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ELECTRIC FUEL HEATER FOR INTERNAL-COMBUSTION ENGINES

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*Fig. 1.*

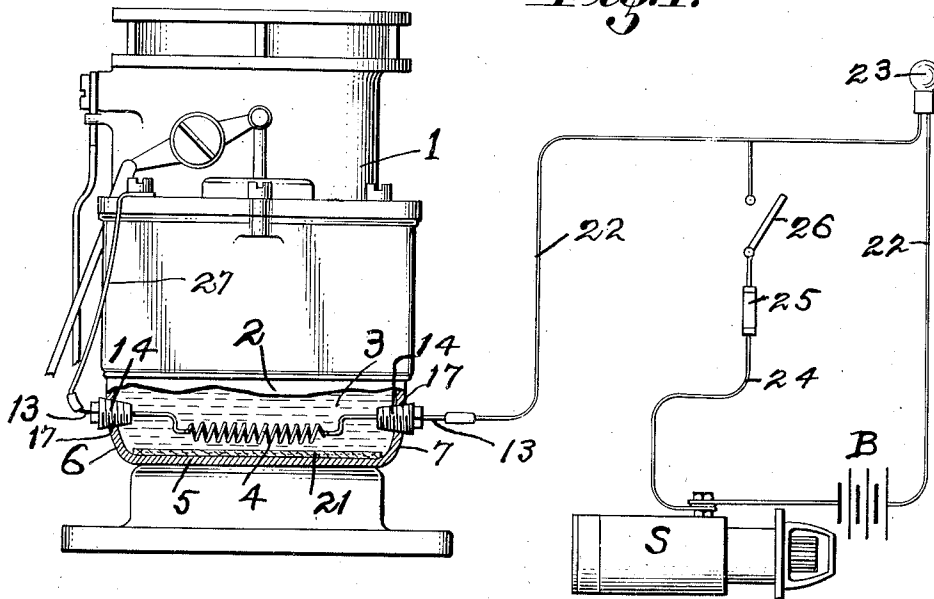
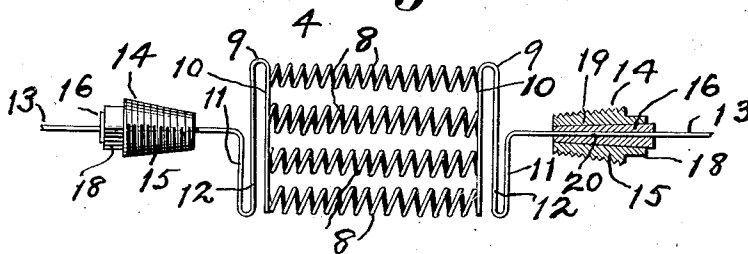
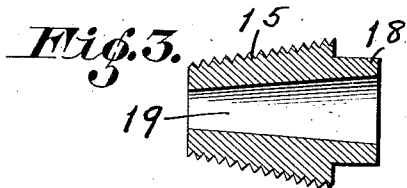
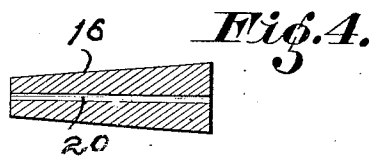


*Fig. 2.*



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## UNITED STATES PATENT OFFICE

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## ELECTRIC FUEL HEATER FOR INTERNAL-COMBUSTION ENGINES

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6 Claims. (Cl. 219—38)

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This invention relates to electric fuel heaters for internal combustion engines designated for use in the initial starting of a cold engine, and particularly to fuel heaters of that type in which a volatile liquid fuel is gasified or vaporized for introduction into the engine cylinders.

One object of my invention is to provide an electric fuel heater which is applicable to a carburetor and adapted for rapidly and efficiently heating the fuel therein so as to supply the fuel in a vaporous state to the engine cylinders to enable a cold motor to be started within a minimum period of time even in very cold weather.

A further object of my invention is to provide an electric heater of the character and for the purpose described which may be readily installed in a conventional carburetor, which will be durable and allow expansion and contraction of the heating unit to prevent injury thereto, and which may be furnished for use and installed in a carburetor at a comparatively low cost.

With these and other objects in view, which will appear in the course of the subjoined description, the invention consists of the novel features of construction, combination and arrangement of parts hereinafter more fully described and claimed, reference being had to the accompanying drawing in which:

Figure 1 is a view in elevation partly in section, showing the application of my improved heater thereto, and also showing an electric circuit in which the heater is arranged.

Figure 2 is a plan view of the electric heater per se and its mounting plugs and insulating sleeves.

Figure 3 is a longitudinal section through one of the plugs.

Figure 4 is a similar view of one of the insulating sleeves.

Referring now more particularly to the drawing, 1 designates a carburetor of any suitable or conventional type having a bowl portion or reservoir chamber 2 for holding a quantity of volatile fuel 3 to be vaporized for passage to the intake manifold and thence to the cylinders of the engine.

My improved heater 4 which is designed to be used to heat the fuel temporarily for use in starting the engine, is submerged in the body of fuel stored in the bowl or chamber above the

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horizontal bottom 5 and between opposed vertical walls 6 and 7 of the chamber. This heater comprises a plurality or group of coiled resistance wires 8, preferably four in number, and arranged in parallel relation to each other and unitarily spaced apart. In practice, these resistance coils may be made of Nichrome steel or other suitable high resistance metal and the wires at each end of the group are secured to and united by a bridge piece or terminal 9 preferably formed of copper wire of #12 gauge.

Each bridge piece or terminal 9 is preferably of looped form and bent to provide inner, outer and intermediate limbs 10, 11 and 12. The limbs are spaced a predetermined distance apart and the adjacent ends of the resistance coils are soldered to the inner limb 10, which is thereby held more or less rigid, and connects and holds the coils in the desired spaced relation. The limb 10 is coextensive in length with the overall width of the coils, and the limb 12 is coextensive in length therewith and extends from one end of the limb 10 toward its opposite end, while the limb 11 is bent backward from the free end of the limb 12 and terminates at or about in line with the longitudinal center of the heater and is thence bent outward in the form of a lead extension 13.

The heater is supported from the walls 6 and 7 and out of contact therewith and above the wall 5 by mounting devices 14 each comprising a tapered threaded plug 15 and a tapered insulating bushing sleeve 16. The plugs 15 are threaded into tapered openings 17 in the walls 6 and 7 and have angular outer ends 18 by which a wrench or similar tool may be applied to thread them into or out of the openings. The plugs also have tapered bores 19 to receive the insulating sleeves 16 which have cylindrical bores 20 to snugly receive and permit passage of the lead extensions 13 of the bridge pieces therethrough. Each sleeve is preferably made of somewhat greater length than its receiving plug so that when applied the outer end of the sleeve will project slightly beyond the plug to enable it to be gripped and removed if and when required.

In installing the heater for use in the carburetor, the heater unit is introduced into the chamber 2 and its leads extended outward through the openings. The plugs 15 are then threaded into the openings 17 about the leads and the sleeves 16

then slipped over upon the leads and fitted with a driving fit into the bores 19 of the plugs. When this is done the heating unit will be supported in the chamber out of contact with and insulated from the walls thereof but so that it will be submerged in the body of fuel 3 when the latter is supplied and so that in the action of the heater the fuel will be rapidly vaporized for supply to the engine cylinders for a quick starting of the engine. When the heating unit is thus installed, a coating of plaster of Paris may be applied to the coils to stiffen them against sagging and against direct contact of any foreign substances therewith. The coating of the consistency of thick cream is applied after all jet openings in the carburetor are temporarily closed by plugs, the coating is allowed to dry and the plugs then removed. This material or any other suitable material may be used to also close any crevices between the plugs 15 and walls of the openings 17.

When the heater is mounted for use in the manner described it will be supported securely against displacement from a working position under movements of the vehicle but its looped bridge pieces or terminals, through bending or flexing movements will allow the unit to longitudinally expand and contract, to prevent warping thereof, as it is heated to different degrees and is allowed to cool off. If desired, a shield 21 of asbestos or the like may be disposed to cover bottom 5 of the chamber 2 and adjacent portions of the vertical walls thereof in order to confine the heat to the body of fuel and prevent heat losses through the chamber walls.

Figure 1 of the drawings shows the device as installed for use and arranged to be supplied with current from an electric circuit. This circuit includes a conductor 22 coupled to the lead 13 at one end of the unit 4 and to one of the poles of a battery B and having arranged therein a signal lamp 23. A branch conductor 24 is connected with the starting switch S, the other pole of the battery B and contains a fuse 25 and a switch 26 by which latter the heater may be thrown into and out of action together with the signal lamp 23 which will indicate whether or not the heater is in operation. A ground conductor 27 coupled to the other lead 13 of the heater connects the heater through the carburetor to the chassis frame of the vehicle and completes the heater circuit.

From the foregoing description, taken in connection with the drawing, the construction and mode of operation of my improved heater will be readily understood and its advantages appreciated by those versed in the art without a further and extended description, and it will be seen that the invention provides a heater of simple construction which may be easily installed for use and removed for repairs or replacement of parts, and whereby the fuel in the chamber 2 may be rapidly evaporated to quickly start an engine in even very cold weather. While the construction shown is preferred, it will be obvious that changes in the form, construction and arrangement of the parts falling within the scope of the appended claims may be made without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described my invention, I claim:

1. An electric fuel heater of the character described comprising a heating unit formed of a plurality of parallel resistance coils, a unitary bridge piece at each end of the unit, said bridge

piece including a member joining and spacing the units from each other, a terminal extension and a resilient connection between said member and extension, and means for cooperation with said terminal extensions of the bridge pieces for supporting the unit within and from the walls of a chamber containing the fuel to be heated.

2. An electric fuel heater of the character described comprising a heating unit formed of a plurality of parallel resistance coils, unitary bridge pieces at the ends of the unit joining and spacing the ends of the coils, each bridge piece embodying a strip of material bent back and forth to provide an inner limb connected to the coils, an outer limb and an intermediate limb resiliently connecting the inner and outer limbs, the outer limb having a terminal extension, and threaded plugs through which the terminal extensions extend for cooperation with said bridge pieces to support the unit within and insulate the same from the walls of a chamber containing the fuel to be heated.

3. An electrical fuel heater of the character described comprising a heating unit formed of a plurality of parallel resistance coils, bridge pieces joining and spacing the ends of the coils of the unit, each bridge piece including a terminal extension resiliently connected therewith, insulating sleeves receiving said terminal extensions through which the same project, and threaded plugs enclosing said sleeves and adapted for cooperation with said bridge pieces for supporting the unit within and from the walls of a chamber containing the fuel to be heated.

4. An electrical fuel heater of the character described comprising a heating unit formed of a plurality of parallel resistance coils, a bridge piece joining the ends of the coils at each end of the unit, each bridge piece including an inner limb fixed to and spacing the coils and an outer limb resiliently connected with the inner limb and having a terminal extension projecting outwardly therefrom, and means through which said terminal extensions extend for cooperation with said bridge pieces to support the unit within and to insulate the same from the walls of a chamber containing the fuel to be heated.

5. An electrical fuel heater of the character described comprising a heating unit formed of a plurality of parallel resistance coils arranged side by side, a bridge piece joining the ends of the coils at each end of the unit, each bridge piece embodying a strip of material bent back and forth to provide an inner limb, an outer limb and an intermediate limb resiliently connected with the inner limb, the outer limb of each bridge piece having a terminal extension, and means engaging the terminal extensions of said bridge pieces for connecting the unit with and supporting it from opposed walls of a chamber containing the fuel to be heated.

6. In an electric fuel heater for internal combustion engines, a carburetor having a fuel containing chamber provided with a bottom wall and opposed vertical walls, the latter having openings therein, a heating unit disposed in said chamber and comprising a plurality of parallel resistance coils and resilient bridge pieces connecting the coils at each end of the unit, the said bridge pieces having terminals projecting outward through the vertical walls, plugs fitted in the vertical walls, and insulating sleeves fitted in the plugs and through which the terminals extend and which cooperate with the plugs for sup-

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porting and insulating the unit from said walls.  
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