

June 18, 1946.

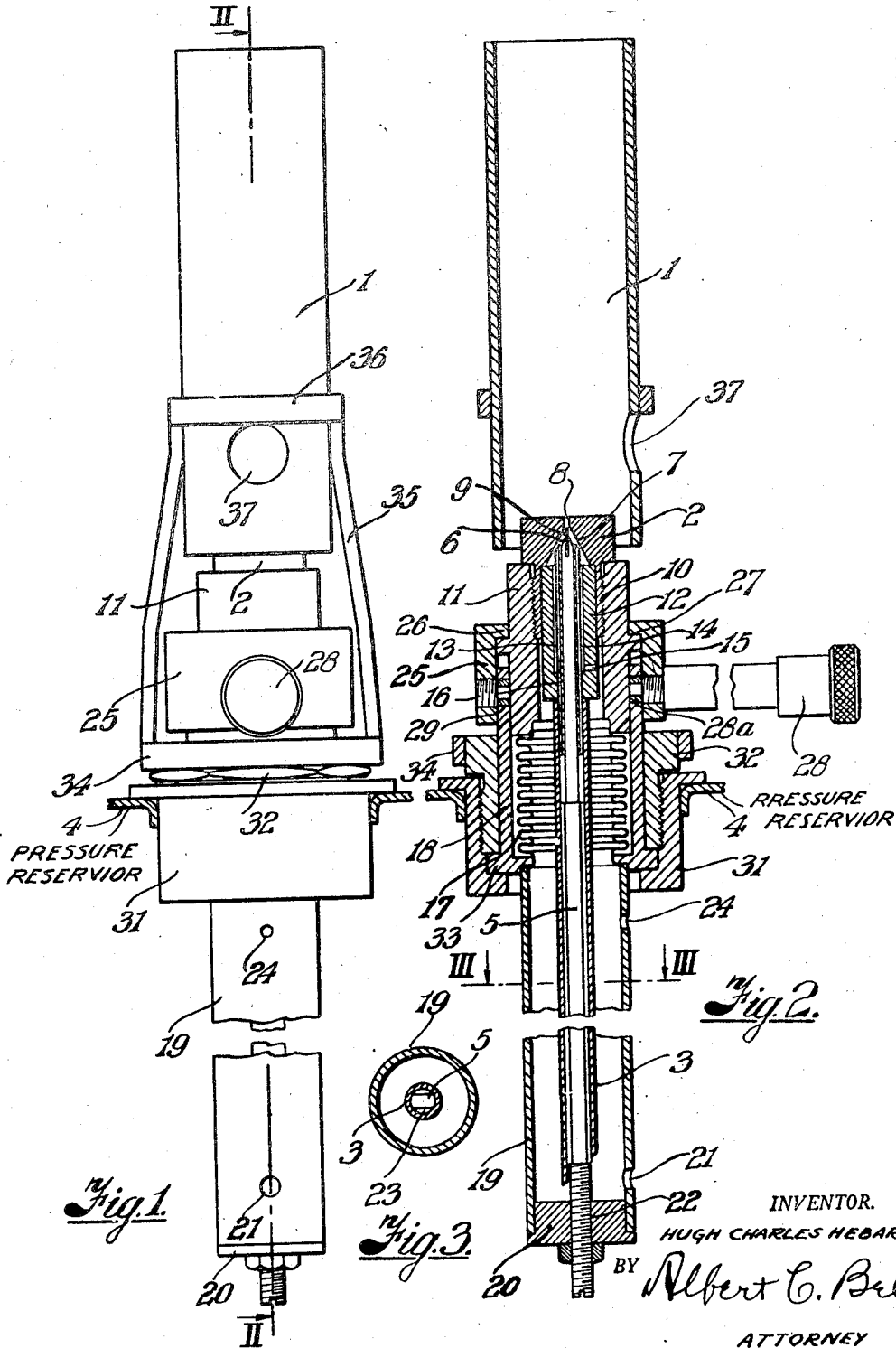
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PREHEATER FOR LIQUID FUEL BURNERS OF THE PRESSURE TYPE

Filed July 21, 1945

2 Sheets-Sheet 1



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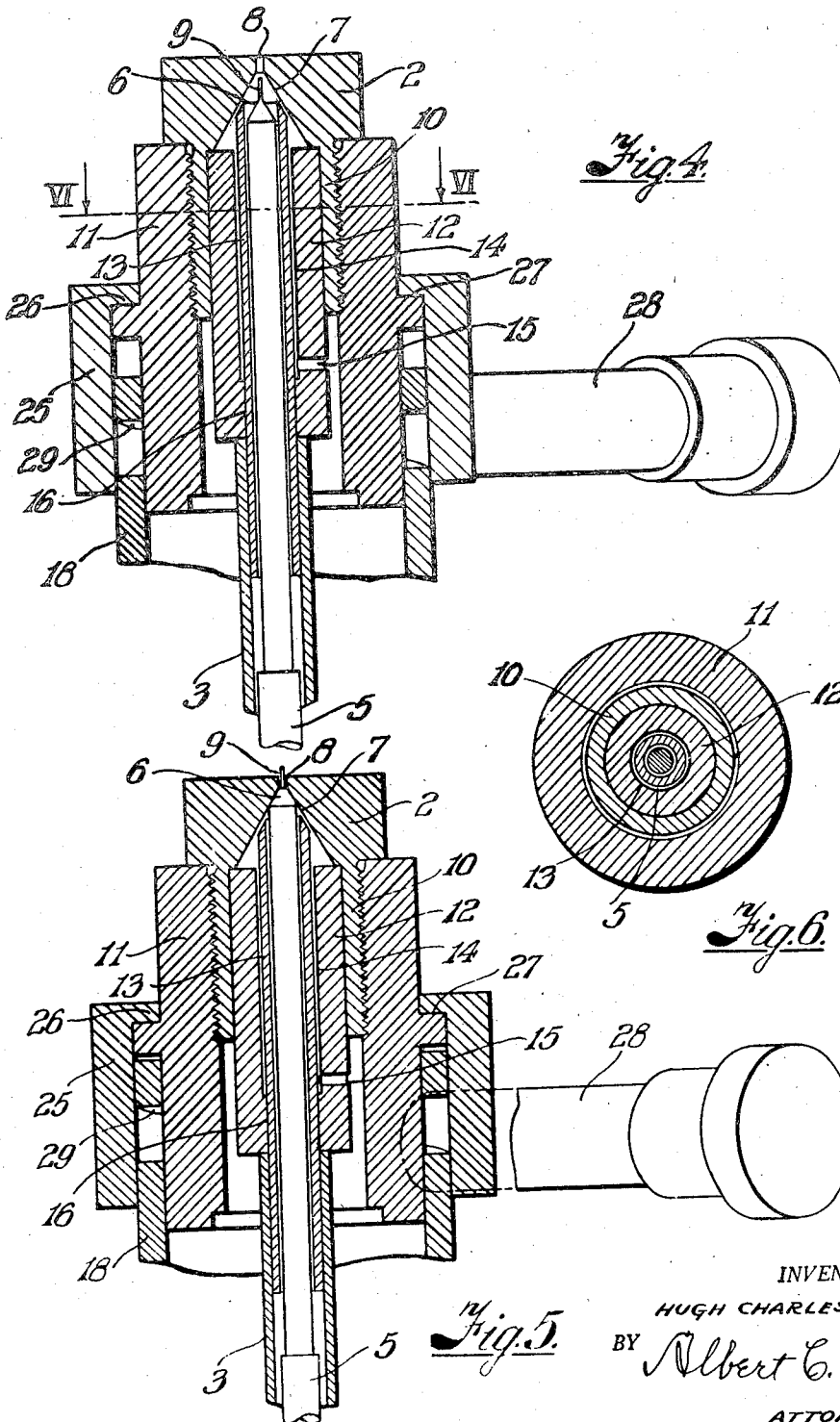
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PREHEATER FOR LIQUID FUEL BURNERS
OF THE PRESSURE TYPE

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Application July 21, 1945, Serial No. 606,408
In Great Britain March 2, 1945

10 Claims. (Cl. 158—120)

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This invention relates to lamps and stoves of the kind adapted to burn oil such as paraffin under pressure and has particular reference to preheating devices used in conjunction with the burners to produce the normal running condition.

Preheating devices have been employed which utilise a fuel and air mixture obtained from the reservoir of the lamp or stove but these have suffered from the disadvantage that the flame is extremely unstable and often goes out due to the fact that the mixture is very critical and a mere momentary interruption of the oil supply is sufficient to extinguish the flame. A common cause of flame failure is obstruction of the jet through which the mixture of fuel and air issues and which must of necessity be of very small diameter.

The object of the present invention is to provide an improved form of preheating device which is free from the disadvantages referred to in the preceding paragraph in that automatic means are provided for clearing the jet orifice from obstructions and the means for supplying air and fuel to the jet are proportioned so as to give the correct mixture and ensure thereby the maintenance of a flame sufficient to heat the vaporiser to the extent required to start the burner into operation in the shortest possible time. These objects are achieved by utilising the principle described in my prior United States application Serial No. 579,987, filed February 27, 1945, and the device according to the invention may be used in conjunction with that of the said prior application or with any other pressure burner having a vaporiser capable of being preheated by the application of a flame thereto.

According to the invention a preheating device for application to a pressure fuel burner is provided wherein a cleaning needle carried by means fixed relatively to a fuel reservoir is disposed within a jet flexibly connected to said reservoir and capable of being maintained in a depressed position after the preheating operation to cause the said cleaning needle first to enter and clear the jet orifice and thereafter to maintain said orifice closed.

According to the preferred form of the invention a preheating device for application to a pressure fuel burner comprises a mixing chamber, jet and fuel supply tube constituting a unit removable from a fuel reservoir, means for imparting vertical movement to said unit to cause a cleaning needle to clear and/or close the jet orifice and flexible means for sealing the said

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unit to the reservoir and for restoring the jet to open condition after depression.

Reference will now be made to the accompanying drawings which illustrate a preheating device constructed according to the invention and in which—

Fig. 1 is an elevation,

Fig. 2 is a sectional elevation taken on the line II—II of Fig. 1,

Fig. 3 is a cross sectional view taken on the line III—III of Fig. 2,

Fig. 4 is a detail view of the jet and associated parts on an enlarged scale showing the jet open,

Fig. 5 is a view similar to Fig. 4, but showing the jet closed and

Fig. 6 is a cross section taken on the line VI—VI of Fig. 4.

In the construction illustrated a mixing chamber 1, jet 2 and fuel supply tube 3 are assembled together as one removable unit which is adapted to be mounted in the upper wall or cover 4 of the reservoir of a pressure lamp of known type and which may conveniently be of the kind illustrated in my said prior application Serial No. 579,987.

Extending through the fuel supply tube 3 is a rod 5 whose upper end terminates in a conical portion 6 shaped so as to be an accurate fit into the inner coned wall 7 of the jet 2 which terminates in an orifice 8. At the extreme upper end of the coned portion 6 of the rod 5 is mounted a very short length of fine wire 9 which will just pass through the orifice 8 so that every time the preheater is turned off the wire 9 enters the orifice 8 which is thereby automatically cleared from the inside and closed.

The jet 2 is formed integral with a screw-threaded extension 10 which engages in an outer sleeve 11 and which extension surrounds an inner sleeve 12 which is slightly spaced from a tube 13 fixed into the upper end of the fuel supply tube 3. The upper end of the tube 13 is bevelled at an angle which is the same as the angle of the internal cone 7 of the jet. The diameters of the sleeve 12 and tube 13 are such that a narrow annular air passage 14 is formed between them communicating with an air port 15 situated above the area 16 over which the tube 13 and sleeve 12 are brazed or otherwise fixed together. The tube 13 is slightly spaced from the rod 5 to form an annular fuel passage. The base of the outer sleeve 11 is fixed to the upper end of a flexible metallic bellows 17 whose lower end is fixed to a cylindrical housing 18 and to a cylinder 19 which depends from the housing 18

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into the fuel reservoir and concentrically surrounds the fuel supply tube 5, the said cylinder 19 being closed at its base by a plug 20 but having a fuel inlet port 21 by which the fuel from the reservoir 4 can reach the lower open end of the supply tube 3.

The rod 5 has screw threaded engagement at 22 with the plug 20 and the said rod 5 has flattened sides as shown at 23 in Fig. 3, so as to form fuel passages by which the fuel can ascend around the said rod up to the jet 2. The upper portion of the said rod which passes through the tube 13 is cylindrical. The cylinder 19 has an air inlet port 24 near its upper end.

Rotatably mounted around the upper end of the housing 18 is a hood 25 having an inwardly directed lip 26 which bears upon an annular shoulder 27 on the sleeve 11. An operating arm 28 is mounted in the hood 25 which carries internally rollers 28a disposed in diametrically opposed positions. These rollers engage in inclined cam slots 29 formed in the housing 18 so that partial rotary movement of the operating arm 28 in one direction will partially rotate and lower the hood 25 whose movement is transmitted through the shoulder 27 to the outer sleeve 11 and jet 2 to depress the latter until the needle 9 enters the orifice 8.

The assembly above described is adapted to be seated in a socket 31 fixed in an opening in the top of reservoir 4 the said socket being internally screw threaded to receive a nut 32 the lower end of which bears upon a flange 33 formed at the base of the housing 18 to retain it in position within the socket 31 as shown in Fig. 2. The nut 32 supports a ring 34 from which extend arms 35 (Fig. 1) which terminate in a ring 36 carrying the mixing chamber 1 which is formed with an open lower end surrounding the jet 2 and with an air inlet 37 above the jet.

The arrangement above described is inoperative during the normal running of the burner with which it is associated, the parts normally occupying the positions shown in Fig. 5 wherein the jet 2 is in its lower position with the wire or needle 9 closing the orifice 8, the bellows 17 being held in a state of compression.

When starting up the burner, however, the operating arm 28 is given a partial rotary movement around the axis of rod 5 and tube 3, so that the hood 25, sleeve 11, inner sleeve 12 and jet 2 are all lifted under the expanding action of the bellows 17 to the position shown in Fig. 4 wherein a clear passage for fuel extends from within the tube 3 and around the rod 5 to the space within the jet 2. Air for admixture with the fuel enters through the port 24 and passes through the interior of the bellows 17, through part 15 and annular passage 14 to the interior of the jet. The dimensions of the mixing chamber 1 relatively to those of the jet are such as to cause a drop in pressure in said chamber sufficient to raise enough fuel to maintain combustion.

At the conclusion of the preheating operation the arm 28 is given a partial turn in the reverse direction to that required for starting and causes the jet to descend and the needle to clear and close the orifice 8.

The fuel mixture is mainly controlled in its composition by the size of the aperture 15 which admits air and by the clearance between the tube 13 and the rod 5. For fixed sizes of these two variable spaces the character of the flame obtained at the mouth of the mixing chamber 1 is greatly influenced by the size of the clearance

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between the bevelled portion at the upper end of the tube 13 and the internally coned surface 7 of the jet 2.

The tube 3, tube 13, sleeve 12, jet 2 and sleeve 11 are rigidly connected with each other to constitute a unitary assembly movable axially relatively to the associated stationary parts comprising the socket 31, the housing 18, the cylinder 19 and the rod 5, to operate in the manner above set forth to secure the results described.

The arrangement shown in the drawings although occupying a position about a vertical axis, is in practice disposed about an inclined axis so that the flame issuing from the mixing chamber 1 is directed onto the main vaporiser tube of the burner.

It has been found in practice that the best results are obtainable with components having dimensions as follows:

20	Jet diameter (8) -----inches--	0.0075-0.0085
	Internal cone angle of jet (7) -----degrees--	60
	Internal bore of sleeve (12) -----inches--	0.128
	Air inlet hole diameter (15) -----do-----	0.025
25	Diameter of centre tube (13) -----do-----	0.115
	Bore of centre tube (13) -----do-----	0.080
	Diameter of round portion of centre rod (5) -----inch-----	0.070-0.075
	Clearance between jet cone (7) and centre tube (13) bevel (measured at right angles to the tube inclined faces) -----inch-----	0.008-0.014

I claim:

1. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, and means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position.

2. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a unitary structure supported by and removable as a unit from said reservoir and comprising a mixing chamber, a fuel jet having a discharge orifice directed into said mixing chamber, and a fuel supply tube connected with said jet, a combined cleaning needle and valve having fixed support in alignment with said jet orifice, means for moving said unitary structure to positions cleaning said jet orifice and closing the same as desired, and flexible sealing means between said unitary structure and said reservoir and comprising a metallic bellows, said sealing means having resilience tending to move said unitary structure to its orifice-opening position.

3. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, said jet including a mixing compartment communicating with said orifice, a fuel supply tube discharging into said mixing compartment, and annular air passageways surrounding said tube and also discharging into said mixing compartment.

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4. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, said jet including a mixing compartment communicating with said orifice, a fuel supply tube discharging into said mixing compartment, and annular air passageways surrounding said tube and also discharging into said mixing compartment, said mixing compartment having a conical surface, and said tube having a conically shaped end adjacent to and spaced from said conical surface to limit and determine the amount of air discharged into said mixing compartment.

5. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, said jet including a mixing compartment communicating with said orifice, a fuel supply tube discharging into said mixing compartment, and annular air passageways surrounding said tube and also discharging into said mixing compartment, said fixed support for said cleaning needle and valve comprising a flat sided rod extending through said fuel supply tube and a fixed support for said rod in said reservoir.

6. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, an outer and axially movable sleeve supporting said jet, a cylindrical housing having fixed support and having a bore engaging said sleeve with a sliding fit, a flexible metallic bellows connected with said sleeve and with said housing, and hand-operated means engaging said sleeve for moving said sleeve axially in said housing.

7. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, an outer and axially movable sleeve supporting said jet, a cylindrical housing having fixed support and having a bore engaging said sleeve with a sliding fit, a flexible metallic bellows connected with said sleeve and with said housing, hand-operated means engaging said sleeve for moving said sleeve axially in said housing, a

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socket secured to the top of said reservoir, devices removably securing said housing in said socket, a cylindrical tube extending from said housing through said socket and surrounding said fuel supply pipe and having air and fuel inlet openings, a plug secured to the inner end of said cylindrical tube, and a rod secured at one end to said plug and extending through said fuel supply tube and at its other end supporting said combined needle and valve.

8. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, an outer and axially movable sleeve supporting said jet, a cylindrical housing having fixed support and having a bore engaging said sleeve with a sliding fit, a flexible metallic bellows connected with said sleeve and with said housing, hand-operated means engaging said sleeve for moving said sleeve axially in said housing, a socket secured to the top of said reservoir, devices removably securing said housing in said socket, a cylindrical tube extending from said housing through said socket and surrounding said fuel supply pipe and having air and fuel inlet openings, a plug secured to the inner end of said cylindrical tube, a rod secured at one end to said plug and extending through said fuel supply tube and at its other end supporting said combined needle and valve, and an inner sleeve within and spaced from the upper end of said outer sleeve, and having an air opening therethrough, said cylindrical tube, said bellows, and said outer sleeve providing a continuous air passage from said reservoir to and around said inner sleeve.

9. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, an outer and axially movable sleeve supporting said jet, a cylindrical housing having fixed support and having a bore engaging said sleeve with a sliding fit, a flexible metallic bellows connected with said sleeve and with said housing, hand-operated means engaging said sleeve for moving said sleeve axially in said housing, a socket secured to the top of said reservoir, devices removably securing said housing in said socket, a cylindrical tube extending from said housing through said socket and surrounding said fuel supply pipe and having air and fuel inlet openings, a plug secured to the inner end of said cylindrical tube, a rod secured at one end to said plug and extending through said fuel supply tube and at its other end supporting said combined needle and valve, a nut in said socket holding said housing in place, and a mixing chamber supported by said nut above and spaced from said jet.

10. A preheating device for pressure fuel burners, including in combination a pressure reservoir for fuel, a combined cleaning needle and valve

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having fixed support from said reservoir, a fuel mixture jet having an orifice in alignment with said cleaning needle and valve and movable axially, means for moving said jet first to a cleaning position of said needle and valve in said jet orifice and then to a position closing said jet orifice and maintaining said jet in said closing position, said jet including a mixing compartment communicating with said orifice, a fuel supply tube discharging into said mixing compartment, and annular air passageways surrounding said tube and also discharging into said mixing com-

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partment, said fixed support for said cleaning needle and valve comprising a flat sided rod extending through said fuel supply tube and a fixed support for said rod in said reservoir, the upper portion of said rod being cylindrical, and said fuel supply tube at its upper end having an extension of reduced internal diameter around the cylindrical portion of said rod providing a restricted clearance passage in said extension limiting the fuel supplied to said jet.

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