

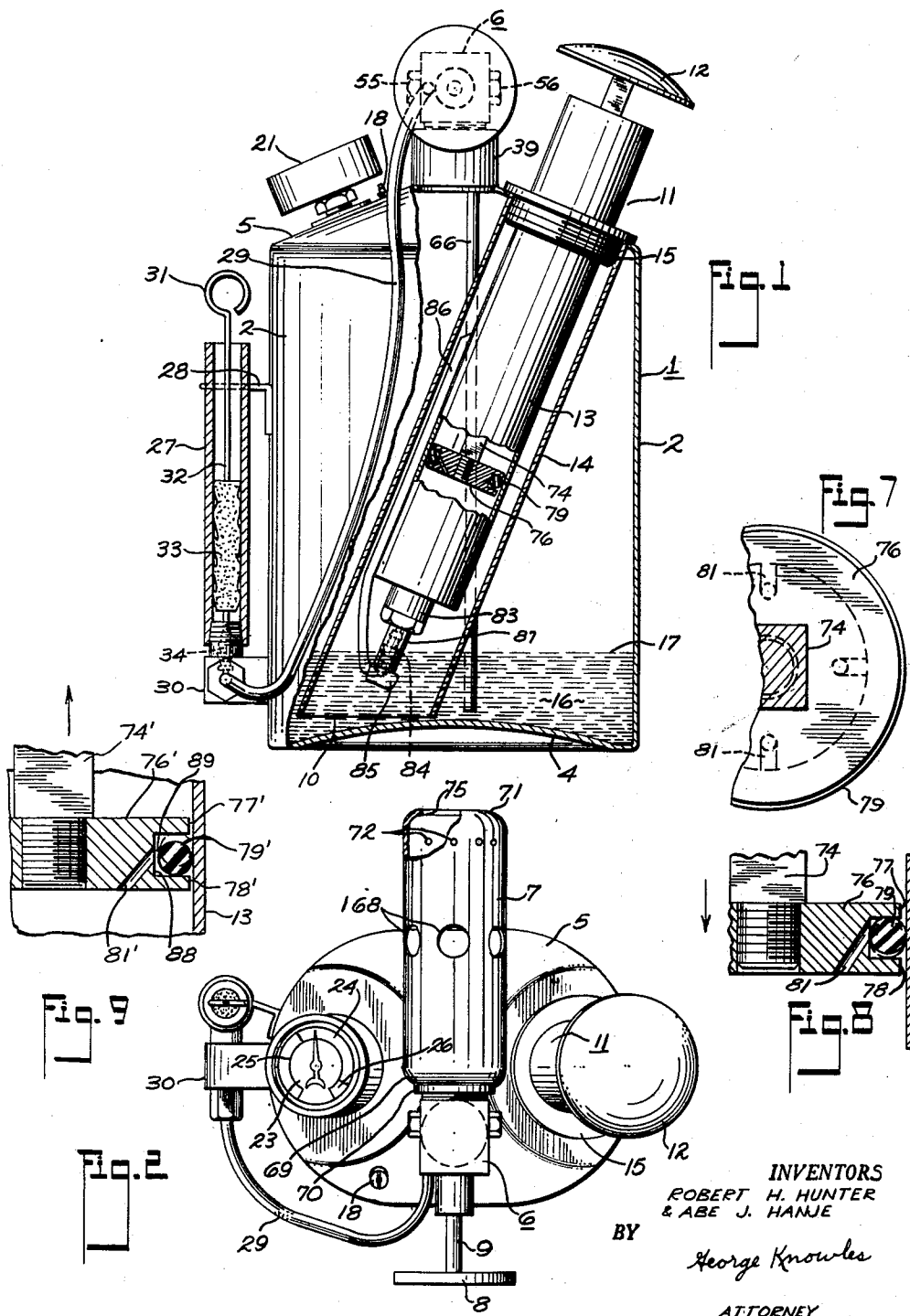
June 14, 1960

A. J. HANJE ET AL
INSTANT FLAME TORCH

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2 Sheets-Sheet 1



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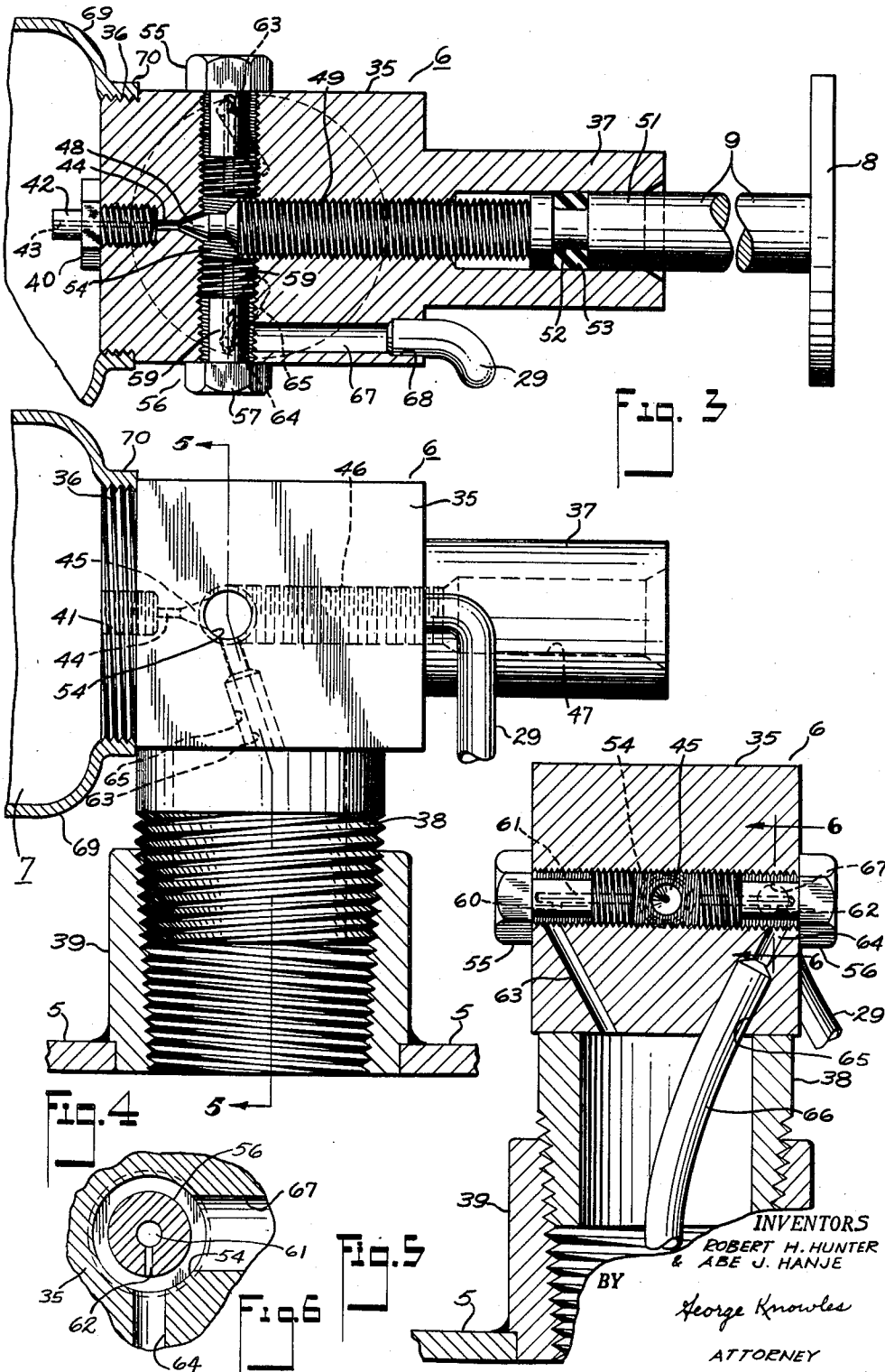
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This invention relates in general to burners for liquid fuels and more particularly to portable burners or torches for liquid hydrocarbon fuels. The invention is specifically concerned with an instant flame torch for such fuels.

The ordinary gasoline blow torch commonly used in the plumbing and electrical trades, operates on the principle of projecting a stream of liquid fuel such as gasoline from a heated nozzle with resultant vaporization. In the usual arrangement, the gasoline is maintained under pressure in a reservoir, a hand pump being provided for that purpose. The pressurized gasoline is ducted through a burner block maintained above the vaporization temperature of the gasoline, so that gasoline vapor rather than liquid gasoline escapes from the orifice of the burner block. The jet of vapor is directed through a flame tube into which air is drawn to support combustion. The mixture of gasoline vapor and air is ignited within the tube, and the flame projects from the flame tube, some combustion also taking place within the flame tube proper which is heated thereby. The flame tube is arranged to conduct heat to the burner block which is thereby maintained at the required elevated temperature for vaporizing the fuel.

In such a blow torch, the vaporization and combustion process, once started, is normally self sustaining. However, in order to start the blow torch it is necessary at the onset to preheat the burner block. Ordinarily an ignition cup is provided for this purpose and is located below the flame tube. To start the torch, a small quantity of liquid fuel is pumped into the flame tube and allowed to drip into the cup. This fuel is then ignited and in burning preheats the burner tube and block sufficiently to cause the vaporization necessary for normal operation.

The ordinary gasoline blow torches have disadvantages which make them unsuitable for certain applications. For one, time is required to preheat the burner tube and block; in cold weather particularly, the delay entailed by this operation may be considerable. For another, the flame from the gasoline burning in the ignition cup can be readily blown out so that it is extremely difficult to start the torch in a windy or exposed place. Furthermore even after ignition, such torches are quite sensitive to temperature and to wind or drafts making them subject to accidental extinguishment or blowing out. Another disadvantage which is inherent in the mode of operation is that the vapor orifice in the burner block and also the fuel passages therethrough become clogged with non-vaporizable compounds within the fuel. Accordingly a supply of pure "white" or non-leaded gasoline must be kept on hand for use in the torch. In remote areas, the far north especially where blow torches are used for preheating internal combustion engines in order to start them, this requirement for special fuel is so inconvenient to fulfill as to make the ordinary blow torch impractical.

Accordingly the principal object of this invention is to provide a new and improved instant flame blow torch for liquid fuels, that is, one which does not require any preheating to start. Another object is to provide a blow

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torch capable of burning liquid fuels with non-volatizable ingredients such as leaded motor fuels. Another object is to provide an instant flame blow torch having provision for purging or reverse flushing the critical orifices in a mixer block wherein fuel and air are admixed and from which an air-fuel mixture is projected out into a burner tube.

Another object of the invention is to provide a blow torch particularly suited to maintain its flame against strong head winds.

Yet another object of the invention is to provide an improved pump piston and valve construction particularly suitable for the instant blow torch.

In accordance with the invention, both liquid fuel and air under pressure are ducted into a mixing chamber through metering orifices. Within the mixing chamber and in issuing therefrom, the fuel is broken up into fine particles and becomes admixed with air so that an air-fuel mixture is projected out of a jet orifice leading from the mixing chamber. The air-fuel jet issues into a combustion chamber formed by a burner tube, the volume of flow being regulated as by a needle valve. Means are provided for reverse flushing fuel and air through the fuel metering orifice in the mixer block in order to clear out any dirt that may have become lodged therein. Because liquid fuel, albeit in atomized form admixed with air, rather than vaporized fuel, issues from the jet orifice the problem of clogging of the orifices by deposition of non-volatizable elements in the fuel (such as tetraethyl lead) is eliminated.

For further objects and advantages and for a better understanding of the invention, attention is now directed to the following description and accompanying drawings illustrating a preferred embodiment thereof representative of the best mode of practicing the invention. The novel features of the invention will be more particularly pointed out in the appended claims.

In the drawings wherein like numerals denote corresponding elements throughout the several views:

Fig. 1 is a vertical elevation partly in section and with parts broken away and removed of an instant flame torch embodying the invention;

Fig. 2 is a top plan view of the torch of Fig. 1;

Fig. 3 is a sectional view of, and taken horizontally through, the mixer block showing the needle valve and the fuel and air metering plugs in full view, this figure being enlarged with respect to the preceding figures;

Fig. 4 is a side elevation of the mixer block of Fig. 3 partly in section and with parts removed;

Fig. 5 is a transverse section through the mixer block taken substantially along lines 5—5 in Fig. 4 and showing the fuel and air metering plugs in full view;

Fig. 6 is a fragmentary sectional detail taken substantially on the line indicated at 6—6 of Fig. 5 showing the full metering plug and the radial passage therein;

Figs. 7 and 8 are fragmentary plan and vertical section views showing the piston or plunger of the air pumps enlarged with respect to Fig. 1, and;

Fig. 9 is a fragmentary sectional detail similar to Fig. 7 showing a modification of the seal arrangement for the air pump.

Referring to the drawings generally and more particularly Figs. 1 and 2, the illustrated instant flame blow torch embodying the invention comprises a tank or pressure container 1, generally oval in horizontal cross section. The container may be formed as by drawing or, as here, by shaping and welding of sheet steel or other suitable material having sufficient strength to withstand the internal pressures built up when the torch is being readied for use. As illustrated in the drawing, the upright or tubular side walls 2 are formed of a single piece of sheet steel bent or formed into a tube and welded

along a vertical seam. Oval shaped bottom wall 4 is formed of a concave or inwardly bowed piece welded peripherally to the side walls. The concavity of the bottom wall provides the necessary strength for withstanding internal pressure and the concave bottom arrangement results in an edge rim on which to rest the torch. Top wall 5 of the container is convex and is formed of a single piece of steel or other metal having a horizontal central portion and sloping side portions, likewise welded peripherally to the side walls 2.

On the central horizontal portion of the top wall is mounted a brass mixer block 6 on the front end of which is a boss threaded to receive a burner tube 7. A regulating knob 8 fastened on the rear end of needle valve stem 9 controls the flow of the air-fuel mixture from the tank and regulates the intensity of the flame as will appear.

From the right hand side sloping portion of the top wall projects the upper portion of air pump assembly 11 including a pump handle 12. The pump comprises a cylindrical casing 13 and is located coaxially within a filler tube 14, extending angularly through the interior of the casing. The filler tube is welded or otherwise fastened at its upper end to the sloping portion of top wall 5 in a manner providing an hermetic seal. The upper end of the filler tube is internally threaded to receive a bushing 15 soldered or otherwise hermetically fastened around the pump casing 13 near its upper end. The purpose of this mounting arrangement for the pump is to facilitate filling the tank with fuel to a predetermined level. Since the instant torch supplies both air and fuel to the mixer block and burner tube, it is necessary to limit the quantity of fuel in the tank in order to leave space for pumping in a sufficient initial quantity of air.

In the illustrated blow torch it is intended that initially the tank be filled with fuel 16 no higher, say, than to the level 17, corresponding to approximately one fifth of the tank capacity. To fill the tank, the pump casing is removed by unscrewing the bushing 15 from the threaded end of the filler tube 14 and fuel is then poured into the open end of the filler tube. Fuel will fill the tank to a level corresponding approximately to horizontal lower end 10 of the filler tube; thereafter air trapped in the tank above the filler tube end will substantially prevent any further rise in level within the tank proper but the liquid will rise in the filler tube filling the latter. Thereafter, the air trapped in the tank is released by actuating a spring biased combination pressure relief and vent valve 18 screwed into a bushing welded to the tank top wall. The fuel within the filler tube then drops and achieves a common level 17 with the fuel within the body of the tank. The filler tube is so proportioned in respect of its dimensions and the depths to which it projects into the tank, that by following this procedure, the tank is filled to the proper and desired one fifth level.

Pressure gauge 21 threaded into a bushing welded to the left hand sloping portion of upper tank wall 5 indicates the air pressure within the tank. The gauge is calibrated and suitably marked to indicate the optimum operating range of the blow torch with regards to air pressure. For instance, dial 23 may have a green sector 24 to indicate the reliable operating range of the torch, an orange sector 25 to indicate lack of sufficient pressure, and a red sector 26 to indicate excessive pressure.

The torch is provided with a purging system for reverse flushing fuel or air or both through the fuel metering orifice in the mixer block (which is the orifice most subject to clogging).

This purging system comprises a purge receptacle or tube 27 open at its upper end and supported in upright position on the outside of the side wall 2 of the tank by means of vertically spaced upper bracket 28 and a lower fitting 30. The fitting has an externally threaded

upstanding boss on which the lower end of the tube 27 is screwed and the fitting is drilled to provide a through passage into which an end fitting of a copper tube 29 is screwed. This copper tube extends up the outside of the main tank and its upper end is received in socket 68 of a passage 67 in the brass mixer block 6. Within the purge tube 27 there is received a removable brush or swab 31 comprising a wire shank portion 32 provided with wick portion 33 near its lower end. The wick portion may consist of a fibrous non-combustible material such as asbestos. The lower end of the shank 32 projecting below the wick portion is adapted to actuate a valve 34 when the swab is pressed down in the purging tube. The swab handle projects above the purge tube 27 to permit easy manipulation and depression. Valve 34, which is screwed into the internally threaded bore in the upstanding boss of the fitting 30, may be a conventional type, such as used for pneumatic vehicle tire inner tubes, and its actuation results in opening tubing 29 to allow flow into the purge tube. This results in reverse flushing fuel and air through the mixer block whereby to clear or purge the orifices therein as will be explained in greater detail hereafter. In the reverse flushing process, a mixture of fuel and air bubbles up into the purge tube 27 and the wick becomes wetted with fuel. If desired, the wick may be lit with a match and used in turn to light the blow torch under conditions where it would be difficult to do so directly with a match.

Referring to Figs. 3 to 6, the mixer block 6 is formed with a generally rectangular body 35 having a threaded cylindrical portion 36 at its front end and a coaxial cylindrical portion 37 at its rear end. The mixer block may be made of any suitable material, preferably metal of a readily machinable kind such as brass. The threaded cylindrical portion 36 receives the rear internally threaded end of the burner tube 7. The under side of the body 35 is provided with an externally threaded nipple 38 which may be made of brass and fastened thereto by brazing. In mounting the mixer block on the tank, the nipple 38 is screwed into internally threaded bushing 39 which has a shouldered lower end welded to the top wall 5 of the tank in an opening provided.

The mixer block is variously drilled and tapped through its long dimension providing a main or longitudinal hole comprising several aligned portions of different diameters and shapes continuous with one another and coaxial to one another and to the cylindrical parts 36 and 37 of the block.

Beginning at the nozzle or fuel discharge end 36, there is provided a threaded recess or hole 41, which accommodates a jet nozzle having an axial orifice passage 43 of about .0145" diameter in the example given herein for the issuance of the atomized fuel and air stream. The nozzle has an intermediate hex portion 40 to receive a wrench for tightening and loosening and an integral cylindrical tip portion 42 having a length at least equal to its diameter. The passage 43 is coaxial to this cylindrical tip portion and opens through an orifice in the center of the tip portion end face which latter is in a plane normal to the passage. The recess 41 is continuous with a short relatively small diameter supply passage portion 44 which in turn is continuous with a coaxial relatively large diameter threaded bore portion 46. The threaded bore 46 is a continuation of a smooth bore portion 47 of larger diameter.

The needle valve stem 9 is formed on its leading end with a conical tip 48 of about 45° included angle, seating in conical passage portion or aperture 45 of about 60° angle which connects the small passage 44 with a transverse threaded bore hole 54, the latter comprising aligned fuel and air portions. Threaded shank portion 49 of the stem 9 engages in the threaded bore 46 and smooth shaft portion 51 fits slidably in the smooth bore portion 47. The smooth shaft portion 51 is provided intermediate its ends with a reduced diameter portion 52 which accom-

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modates a sealing ring or washer 53 made of a suitable resilient material, for instance "neoprene" or a similar synthetic rubber-like material, resistant to the gasoline or other hydrocarbon fuel used with the torch. Knob 8 fastened on the outer end of the stem 9 facilitates screwing the needle valve out or in to open or close the opening through which the conical valve seat 45 communicates with the small supply passage 44, whereby to regulate the flow of the air-fuel mixture into and through the jet nozzle and out of the orifice 43.

The configuration of the needle valve leading end illustrated is particularly conducive to effective mixing of the air and fuel streams issuing from the coaxial passages 61, as will appear, these streams impinging against opposite sides of the needle valve. Adjacent the conical tip 48 is a cylindrical portion of less axial length than the tapered tip and the cylindrical portion is connected to the larger diameter threaded stem portion 49 by a steeply tapered portion having a wider included angle than the tip portion 48, say about 90° in the example shown. In Fig. 3 the needle valve is shown only slightly open for clarity, the parts being arranged, however, so that in the open operating position one of the tapered portions of the needle valve is in or closely adjacent the path of the air and fuel streams. The frusto conical surface of the larger of the tapered portions of the valve constitutes the rear wall of the annular chamber which surrounds the leading end of the valve stem. It is into this chamber that the opposed jets are projected and the fuel and air become intermingled prior to flowing together into the tapering or converging passage surrounding the valve tip 48 and thence into the small diameter supply passage 44.

The rectangular body 35 of the mixer block is provided with threaded transverse bore 54 the axis of which intersects the axis of the longitudinal bore at the base of the conical aperture 45 to form a mixing chamber. Screwed into opposite ends of the transverse bore 54 are air metering plug 55 and fuel metering plug 56. Each plug resembles a bolt and has a hexagonal head 57 on its outer end, a threaded inner end portion 58 and intermediate such ends a reduced diameter shank portion 59. The plugs are blind bored from their threaded ends to provide each with an axial passage portion 61. Radial metering holes 60 in the reduced diameter portion of the air metering plug 55 and 62 in the corresponding portion of the fuel metering plug 56 communicate with the passages 61. The block body 35 is drilled to provide an inclined air passageway 63 which leads from the underside of the body within the nipple 38 up to the transverse bore 54 and opens into the annular space surrounding the reduced shank portion of the air metering plug 55. The body 35 is also drilled to provide inclined fuel passageway 64 whose upper end opens into the annular space around the reduced shank portion of the fuel metering plug 56. The fuel passageway 64 has an enlarged lower portion 65 which accommodates the upper end of a fuel supply tube 66 of copper or other suitable metal. Tube 66 may be soldered or press fitted at its upper end into the passageway and projects downward through the nipple 38 to a point close to the bottom of the tank.

In order to purge or reverse flush one of the orifices in the metering plugs screwed into the mixer block, an additional passageway is bored or otherwise formed in the block 35 so as to open into the annular space around the plug containing the orifice through which reverse flushing is desired. Clogging is most likely to occur at the radial metering hole 62 of the fuel metering plug 56. Accordingly in the illustrated embodiment there is provided an auxiliary passageway 67 parallel to the base 46 (best seen in Fig. 3), which leads from the annular space around the reduced diameter shank of fuel metering plug 56 to the rear face of the body 35. Passageway 67 has at its outer end counterbore enlargement 68 for receiving and soldering into it the end of the tubing 29 leading to the purge tube 27.

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The operation of the blow torch in connection with the mixer block and the various passageways or orifices there-through is as follows. Upon unscrewing the needle valve 9 to open a passageway into the nozzle passage or orifice 43, the air pressure within the tank 1 causes air to flow through the passageway 63 and fuel to flow up through the tube 66 and passageway 64. Air and fuel flow through the axial and radial channels 61, 60 and 62 in the air and fuel metering plugs 55, 56 respectively, and into the mixing chamber about conical tip 48 of the needle valve. The various passageways and channels are dimensioned to obtain the proper proportions of air and fuel in the air-fuel spray that issues from jet orifice 43.

In one actual construction of a blow torch in accordance with the invention having a 25,000 B.t.u. per hour capacity, the axial channels 61 in both plugs are .031" in diameter; the radial channel 60 in air metering plug 55 is .036" in diameter whereas the radial channel 62 in the fuel metering plug 56 is .011" in diameter. Air passageway 63 is .0625" in diameter whereas fuel passageway 64 is .040" in diameter.

The air and fuel issuing in opposed jets from the axial passageways in the metering plugs 55, 56 strike the needle valve and pass about its conical tip portion into the small passage portion 44 and in so doing the fuel is atomized into fine particles so that the air-fuel mixture issues in atomized form as a fine spray out of the orifice which terminates the nozzle passage 43.

In the event dust, dirt, grit or other foreign matter is present in the fuel, such foreign matter is likely to become trapped in the annular space around the shank of the fuel metering plug 56 and to block the radial metering passage 62 because that is the smallest opening through which the fuel is required to pass. When the auxiliary passageway 67 is opened to atmospheric pressure by pressing down swab 31 in the purging tube 27 so as to actuate the valve 34 at the bottom thereof, fuel will flow out through the auxiliary passageway. The diameter of the auxiliary passageway is made greater than that of the fuel passageway 64; for instance the diameter of auxiliary passageway 67 may be .0937" so that its fluid carrying capacity is much greater than that of the fuel passageway 64. As a result, a pressure differential is created between the annular space about the fuel metering plug 56 and that about the air metering plug 55, the pressure being less about the fuel metering plug. This pressure differential causes air to flow from the air metering plug, around the needle valve, then through the axial and radial channels 61, 62 of the fuel metering plug 56, and out the auxiliary passageway 67. By reason of the relatively low flow resistance of the air, the volume of air released when the purging valve is actuated greatly exceeds that of fuel so that the flow of air in a reverse direction thus obtained through the channels in the fuel metering plug effectively blows out any grit or dirt blocking the same.

The air-fuel mixture issuing from the jet nozzle orifice 43 into the burner tube 7 contains a fraction only of the volume of air required for complete combustion of the fuel. In relation to the stoichiometric proportions required for complete combustion, the proportion of primary air in the mixture may be as little as 2% of requirements. However, the air-fuel jet, as it issues in a finely divided or atomized spray, entrains secondary air which enters the interior of the tube through a first circular group or ring of relatively large apertures 168 each about 3/8" in diameter in the example mentioned, circumferentially spaced in the wall of the thin sheet metal burner tube about midway between its ends. The mixture of atomized fuel and primary and secondary air burns in part within the tube and in part beyond or outwardly of discharge opening 75 at the forward end thereof.

As may readily be seen in Fig. 2, the burner tube 7 has inwardly curving circumferentially extending circular

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shoulders at both its front and rear ends. Rear curving shoulder 69 leads to an internally threaded cylindrically shaped axial extension 70 of reduced diameter which is screwed onto the threaded cylindrical portion 36 of the mixer block. Inwardly curving front shoulder 71 terminates in circular tube discharge opening 75 of reduced diameter and provides an abrupt reduction in cross section of the tube which controls the flame. A second circular group or ring of circumferentially spaced relatively small apertures 72 in the wall of the burner tube adjacent the front curving shoulder 71, each about $\frac{1}{16}$ " to about $\frac{3}{32}$ " in diameter in the example mentioned, affect the vibratory characteristics of the burning gas column within the burner tube and may supply secondary air to support combustion. They have the effect of stabilizing the flame.

The air pump 11 comprises the cylindrical brass casing 13 which is closed at its upper end by a circular brass head or disc (not shown) suitably secured in place and having a central square aperture therethrough accommodating square cross-section pump rod 74. Breather holes through the top disc or clearance around the pump rod allow air to enter the pump casing above piston or plunger 76. This plunger 76 is in the form of a circular disc having a channel about its periphery in the provision of a reduced diameter central portion and axially spaced parallel circular outwardly projecting radial flange portions 77, 78. These flange portions 77, 78 in conjunction with the inside surface of the casing 13 define an annular space of rectangular cross-section. The plunger channel is proportioned such that the cross-section of the annular space is slightly longer in a direction parallel to the axis of the pump than in the radial direction at right angles thereto. An O ring 79, that is, a ring of substantially circular cross-section, is disposed in the annular space. The ring is made of a resilient rubber-like material and, in the arrangement of Fig. 8, is proportioned to make a pressure fit between the bottom of the plunger channel and the pump casing walls. However by reason of the dimensions of the annular space into which the ring is fitted, it will not bear against the inside surfaces of both flange portions 77, 78 at the same time. When the plunger is moving down, the ring will move up relatively in the annular space and bear against the upper flange 77; when the piston is moving up, the ring will move relatively down and bear against the lower flange portion 78. The plunger is provided with a plurality of inclined holes 81 drilled from the underside of the plunger into the upper corner of the annular space or channel next to the upper flange portion 77.

The O ring, through its axial shifting in the annular space with the up and down movements of the piston, operates as a valve. During downward movement of the plunger as represented in Fig. 8, the O ring rests sealingly against upper flange portion 77 and also makes an effective completely circular seal with the wall of the pump casing. Thus downward movement of the plunger compresses air below it. During upward movement of the plunger, the O ring rests against the lower flange portion 78. A bypass is thus opened through the inclined holes 81, the annular clearance space above the O ring within the annular space, and the clearance between the periphery of the upper flange portion 77 and the inside wall of the pump casing. A fresh charge of air may thus flow down into the space below the piston. A coiled helical spring (not shown) may be provided to return the piston to its uppermost position whereby to facilitate pumping.

In Fig. 9 is illustrated a modification of the pump plunger wherein an O-ring 79' is, in its normal or unstressed condition, of slightly larger diameter than when confined within the peripheral channel of pump plunger or piston 76'. Additionally the radial thickness of the body of the O-ring 79' is less than the radial dimension from cylindrical bottom 88 of the plunger channel to the

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cylindrical walls of the pump casing 13. Thus in the modification of Fig. 9 there is at all times an annular clearance 89 between the cylindrical channel bottom 88 and the inside surface of the O-ring 79'.

In the arrangement of Fig. 8, previously described, the O-ring is radially compressed between the channel bottom and the cylindrical wall of the pump casing to thereby maintain a circular line contact seal with the casing wall. In the modified arrangement of Fig. 9, the circular line contact seal between the casing wall and the outer periphery of the O-ring 79' is maintained only by circumferential compression of the latter, tending to expand it to its larger diameter normal or unstressed shape, as distinguished from the radial compression of the ring which characterizes the Fig. 8 arrangement.

Because of the clearance 89 between the O-ring 79' and the channel bottom 88 a by-pass around the O-ring seal on the up or intake stroke of the plunger (represented in Fig. 9) is readily provided by one or more oblique bore holes 81' which extend diagonally through the plunger 76'. These holes or passages open through the bottom surface of the plunger and through the channel bottom 88. Since the O-ring 79' remains clear of or out of contact with channel bottom 88 at all times, the location of the openings from the holes 81' into the channel bottom is not critical and the cost of drilling such holes minimized. Additionally the elimination of radial compression of the body of the O-ring 79' reduces the pump friction as well as minimizing wear on the O-ring seal. The plunger flanges 77' and 78' of Fig. 9 correspond to the flange portions 77 and 78 of Fig. 8, and the same pump rod 74 and casing 13 as previously described may be used in the modification of Fig. 9. When the plunger 76' is forced downwardly on the pressure stroke of the modified form of pump structure the O-ring 79' shifts from its circular line contact sealing engagement against the lower flange 78', shown in full lines of Fig. 9, to the broken line position shown in which a circular line contact seal is effected with the upper flange 77'. This latter seal, together with the continuous line contact seal between the O-ring and the casing walls, traps the air below the piston for compression in the usual manner.

The lower end of the pump casing 13 has a closure fitted with a bushing 83 internally threaded to receive a tubular extension 87 in which is fitted a one-way valve 84 of conventional construction like the purge control valve 34. The spring biased valve 84 allows flow of air from the pump into the tank but prevents reverse flow. The outlet end of the tubular extension 87 into which the valve is screwed opens into a hollow fitting 85 which is open through an upwardly extending tube 86 into the tank at a point considerably above the level of fuel therein. This arrangement eliminates the possibility of fuel being driven back into the pump in the event that a leak should develop at valve 84, since the tube will conduct air back into the pump rather than fuel. Thus the possibility of contamination of the O ring 79 with fuel and likewise the possibility of fuel being driven out of the torch through the pump are eliminated.

While a certain specific embodiment of the invention has been shown and described, it will be appreciated that the same has been given for illustrative purposes and is not intended as limiting the invention to the exact forms and dimensions shown. The invention proper is to be defined by the appended claims which are intended to cover any modification falling within its true spirit and scope.

What we claim and intend to secure by patent is:

1. A mixer block for a liquid fuel instant starting blow torch comprising a body having a mixing chamber and an orifice leading from said mixing chamber to a burner face, a needle valve working in said body and projecting into said chamber for regulating flow out of said chamber through said orifice, an air passageway through said

body leading into said mixing chamber and a fuel passageway through said body likewise leading into said mixing chamber, and metering plugs in said passageways disposed to direct jets of air and fuel respectively against said needle valve.

2. A mixer block for a liquid fuel instant starting blow torch comprising a body having a mixing chamber and an orifice leading from said mixing chamber to a burner face, a needle valve working into said body and projecting through said chamber and having a portion entering said orifice to an adjustable extent for regulating flow out of said chamber through said orifice, an air passageway through said body leading into said mixing chamber and a fuel passageway through said body likewise leading into said mixing chamber, and metering plugs in said passageways opening into said chamber from opposite sides to direct jets of air and fuel respectively against opposite sides of said needle valve.

3. A mixer block for a liquid fuel instant starting blow torch comprising a body having a mixing chamber and a generally conical aperture leading from said mixing chamber and tapering to a restricted orifice opening at a burner face, a needle valve working into said body and projecting through said chamber and having a generally conical portion entering said generally conical aperture to an adjustable extent for regulating flow out of said chamber through said orifice, an air passageway through said body leading into said mixing chamber and a fuel passageway through said body likewise leading into said mixing chamber, said passageways opening into said chamber from opposite sides and being disposed to direct jets of air and fuel respectively against opposite sides of said needle valve and at least in part about the generally conical portion thereof.

4. A mixer block for a liquid fuel instant starting blow torch comprising a body having a burner face, a mixing chamber and a generally conical aperture starting at said mixing chamber and tapering to a jet orifice opening in said burner face, a needle valve working into said body and projecting through said chamber and having a tapering portion with sloping surfaces entering said generally conical aperture to an adjustable extent for regulating flow out of said chamber through said orifice, an air passageway through said body leading into said chamber and a fuel passageway through said body likewise leading into said mixing chamber, said passageways opening into said chamber from opposite sides and being disposed to direct jets of air and fuel respectively against opposite sides of said needle valve and at least in part against the tapering portion of said needle valve in order to achieve improved atomization of fuel against the sloping surfaces thereof.

5. A mixer block for a liquid fuel instant starting blow torch comprising a body having a front burner face and a rear face, said body being formed with a longitudinal hole extending from its rear to its front face and including a section tapering to a jet orifice opening at said front face, a needle valve having a tapered portion entering said tapering section to an adjustable extent for regulating flow out of said orifice, said body being formed with a transverse hole intersecting said longitudinal hole in the region of said tapering section, air and fuel metering plugs fitted into opposite sides of said transverse hole and each having a channel therethrough opening at the inner end of the plug towards said tapering section and opening also at the side wall of the plug, and said body being formed with air and fuel passageways leading into the side wall openings in the air and fuel metering plugs respectively.

6. A mixer block for a liquid fuel instant starting blow torch comprising a body having a front burner face and a rear face, said body being formed with a longitudinal hole extending from its rear to its front face and including a generally conical section tapering to a jet orifice opening at said front face, a needle valve having a tapered

portion with sloping surfaces entering said generally conical aperture to an adjustable extent for regulating flow out of said orifice, said body being formed with a transverse hole intersecting said longitudinal hole in the region of said tapering section, air and fuel metering plugs fitted into opposite sides of said transverse hole and each including a reduced shank portion defining, in conjunction with the wall of said bore, an annular space, each plug having an axial channel opening towards said generally conical section and communicating with a radial hole in the reduced shank portion opening into said annular space, and said body being formed with air and fuel passageways leading into the annular spaces about the air and fuel metering plugs respectively.

7. A mixer block for a liquid fuel instant starting blow torch comprising a body having a front burner face and a rear face, said body being formed with a longitudinal hole extending from its rear to its front face and including a generally conical section tapering to a jet orifice opening at said front face, a needle valve having a tapering portion with sloping surfaces entering said generally conical aperture to an adjustable extent for regulating flow out of said orifice, said body being formed with a threaded transverse hole intersecting said longitudinal hole in the region of said tapering section, air and fuel metering plugs fitted into opposite sides of said transverse hole and each including a head portion, a threaded inner end portion engaging in the threaded bore and a reduced shank portion intermediate the head and threaded portions and defining, in conjunction with the wall of said bore, an annular space, each plug having an axial channel opening towards said generally conical section and communicating with a radial hole in the reduced shank portion opening into said annular space, and said body being formed with air and fuel passageways leading into the annular spaces about the air and fuel metering plugs respectively.

8. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of transverse holes, the axes of the transverse holes intersecting and being each substantially normal to the main hole, the block being formed to provide a mixing chamber at one of the intersections, a pair of plugs one in each of the transverse passages each of said plugs being formed to define cooperatively with an adjacent wall portion of the transverse passage sealed thereby a fluid confining chamber, said block being formed with fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said confining chambers, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, said plugs being formed one with a fuel and the other with an air metering passage, said fuel metering passage being continuous with the confining chamber which is continuous with the fuel supply passage, said air metering passage being continuous with the confining chamber which is continuous with the air supply passage, and said fuel and air metering passages terminating in orifices oriented and adapted to discharge fuel and air streams directly into the mixing chamber from opposite sides of the latter.

9. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of transverse holes, the transverse holes intersecting the main hole and having longitudinal axes disposed in a common plane substantially normal to the longitudinal axis of the main hole, the transverse holes having inner ends communicating directly with the main hole through lateral openings into the latter, the main

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hole having a mixing chamber portion at the intersection of the main and transverse holes, the block being formed with separate fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said transverse holes, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, plug means mounted in the transverse holes for facile removal and replacement, and said plug means being adapted to meter the flow into the mixing chamber of fuel and air received in the transverse holes from the supply passage.

10. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of coaxial transverse holes which intersect the main hole, the transverse holes having inner ends communicating directly with the main hole through lateral openings into the latter, the main hole having a mixing chamber portion at the intersection of the main and transverse holes, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, the block being formed with separate fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said transverse holes, plug means mounted in the transverse holes for facile removal and replacement, and said plug means being adapted to meter the flow into the mixing chamber of fuel and air received in the transverse holes from the supply passages.

11. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of coaxial transverse holes which intersect the main hole, the transverse holes having inner ends communicating directly with the main hole through lateral openings into the latter, the main hole having a mixing chamber portion at the intersection of the main and transverse holes, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, the block being formed with separate fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said transverse holes, said transverse holes each having threaded portions, plug means formed with external threads and screwed into the threaded portions of the transverse holes for facile removal and replacement, and said plug means being adapted to meter the flow into the mixing chamber of fuel and air received in the transverse holes from the supply passages.

12. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of coaxial transverse holes which intersect the main hole, the transverse holes having inner ends communicating directly with the main hole through lateral openings into the latter, the main hole having a mixing chamber portion at the intersection of the main and transverse holes, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, the block being formed with separate fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said transverse holes, said transverse holes each having threaded portions, plug means formed with external threads and

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screwed into the threaded portions of the transverse holes for facile removal and replacement, said plug means having outer end portions projecting from the block and of non circular configuration to facilitate screwing of the plug means into and out of the transverse holes, and said plug means being adapted to meter the flow into the mixing chamber of fuel and air received in the transverse holes from the supply passages.

13. A mixer for a torch of the type in which liquid fuel and air both under pressure are commingled and then released in the form of an ignitable spray, said mixer comprising a metal block formed with a main hole and a pair of transverse holes, the transverse holes intersecting the main hole and having longitudinal axes disposed in a common plane substantially normal to the longitudinal axis of the main hole, the transverse holes being threaded and having inner ends communicating directly with the main hole through lateral openings into the latter, the main hole having a mixing chamber portion at the intersection of the main and transverse holes, said block being formed with an outlet passage having an opening into the mixing chamber and an outlet through which a mixture of fuel and air received from the mixing chamber is discharged, the block being formed with separate fuel and air supply passages, the fuel passage being continuous with one and the air passage being continuous with the other of said transverse holes, plug means formed with external threads and screwed into the threaded portions of the transverse holes for facile removal and replacement, said plug means having outer end portions projecting from the block and of non circular configuration to facilitate screwing of the plug means into and out of the transverse holes, and said plug means being adapted to meter the flow into the mixing chamber of fuel and air received in the transverse holes from the supply passages.

14. A mixer for a torch comprising a metal block formed with a mixing chamber, a main hole and a pair of transverse holes all continuous with the chamber; the transverse holes each intersecting and being substantially normal to the main hole; plugs in and sealing the transverse holes and, cooperatively with the walls of such holes, defining separate fluid confining chambers; said block being formed with separate passages each continuous with a different one of the fluid chambers for conducting liquid fuel and air under pressure thereto; means defining fuel and air metering passages communicating said fluid chambers with the mixing chamber; the main hole including a rod receiving portion and an outlet passage portion having an entrance opening into the mixing chamber; a rod in the receiving portion of the main hole, said rod having a needle portion projecting across and spaced from the walls of the mixing chamber and an end in alignment with the passage opening; said fuel and air metering passages having coaxial outlet orifices respectively located on opposite sides of the mixing chamber and spaced from the rod to direct fuel and air jets toward one another across the mixing chamber, and said needle portion of the rod intersecting the jet axis for impingement of such fuel and air jets from the outlet orifices of the metering passages against opposite sides of said rod needle portion and for commingling of impinged fuel and air in the mixing chamber to flow thence over the end of the needle portion of the rod into the outlet passage.

15. A mixer for a torch as claimed in claim 14 in which the needle portion of the rod is of circular section and terminates in a tapered part at the end aligned with the opening into the outlet passage.

16. A mixer for a torch as claimed in claim 14 in which the rod includes a body portion of relatively large cross sectional area sealed in the receiving portion of the main hole and the needle portion is of relatively small cross sectional area and terminates in a tapered part coaxial to the outlet passage.

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