July 31, 1962 R. H. HUNTER ET AL 3,047,054

GENERATOR FOR LIQUID FUEL TORCH

Filed Jan. 2, 1958 2 Sheets-Sheet 1

Fig. 1

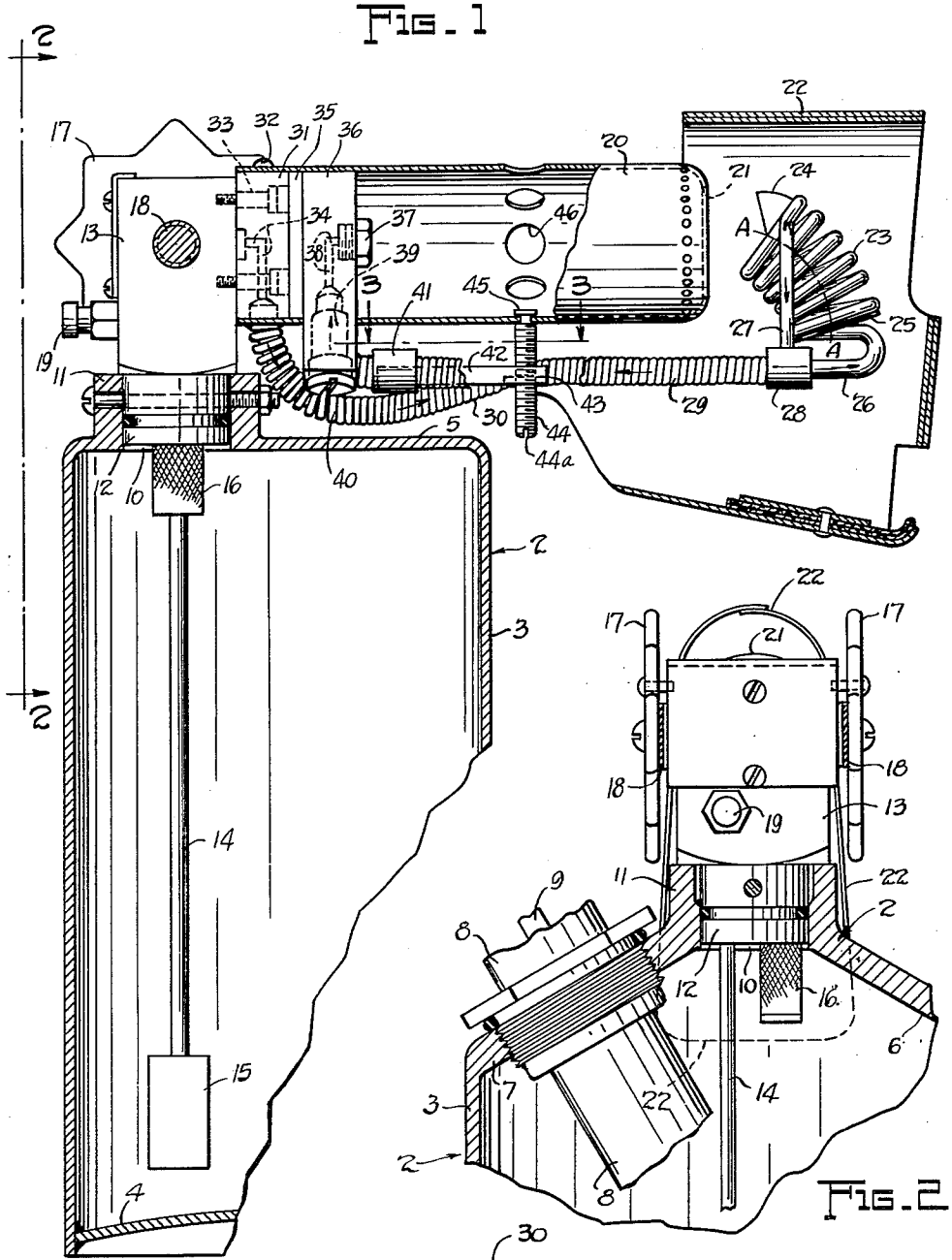


Fig. 2

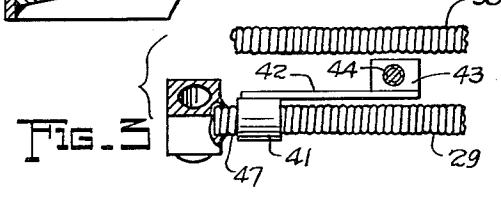


Fig. 3

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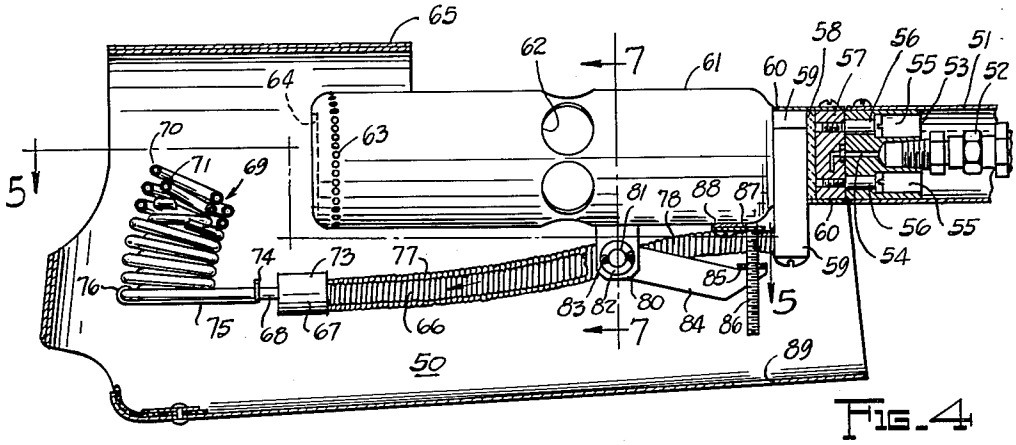


Fig. 4

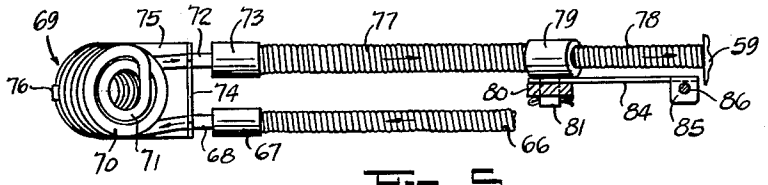


Fig. 5

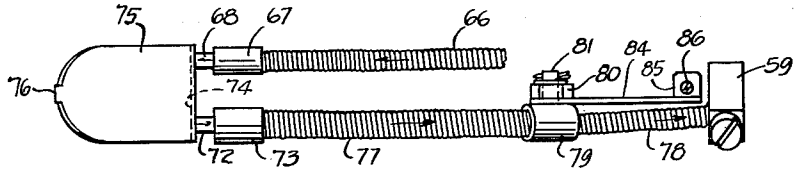


Fig. 6

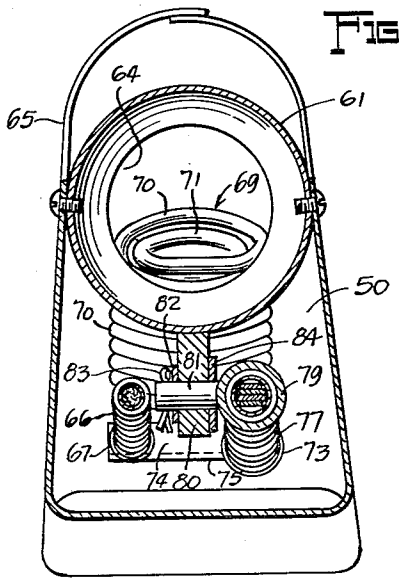


Fig. 7

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United States Patent Office 3,047,054 Patented July 31, 1962

3,047,054

GENERATOR FOR LIQUID FUEL TORCH

Robert H. Hunter, Gates Mills, Abe J. Hanje, Northfield, and Harris W. Smith, Bainbridge, Ohio; said Hanje and said Smith assignors to said Hunter

Filed Jan. 2, 1958, Ser. No. 706,718
12 Claims. (Cl. 158—33)

This invention relates to liquid fuel torches and in particular to such torches incorporating generating systems for pre-heating the fuel.

Systems for preheating the liquid fuel of torches have been proposed in the past, as for example, in prior application for U.S. patent Serial No. 479,074, filed December 31, 1954, now Patent No. 2,940,515, in the names of Robert H. Hunter, Abe J. Hanje and Harris W. Smith. In general, such a system makes use of a tubular fuel-heating coil disposed in the path of the flame emanating from the combustion tube for converting at least a portion of the gasoline or other liquid fuel to the gaseous state prior to being discharged from the nozzle. In order to vary the heat absorbing rate of the generator over a fairly wide range, depending on conditions of use and the type of fuel being burned, it is desirable that such a system incorporate adjusting means for moving the coil bodily in relation to the flame. Among other things, the present invention provides a generating system incorporating manual adjusting means peculiarly well adapted for this purpose.

Such adjusting means must be simple, sturdy and effective. It must incorporate no more than a minimum number of moving parts. It must be such that it can be manipulated by an operator wearing heavy gloves. It must be readily accessible notwithstanding the fact that the torch as a whole may incorporate a flame shield covering not only the burner tube but also the heater coil itself. All of these and other like desiderata are very satisfactorily answered by the present invention, as will shortly appear.

The present invention further provides as an optional feature a generating system in which the heater coil is toroidal in shape; i.e., so formed that its longitudinal axis describes an arc of short radius of curvature. A toroidal coil of this kind offers enhanced efficiency of operation, particularly in combination with a manual adjusting system of the type hereinafter described. Such a coil may consist of only a single helical spiral, or if added heat adsorption is desired, it may take the form of a double helix. The length of the path is increased which the fuel must travel before being delivered by the generating system to the nozzle by which it is projected into the combution tube.

Other objects, advantages and features of the invention will be apparent from the description which follows and from the accompanying drawings, forming part of the specification, in which:

FIGURE 1 is a vertical section with parts broken away and removed and with parts in elevation, of a fuel-burning torch incorporating the features of and representing the best known mode of practising the invention;

FIGURE 2 is a corresponding fragmentary end elevation of the torch with parts in section and other parts broken away, seen as if from the plane represented by line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary detail plan of the adjusting system, seen as if from the plane represented by line 3—3 of FIGURE 1;

FIGURE 4 shows in longitudinal section through its sheet metal shroud, but with certain of its major parts in elevation, a modified torch head for use with an extension tube;

FIGURES 5 and 6, respectively, are fragmentary top and bottom detail plans of the generating system of the torch of FIGURE 4; and

FIGURE 7 is a section substantially in the plane represented by line 7—7 of FIGURE 4 but on an enlarged scale.

The embodiment of the invention illustrated in FIGURES 1 to 3 includes a conventional fuel reservoir or tank 2 made up of side walls 3, bottom 4 and top 5. The latter consists of a narrow flat portion, shown in longitudinal section in FIGURE 1, which extends diametrically across the tank. It is flanked by two inclined portions 6 and 7 (FIGURE 2); inclined portion 7 is apertured to receive a bushing in which is mounted a filler tube 8 housing a pump for charging the tank with air. The pump has a piston actuated by a rod 9.

On the tank top at one end of the flat portion is an opening surrounded by a flange 11 of upstanding circular shape in which is mounted the cylindrical lower end 12 of a chambered mixing block 13 having internal fuel and air passages, the block being of a type shown, described and claimed in copending application for patent Serial No. 747,411, filed July 9, 1958 and which has now become Patent No. 3,002,551. Depending from the lower end of the mixing block and connected to the fuel passage if the latter is a fuel tube 14. At the bottom of the tank a filter assembly 15 is mounted on the fuel tube to filter liquid fuel entering the tube. A second filter assembly 16 for air is mounted directly on the flat bottom of the cylindrical portion of the lower end of the mixing block.

Fuel and air passing through filter assemblies 15 and 16 into the mixing block 13 travel through separate vertical passage bores in the mixing block to a mixing chamber (not shown) from which a horizontal passage or bore leads forwardly to the front face of the mixing block opposite the face shown in FIGURE 2. Star wheels 17, of which there are two, are connected to fuel and air flow regulating or metering plugs 18, seen in part in FIGURE 2, which control separately the flow of fuel and air through the mixing block. On the rear of the mixing block is a manually-operated pressure relief valve 19 for use, if desired, in venting air under pressure from the interior of the tank to the atmosphere.

On the front face of the mixing block is mounted a combustion tube 20 provided at its forward end with a flame opening 21. To it is attached a flame shield 22. The combustion tube 20 may be supported from the mixing block 13 in any convenient way such as by fastening means of the quick-attachable and quick-detachable type, described and claimed in copending application for patent Serial No. 654,322 filed April 22, 1957, now Patent No. 3,001,573, for Extension Tube Torch by Robert H. Hunter, Abe J. Hanje and Harris W. Smith. A torch-like flame is projected from the combustion tube at its unsupported end when the torch is operating. This flame is brought into contact with or directed against the object to be heated; e.g., those components of an engine for a vehicle, tank or airplane that may advantageously be heated to facilitate starting in cold weather.

In the path of the flame emanating from the end of the combustion tube 20 is a helical coil 23 that forms part of a generating system for heating and partially vaporizing the fuel before it is discharged into the combustion tube in accordance with the principles described and claimed in said prior application, Serial No. 479,074. The coil 23 is tubular in the sense that it is formed of tubing of high seat conductivity metal and also in the sense that by virtue of its coil shape having an opening through its center it superficially resembles a tube.

It will be noted from FIGURE 1 that longitudinal axis A—A of coil 23 describes an arc one or upper end of which is just forward of the flame discharge end of the

combustion tube and the other or lower end of which centers in the intercepting plate 25, thereby imparting a toroidal shape to the coil. In practice it has been found that the efficiency of the coil 23 is enhanced if the coil thus be given such toroidal shape. In part this appears to result from the fact that a portion of the flame emanating from the combustion tube 20 is guided into the coil in such manner as to utilize its heat to better advantage. The coil 23, seen as in FIGURE 1, carries a flame deflector 24 at its upper end; at its lower end the coil carries a circular metal baffle plate 25 in transverse relation for closing the coil end and intercepting the gaseous blast that is directed into the coil by the deflector 24 and flows axially downwardly through the helix. This diadending of the flame path through the helix causes the flame to spread laterally through the opening or space between the turns of the helical generator coil. Deflector 24 and the intercepting plate 25 are welded to the uppermost and lowermost turns of the coil, respectively.

Coil 23 has an inlet line 26 through which is received fuel to be pre-heated and an outlet line 27 for fuel that has been subjected to the heat of the flame. The outlet line 27 communicates through a fitting 28 with near end of a flexible return conduit 29 which extends rearwardly toward but is not connected to the mixing block 13. Although not so shown in FIGURE 1, inlet line 26 is connected to a similar fitting at the near end of a second flexible or supply conduit 30 which extends rearwardly in generally parallel relation to the outlet conduit 29. Accordingly, in FIGURE 1, parts of the supply conduit 30 appear to be concealed by the return conduit 29. Through the inlet and outlet lines 26 and 27 the outboard ends of the flexible return and supply conduits 29 and 30 are interconnected by the coil 23.

Although the conduits 29 and 30 may be regarded as extending rearwardly from the coil 23 in the general direction of the mixing block, they are not in direct communication with the mixing block; instead, they are respectively connected to a nozzle base block 36 and to a cylindrical mounting base 31. The latter receives drive screws 32 disposed radially through the end of the combustion tube 20 by means of which such tube is coupled to the mixing block. Coupling means 33 of the quick-attachable and quick-detachable rotary joint type are employed to hold the forward face of the mixing block and the rear or coupling face of the mounting base in mutual engagement. Passages 34 in the mounting base 31 serve to conduct air, fuel, or a mixture of both from the mixing block 13 to the open end of the conduit 30. Seen from the left-hand end of FIGURE 1, conduit 30 is connected to the mounting base in a position a few degrees removed from the six o'clock position in the clockwise direction, usually in about the seven o'clock or the eight o'clock position.

The nozzle base 36 is separated from the mounting base 31 by a circular gasket 35 of asbestos or other heat-insulating material and is held to the mounting base by screws, not shown. The nozzle base 36 is elongated and of square or rectangular cross section. As indicated by the showing in FIGURE 1, it is so mounted that as seen from the left-hand end of FIG. 1 its long axis is angled a few degrees counterclockwise from the vertical and the projecting lower end of the nozzle base 36 is in about the four o'clock or five o'clock position.

The nozzle base 36 supports nozzle 37 through which fuel is projected axially into the combustion tube. Back of nozzle 37 in the interior of the nozzle base is a system of passages 38 communicating with a filter assembly 39 which can be reached for cleaning by removing cap 40. The return conduit 29 is soldered or otherwise held in place in a suitable opening in the forward face of the nozzle base 36 in such manner as to permit pre-heated fuel from the coil 23 to flow through the conduit 29, the filter assembly 39, the passages 38 and the nozzle 37 in that order.

As already pointed out, it is desirable that provision be made for moving the generating system toward or from the longitudinal axis of the combustion tube 20. To accomplish this in simple fashion, one of the two conduits 29, 30, preferably the conduit 29, carries a sleeve 41 to which is brazed an axially or forwardly extending arm 42: see FIGURE 3. At the forward end of the arm 42 is a laterally directed horizontal portion 43 in which is a tapped opening accommodating a screw 44. The sleeve 41 is brazed to the tube 29 in spaced relation to the nozzle base 36 so as to leave several convolutions 47 of the flexible tube 29 unconfined between such sleeve and the base, thereby permitting bending of the tube in such unconfined zone, as will appear.

In order that the screw 44 may function to actuate the arm 42 it is held against axial shifting as a captive screw. Its reduced diameter upper end 45 is received through an opening in the bottom of the combustion tube 20 and headed over to an extent sufficient to keep the screw as a whole from moving longitudinally but not sufficient to keep it from rotating. For the purpose of heading the screw in assembly, the end 45 is accessible through one of several combustion tube holes 46 by means of which air enters the tube during operation of the torch. When screw 44 is rotated, as by a screw driver applied to kerf 48 in its lower end, the axially extending rigid arm 42 and the conduit 29, move up or down, as the case may be, carrying with them the coil 23 and the conduit 30, the conduit 29 bending in the zone 47 and the conduit 30 bending along its entire length.

It will be observed that the adjusting device shown in FIGURES 1 and 3 is extremely simple, consisting mainly of sleeve 41, arm 42 and screw 44. The lower end of the screw 44, which is the end by which the adjustment is accomplished, is readily accessible to the user. The adjusting device operates directly on one and indirectly on the other of the two conduits 29, 30, this being sufficient to accomplish the desired raising or lowering movement of the generating system toward or from the combustion tube. The sleeve part 41 of the adjusting device can readily be applied and soldered or brazed to either one of the two conduits 29, 30 in assembly before the generating system is incorporated in the torch head.

In the embodiment of the invention illustrated in FIGURES 4 to 7, the torch head forms part of a torch of the type in which an extension tube intervenes between the fuel reservoir (not shown) and the torch head. At the head end of the extension tube (remote from the fuel reservoir) is a tubular grip 51 for holding and manipulating the torch head. The extension tube itself terminates as shown in a fitting 52 at the forward end of the grip 51.

In the grip 51 is a mounting base 53 provided with an axial passage 54 for fuel, air, or a mixture of both coming from the extension tube by way of the fitting 52. The mounting base 53 is held in place in the grip 51 by drive screws or the like. Openings 55 in the mounting base are for two longiudinally directed studs 56 which form part of a quick-attachable and quick-detachable coupling system. The openings 55 in which the studs 56 are received take the form of bayonet slots. By twisting, the mounting base 53 may be coupled to or uncoupled from the torch head.

A second mounting base 57, an insulating gasket 58 and a nozzle base 59 are located as shown in FIGURE 4 in neck 60 of a combustion tube 61. The mounting base 57, the gasket 58 and the nozzle base 59 correspond closely to the like parts in the first described embodiment of the invention (specifically, the mounting base 31, the gasket 35 and the nozzle base 36) except that in an optional reverse arrangement the studs 56 project rearwardly rather than forwardly into the mounting base 57. The openings for the attaching studs thus in the mounting base 53 at the forward end of the extension tube rather than in the base 57 within the supported end of the com-

bustion tube, as in the previously described embodiment of the invention.

The combustion tube **61** has a circumferential series of centrally located large air openings **62**, a series of lesser air openings **63** near the forward discharge end of the burner tube, and an axial discharge opening **64** in such forward end through which the flame projects. Attached to and partially enclosing the tube **61** is a shroud or flame shield **65**, located and mounted as shown in FIGURES 4 and 7. Within it in a chamber **50** generally below and ahead of the combustion tube is the generating system about to be described, by which fuel received in the mounting base **57** at the supported end of the tube **61** is pre-heated before being admitted to the nozzle base **59**.

Fuel received in the generating system from the mounting base **57** travels forwardly; i.e., from right to left as seen in FIGURE 4, through a conduit **66**. In order to show details of the manual adjusting device, this supply conduit is represented as broken away in FIGURES 4 to 6 at a point approximately midway of its length. It should be understood that at its inboard end it is coupled to the mounting base **57** as in the embodiment of the invention shown in FIGURES 1 to 3 the conduit **30** is coupled to the base **31**.

At the outboard or forward end of the flexible conduit **66** is a tubular fitting **67** to which is connected a first tube **68** leading to generator coil **69**. Like coil **23**, coil **69** is of copper, brass or other heat resistant high heat conductivity metal, it is toroidal in shape; that is to say, its longitudinal axis describes an arc of relatively long radius of curvature centered on the pivot axis of the generator adjusting pin **81**, later described. Unlike the coil **23**, which consists of a single helix, the coil **69** consists of two concentric helices, an outer helix **70** and an inner helix **71**. From the inner helix **71** a second tube **72** delivers heated fuel to a fitting **73** at the outboard end of a return conduit **77**.

The tubes **68** and **72**, the former admitting to coil **69** the fuel that is to be heated and the latter removing the heated fuel from the coil, pass through suitable openings (not shown) in a vertically extending portion **74** of a deflecting or bottom closure plate **75** that is mechanically fastened to the coil **69**. The shape of the deflecting plate **75** is best seen in FIGURE 6. It intercepts that portion of the torch flame which travels downwardly through the arcuate passage defined by the generator coils **70, 71**. The plate is held in place by a tang **76** which projects forwardly from its curved front edge, the tang being bent around the lowermost turn of outer helix tube **70**.

Extending rearwardly from the fitting **73** is a flexible conduit **77** through which heated fuel passes on its way to the nozzle base **59**. It will be noted that the return conduit **77** is somewhat larger in diameter than the companion supply conduit **66**. This permits the return conduit to accommodate bi-metallic control strips (not shown) of the kind described in prior application Serial No. 479,074, filed December 31, 1954 in the names of Robert H. Hunter, Abe J. Hanje and Harris W. Smith. These control strips bring about automatic flexing of the conduit **77** and an accompanying movement of the generator coil **69** toward or away from the path of the torch flame projected from the end opening **64** of the combustion tube **61**. Conduit **77**, in which the bi-metallic elements are housed, is an open communication through a fitting **79** with a relatively narrow conduit **78** by means of which the heated fuel is delivered to the nozzle base **59**.

The manual adjusting device for the generator comprises a lug or bracket **80** depending from the combustion tube **61** in juxtaposition to the fitting **79**. In lug **80** is an opening accommodating a pivot pin **81**. One end of the pivot pin **81** is brazed or otherwise secured to fitting **79**. At the opposite end of the pivot pin **81** are a metal retaining washer **82** and a cotter pin **83**. Washer **82** intervenes between the cotter pin **83** and the lug **80** as shown in FIGURE 7. Accordingly, rotary movement of the pivot pin **81** is capable of producing movement of the conduit **77**, the fitting **73** and the coil **69**. Such movement is imposed on the pivot pin **81** by a rearwardly extending arm **84** brazed or otherwise rigidly attached to the pivot pin and the fitting **79**: see FIGURE 7. At its free end the arm **84** is provided with a laterally extending bent over portion **85** that corresponds to the laterally extending portion **43** of the arm **48** in the previously described embodiment of the invention. An adjusting screw **86**, provided at its lower end with a screwdriver kerf, is threaded through the laterally extending portion **85** of the rearwardly directed arm **84**. The upper end of the screw **86** is mounted for rotation in and held captive by a metal tab **87** that is held in place against the underside of the combustion tube **61** by means of screw **88**, all as shown in FIGURE 4.

When a screwdriver is applied to the kerf of the screw **86** about its horizontal axis and corresponding movement of the generating system toward or from the combustion tube. The adjusting system acts directly on the conduit **77** and only indirectly on the conduit **66**, which moves with the conduit **77** in consequence of the fact that the two are interconnected through the coil **69**.

Thus the invention provides generating systems characterized, inter alia, by manual adjusting means that are simple, sturdy and unlikely to get out of order. In each case it is only necessary to apply and turn a tool such as a screwdriver to the lower end of the adjusting screw, thereby producing movement of the conduit with which the adjusting screw is associated and of the generating system as a whole. In the embodiment of the invention shown in FIGURES 1 to 3, the adjusting device is particularly simple, comprising a captive screw, an arm cooperating with it, and a sleeve to which the arm is attached; in that of FIGURES 4 to 7, the actuating arm is mounted to turn on a pivot carried by the combustion tube.

The above-described adjusting devices serve to shift the generator coil and the flexible conduits connected to it toward or from the logitudinal axis of the combustion tube which latter also is the axis of the torch flame path. In general, movement toward such axis is desirable if the fuel delivered to the nozzle **37** is not being heated to a sufficiently high temperature; movement away from such axis is in order if too high a fuel temperature is being attained. The optimum position of the generator **23** (or **69**) depends partly on the fuel being used, some fuels vaporizing more readily or at lower temperatures than others or being capable of producing a flame considerably hotter than others. Another factor is the temperature of the environment in which the torch is used, the generator being adjusted to a position closer to the path of the flame for operation in a relatively low temperature environment and adjusted to a position relatively removed from the path of the torch flame issuing from the discharge opening **21** (or **64**) for operation in a relatively high temperature atmosphere. The bimetallic elements provide automatic thermostatic control over the position of the generator coil in operation of the torch.

The use of a toroidal coil within the flame shield tends to further enhance the efficiency of the torch. Such a coil may be of the single-helix or double-helix type, as desired, although it will be obvious that a coil of the double-helix type will prove more and a somewhat different cycle of pre-heating of the fuel in the generating system. With either type of coil it is desirable to use a deflecting plate at the remote or bottom end, as shown, such deflecting plate intercepting the torch flame and causing the latter to exit laterally between the coil convolutions. The generator coils may be used also in systems that lack the manual adjusting means of the present invention; similarly, the manual adjusting devices with which

the invention is mainly concerned may be used with coils of other types.

It is intended that the patent shall cover, by summarization in appended claims, all features of patentable novelty residing in the invention.

What we claim and desire to secure by United States patent is:

1. In a liquid fuel torch of the type comprising an elongated combustion tube, a nozzle, body means mounting the nozzle in fixed relation to the tube to project fuel axially into one end of the tube, the other end of the tube having a discharge opening through which ignited fuel issues as a torch flame along a predetermined axis, a helical coil tube fuel heater having spaced convolutions disposed at the other end of the combustion tube, means mounting the coil heater for movement toward and away from said flame axis, conduit means fast at one end to the body means and at the other end to the heater for connecting the heater tube to a fuel source and to the nozzle for serial flow first through the heater and second through the nozzle and a stop across one end of the heater coil for movement with the latter as a unit to intercept flame flow through the coil, thereby influencing the flame to flow radially out of the heater coil between the convolutions of the latter, said stop being secured to and wholly supported by the heater tube.

2. In a liquid fuel torch of the type comprising an elongated combustion tube, a nozzle, body means mounting the nozzle in fixed relation to the tube to project fuel axially into one end of the tube, the other end of the tube having a discharge opening through which ignited fuel issues as a torch flame along a predetermined axis a helical coil tube fuel heater having spaced convolutions disposed at the other end of the combustion tube, means mounting the coil heater for movement toward and away from said flame axis, conduit means fast at one end to the body means and at the other end to the heater for connecting the heater tube to a fuel source and to the nozzle for serial flow of fuel first through the heater and second through the nozzle and a deflector mounted on and wholly supported by the endmost convolution of the coil heater at one end of and for movement with the latter as a unit and disposed to intercept a torch flame emanating from the discharge opening in said other end of the combustion tube and to deflect the intercepted flame to flow through the helical coil heater.

3. In a liquid fuel torch of the type comprising an elongated combustion tube, a nozzle, body means mounting the nozzle in fixed relation to the tube to project fuel axially into one end of the tube, the other end of the tube having a discharge opening through which ignited fuel issues as a torch flame along a predetermined axis, a helical coil tube fuel heater having spaced convolutions disposed at the other end of the combustion tube, means mounting the coil heater for movement toward and away from said flame axis, conduit means fast at one end to the body means and at the other end to the heater for connecting the heater tube to a fuel source and to the nozzle for serial flow first through the heater and second through the nozzle, a deflector mounted on and wholly supported by the endmost convolution of the coil heater at one end of and for movement with the latter as a unit and disposed to intercept a torch flame emanating from the discharge opening in said other end of the combustion tube and to deflect the intercepted flame to flow through the helical coil heater, and a stop at the other end of the heater coil for movement with the latter as a unit to intercept the deflected flame flow through the helical coil, thereby influencing the deflected flame to flow radially out of the heater coil between the convolutions of the latter, said stop being secured to and wholly supported by the heater tube.

4. In a liquid fuel torch of the type comprising an elongated combustion tube, a nozzle supported in fixed relation to the tube and disposed to project fuel into one end of the tube, the other end of the tube having a discharge opening through which ignited fuel issues as a torch flame along a predetermined axis, a generating system for preheating fuel being advanced to the nozzle, said system comprising a helical coil heater tube having inlet and outlet ends, means mounting the coil heater for movement toward and away from said flame axis, said mounting means including supply and return conduits connected respectively to said inlet and outlet ends of the heater tube, and said helical coil being in the shape of a segment of a torus having a curved axis which lies in a plane containing the longitudinal axis of the combustion tube, the curved axis being inclined toward the nozzle and one end of the coil comprising a convolution defining an end opening into the interior of the coil disposed to receive by direct blast a portion of the flame resulting from combustion of the projected fuel.

5. In a liquid fuel torch of the type comprising a combustion tube having fuel receiving and flame discharging ends, a nozzle, body means mounting the nozzle in fixed relation to the tube for projecting fuel into the receiving end of the tube, a generating system comprising a fuel heater disposed at the discharge end of the combustion tube to intercept hot gases discharged from the tube for preheating fuel advancing to the nozzle, and flexible conduit means extending in generally parallel relationship to the combustion tube, the conduit means being anchored at one end to the body means and at the other end being fast to the fuel heater to support the latter, and fuel heater adjusting means comprising an arm, means on one end of the arm rigidly attaching it to the conduit means at a point of the latter spaced from the heater, a screw threadedly engaging the other end of the arm, and means securing one end of the screw to the combustion tube in captive relationship.

6. In a liquid fuel burning torch comprising a combustion tube supported by and at its rear end and having a discharge opening at its forward end through which a flame is projected in operation, a generator system comprising first and second conduits substantially paralleling the combustion tube, said conduits extending substantially from adjacent the rear end of the tube toward and beyond the forward end thereof, a tubular coil interconnecting the forward ends of the conduits and disposed to intercept a projected flame, and manual adjusting means for shifting the position of the coil relative to the path of the flame, said manual adjusting means being connected between the combustion tube and one of the conduits, said adjusting means comprising screw means connected to the tube and means operatively connecting the screw means to the one conduit, said screw means being rotatable relative to the tube and said connecting means and being adapted upon such rotation to shift the one conduit toward and away from the flame path.

7. An adjustable generator system in combination in a torch as defined in claim 6 in which the connecting means includes a lever fast at one end to the one conduit and in engagement with the screw means at the other end.

8. An adjustable generator system in combination in a torch as defined in claim 7 in which said one end of the lever is formed with a sleeve and such sleeve embraces the one conduit.

9. An adjustable generator system in combination in a torch as defined in claim 6 in which the screw means is formed at one end with a head held captive at one end by the combustion tube against axial shifting and for free rotative movement.

10. In a liquid fuel burner of the type comprising a combustion tube in which a torch flame is originated and means for supplying fuel and projecting it into the tube to feed the flame, the tube having an outlet end formed with a discharge opening through which the torch flame issues and which defines the torch flame and the axis along which the latter travels in operation, the fuel supplying means including a helical coil tube heater disposed

outside the combustion tube in heat exchange relation to such flame and adapted to conduct and heat fuel being supplied before such fuel is so projected, the coil heater having an open end and comprising a series of convolutions coaxial about a curved axis generally transverse to the axis of the discharge opening and the path of the flame to provide a heater having one series of relatively widely spaced coil portions on the outside of the curved axis and another series of relatively closely spaced coil portions on the inside of the curved axis, the closely spaced coil portions being generally on that side of the heater directed toward the flame origin and the widely spaced coil portions being generally on that side of the heater directed away from such origin, the coil being inclined toward the flame origin and being disposed with the opening in said one of its ends facing toward the combustion tube to receive a portion of the torch flame, the other of its ends normally being disposed laterally beyond the flame path, and means mounting the coil heater for generally endwise movement laterally relative to the axis of the discharge opening to vary the exposure of the coil heater to the torch flame.

11. In a liquid fuel burner as in claim 10 the combination in which a closure is disposed across the other end of the heater coil for movement therewith as a unit to block egress of the received portion of the flame and cause such flame portion to exit between the heater coil convolutions, said closure being fast to and wholly supported by the coil.

12. In a liquid fuel burner as in claim 10 the combination in which a deflecting element is fast to and wholly carried by the endmost convolution of the heater coil at said one end and for movement with the heater coil as a unit, the deflecting element being disposed to intercept flame from the combustion tube and deflect the intercepted flame into said one end opening of the coil.

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