby the flow of fluid through the device is regulated and proportioned to the capacity of the coil, the thermostatic member being readily adjustable to operate the inlet valve under different degrees of heat.

This invention contemplates as a further object the provision of an improved mounting for the heating member whereby the same is centrally suspended in the heating chamber of the device and the connecting therewith of electrical feed wires facilitated.

It is a still further object of this invention to provide a device of the character described having a chamber equipped with a heating member formed of spirally wound wire the coils of which are slightly spaced and form a substantially tubular heating element, the fuel to be reduced or vaporized being discharged on the upper end of the element and spiraling down the coils, the fuel, upon being vaporized, leaving the coil at any point and passing through the outlet. With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood

that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated two complete examples of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view of an initial or priming charge control and heating device embodying my invention. parts thereof being in section and parts in elevation to illustrate structural details;

Figure 2 is a transverse sectional view taken through Figure 1 on the plane of line 2—2;

Figure 3 is a view similar to Figure 1 illustrating a slightly modified form of my initial or priming charge control and heating device; and

Figure 4 is a transverse sectional view taken through Figure 3 on the plane of line 4—4.

My improved device is capable of use with any design of automotive engine and, in the drawing, the numeral 5 designates a pipe line connected with a fuel supply, not shown, and the numeral 6 designates an outlet pipe adapted to be connected with the cylinder or cylinders of the engine to which my device is applied, preferably at the intake manifold thereof, not shown.

The line 5 is connected to one end of an elbow 7 by a suitable union 8, the other end of the elbow being secured to the outer end of a plug 9. The plug is centrally bored, as at 10, and the inner end of the bore is reduced, as at 11, to provide a seat 12 for a valve member 13 which is yieldably urged to engagement therewith by a spring 15. The spring 15 is confined within the vertical portion of elbow 7 and one end thereof engages against the outer end of the valve member and its other end against the rear wall of the elbow.

The inner end of the plug 9 is secured to and closes the outer end of a coupling 16, the inner end of which is closed by a wall 17 carrying an externally threaded boss 18 on its outer face which is engaged in the internally threaded end 19 of a casing 20. The wall 17 of the coupling is centrally bored, as at 21, to provide means of communicating with the heating chamber 22 defined by the interior of the casing. A sleeve or guard tube 23 extends from bore 21 and has a heating element 24, to be later described, projected therethrough.

The heating element is an open ended tube constructed of flat resistance wire 25 coiled so that both ends thereof are at the upper termination of the element. The ends of the element pass through openings 26 in the wall of the coupling and are electrically connected with terminals 27 with which the lead wires 28 of the battery or other source of supply, not shown, are connected. The openings 26 are preferably sealed with a cement or other material 29 to prevent leakage of fuel from the interior of the coupling.

The tube 23 is lined with mica or other material 30 to prevent short circuiting of the coils of the heating member passing therethrough. The major portion of the heating element extends beyond the end of tube 23 in order to afford a maximum area of disengaging surface, as hereinafter described.

Valve member 13 is automatically opened by a thermostatic bar or rod 31 which is preferably constructed of a material having a high coefficient of expansion and passes centrally through the heating member. One end 32 of rod 31 is adjustably threaded in a cap 33 closing the lower end of casing 20 and the other end thereof is normally positioned slightly in bore 11 but disengaging valve 13, said rod being instantly expanded upon heating of member 24 to open the valve and permit the discharge of fuel from line 5 into the device.

As illustrated in Figure 1, the inner end of plug 9 has a boss or projection 34 through which bore 11 extends and the inner periphery thereof is chamfered or tapered, as at 35, to discharge the fuel directly on to the coils of the heating member and not thermostatic member 31.

Assuming the circuit of the heating member to be closed and valve 13 opened, the fuel falls from bore 11 on to the coils of the heating member and instead of falling directly downwardly, it follows the spirals of the coils and is prevented from falling outwardly thereof by tube 23. By the time the fuel passes the end of tube 23 a part thereof will be in a vapor state and is immediately drawn through the outlet 36 with which pipe 6 is connected by a small metering opening 37 in a coupling member 38.

As the fuel continues spiraling down the coils of the heating member, the portions thereof being vaporized are continually given off, the fuel forming practically a wall about the tube which increases in diameter as it nears the lower end thereof, thus providing what is termed as the disengaging surface. In the event the heavier portions of the fuel are not vaporized by the time the end of the coil is reached, they fall into the sump 39 at the bottom of the heating chamber and are gradually vaporized and carried off through the outlet.

In the event the fuel is supplied the heating chamber at a volume greater than the capacity of the heating member, the thermostatic member by reason of its extreme sensitiveness will immediately shorten and permit closing movement of valve 13

to effectively regulate the volume of fuel in proportion to the capacity of the heating member. The thermostatic member 31 is readily regulated to operate at different degrees of heat by moving its upper end closer to or further away from valve 13 by screwing the same at its end 41 extended through cap 33 and the same is locked in adjusted position by a lock nut 42.

A bleed or air opening 40 is provided in the wall of casing 20 at a point positioned well above the maximum level at which the heavy particles are apt to be within the sump to facilitate the withdrawal of the vaporized fuel from the heating chamber.

In Figures 3 and 4 a slightly modified construction is illustrated in which casing 20 is positioned substantially horizontally and has its end opposite cap 33 closed by a cap 43 through which the threaded end of plug 9 is projected to communicate with the heating chamber. In this construction, the heating element is centrally suspended in the heating chamber by two end members 44 positioned adjacent the ends of the casing by terminal bolts 45 which pass through openings in the casing wall and are insulated therefrom by fiber, or the like, washers 46. The end members are rigidly secured in place by clamping nuts 47 on the terminal bolts and nuts 48 serve to connect the electrical feed wires, not shown, with the bolts.

The opposed faces of the end members are recessed, as at 49, and the ends of the heating member, which is preferably in the form of a spirally wound coil, are nested therein, the end members thus being in electrical contact with the ends of the heating element and acting as terminals.

In this form of my invention, the valve member 13 is preferably of substantially triangular shape in transverse section to permit its having a snug but slidable fit in bore 13 and at the same time permit free flow of fluid therepast when its inner end is disengaged from seat 12. To prevent the fuel from following the thermostatic rod, the reduced portion 11 of the plug bore is chamfered and a washer 50 secured to the outer face of the end member adjacent plug 9 through which the end of the rod passes, whereby the fuel flows about the periphery of the end member and follows the coils of the heating member.

With this construction, the fuel lies in the bottom of the heating chamber and partly submerges the heating member, that portion of the heating member projecting above the level of the fluid forming the disengaging surface herein described, and as the fuel is vaporized it rises and is drawn outwardly through pipe line 6.

What I claim as my invention is:

1. A device of the character described, comprising a chamber, a fluid supply connectable with the chamber, means normally disconnecting the fluid supply and the chamber, means for heating the chamber, and thermostatic means operable by the heating means to connect the fluid supply with the chamber and regulate the flow of fluid into the chamber.

2. A device of the character described, comprising a chamber, a fluid supply connectable with the chamber, means for heating the chamber, means operable by the heating means to connect the fluid supply with the chamber, and means for regulating the operation of the last mentioned means.

3. A device of the character described, comprising a chamber, a heating member positioned within the chamber, a valve controlled fuel inlet for the chamber, a thermostatic member in said chamber and within the range of influence of the heating member, said thermostatic member expanding under the influence of the heating member and communicating the fuel inlet with the chamber, and an outlet leading from said chamber.

4. A device of the character described, comprising a chamber, a tubular heating member in the chamber, a fuel inlet communicating with one end of the chamber, a thermostatic member carried by the other end of the chamber and passed through the heating member with one end adjacent the inlet valve member, said thermostatic member expanding under the influence of the heat given off by the heating member and communicating the inlet with said chamber, and an outlet leading from the chamber.

5. A device of the character described, comprising a chamber, a centrally apertured partition in said chamber near one end thereof, a substantially tubular heating member suspended in one part of said chamber, a fluid supply connectable with the other part of the chamber, means whereby fluid from said supply is directed outwardly to engage the walls of the heating member, and an outlet leading from the part of the chamber in which the heating member is positioned.

6. A device of the character described, comprising a chamber, a tubular heating member suspended in the chamber, a fuel supply arranged to discharge into the chamber and onto the heating member, a sleeve surrounding the upper portion of the heating member, whereby fuel entering the chamber is forced in engagement therewith, and an outlet for the chamber.

7. A device of the character described, comprising a chamber, a tubular heating member suspended in the chamber, a fuel supply arranged to discharge into the chamber and onto the heating member, a valve member normally closing the fuel sup-

ply, a thermostatic member terminating adjacent the valve member for actuating the same, and means for directing fuel admitted through the fuel supply onto the heating member.

8. A device of the character described, comprising a chamber, a heating member therefor, a fuel supply connectable with the chamber, an outlet leading from the chamber, and means controlling the admission of fuel into the chamber in proportion to the capacity of the heating member.

9. A device of the character described, comprising a fuel receiving chamber, a heating chamber disposed therebeneath, a tubular heating member projected into the heating chamber through an opening connecting the chambers, a fuel inlet communicating with the first named chamber, an outlet leading from the heating chamber, and means for directing fuel entering the first named chamber onto the heating member.

10. A device of the character described, comprising a fuel receiving chamber, a heating chamber disposed therebeneath, a tubular heating member projected into the heating chamber through an opening connecting the chambers, a fuel inlet communicating with the first named chamber, an outlet leading from the heating chamber, and means causing fuel entering the first named chamber from the inlet to be discharged directly on the heating member.

11. A device for heating the initial priming charge of an internal combustion engine, comprising an elongated, vertical chamber, a tubular heating element centrally mounted in said chamber with its ends adjacent the chamber ends, a fuel inlet communicating with the chamber at its upper end, said inlet protruding into the chamber and having the passageway thereof chamfered to cause the fuel from the inlet to be discharged onto the heating element, a member having a relatively high coefficient of expansion and extended centrally through the heating element, means adjustably securing the lower end of said member to the chamber lower end, the upper end of said member terminating at the fuel inlet, valve means normally closing the fuel inlet, said member expanding upon the temperature of the heating element exceeding a predetermined degree and opening the valve means, an air inlet communicating with the chamber, and an outlet leading from the chamber.

In testimony whereof I affix my signature.

MITCHELL MACKIE.