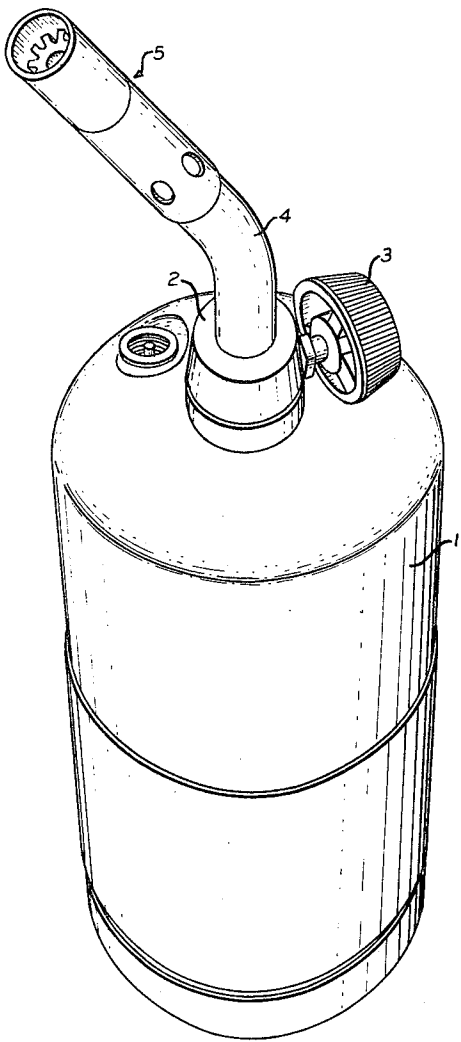


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[54] BLOW TORCH BURNER
9 Claims, 7 Drawing Figs.
[52] U.S. Cl..... 431/349,
431/344, 431/353
[51] Int. Cl..... F23d 13/40
[50] Field of Search..... 431/252,
350, 349, 353, 344
[56] References Cited
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ABSTRACT: A blowtorch burner having a section formed as a jet pump which leads into a cylindrical sleeve provided with a flame holder. A gas conduit with a gas flow orifice leads into the inlet section of the jet pump, which is provided with peripheral air inlet ports, the orifice constituting the nozzle of the pump. The flame holder in connection with the construction producing a pencil-type flame has a central axial passage and a peripheral gas flow passage with a greater cross-sectional area at its exit than at its inlet in order to provide a mantle of slow moving gas. In connection with a utility-type flame, the flame holder has a central diverter with peripheral gas flow passages extending therearound.



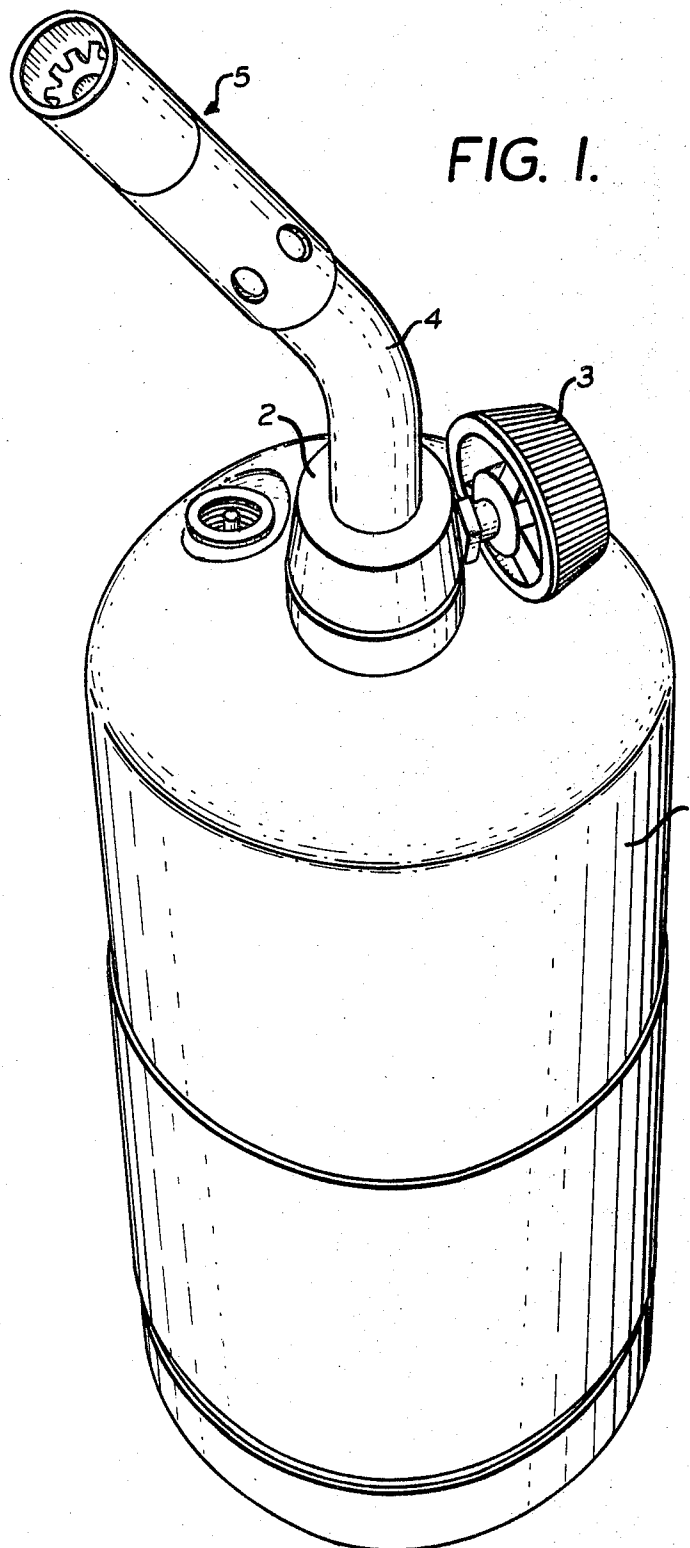


FIG. 1.

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FIG. 2.

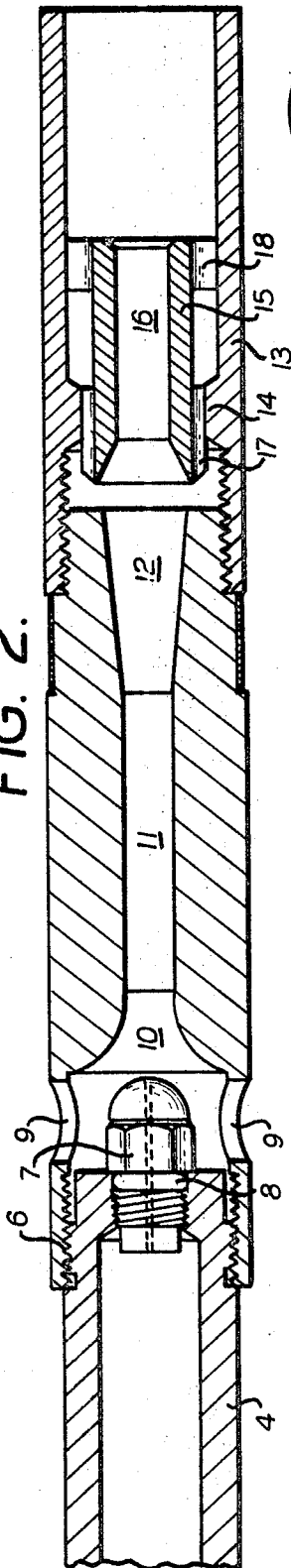


FIG. 3.

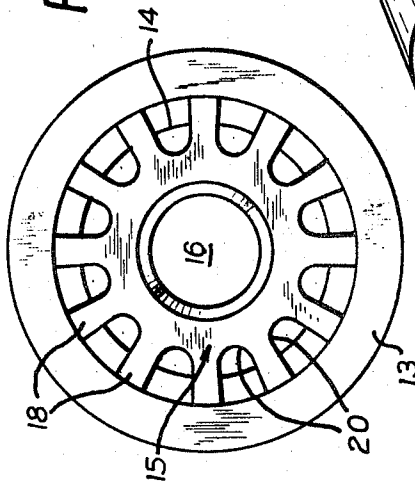
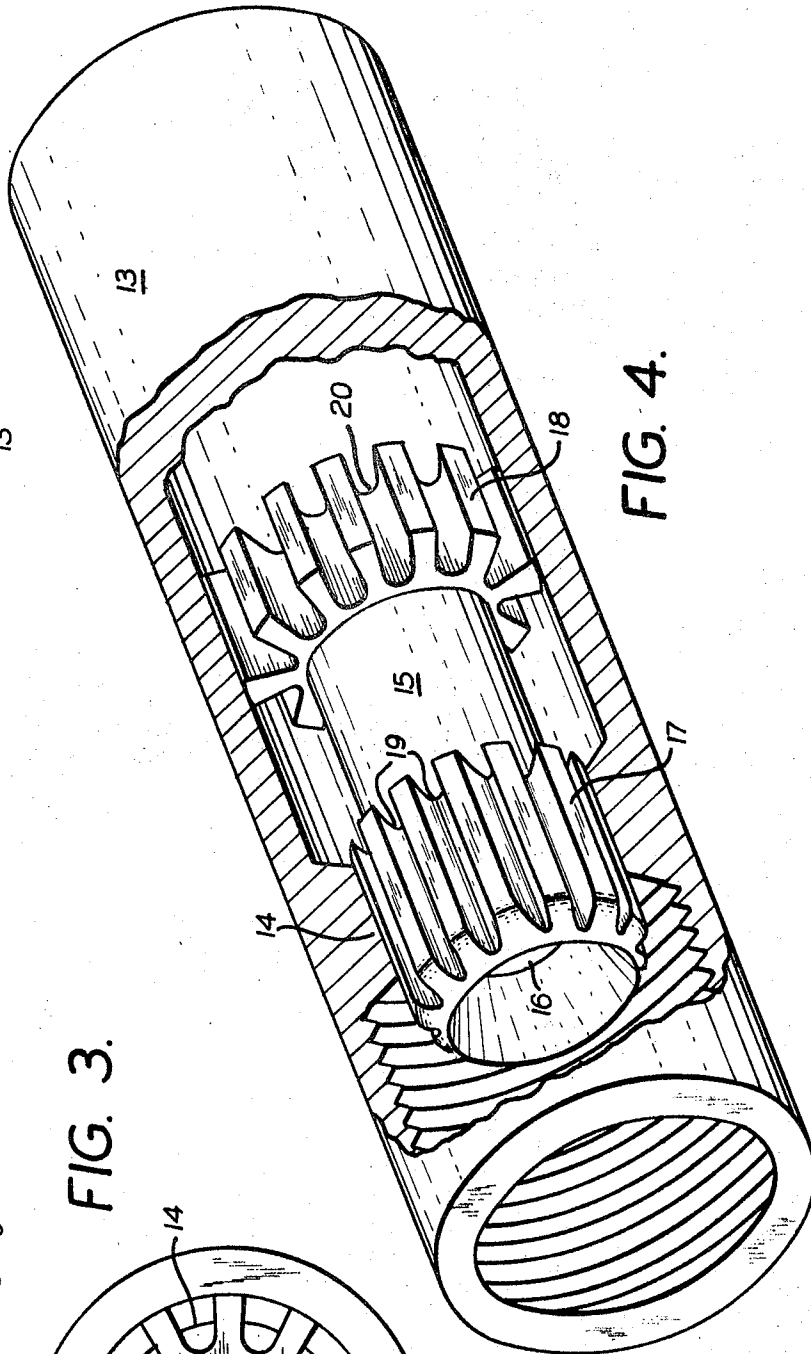
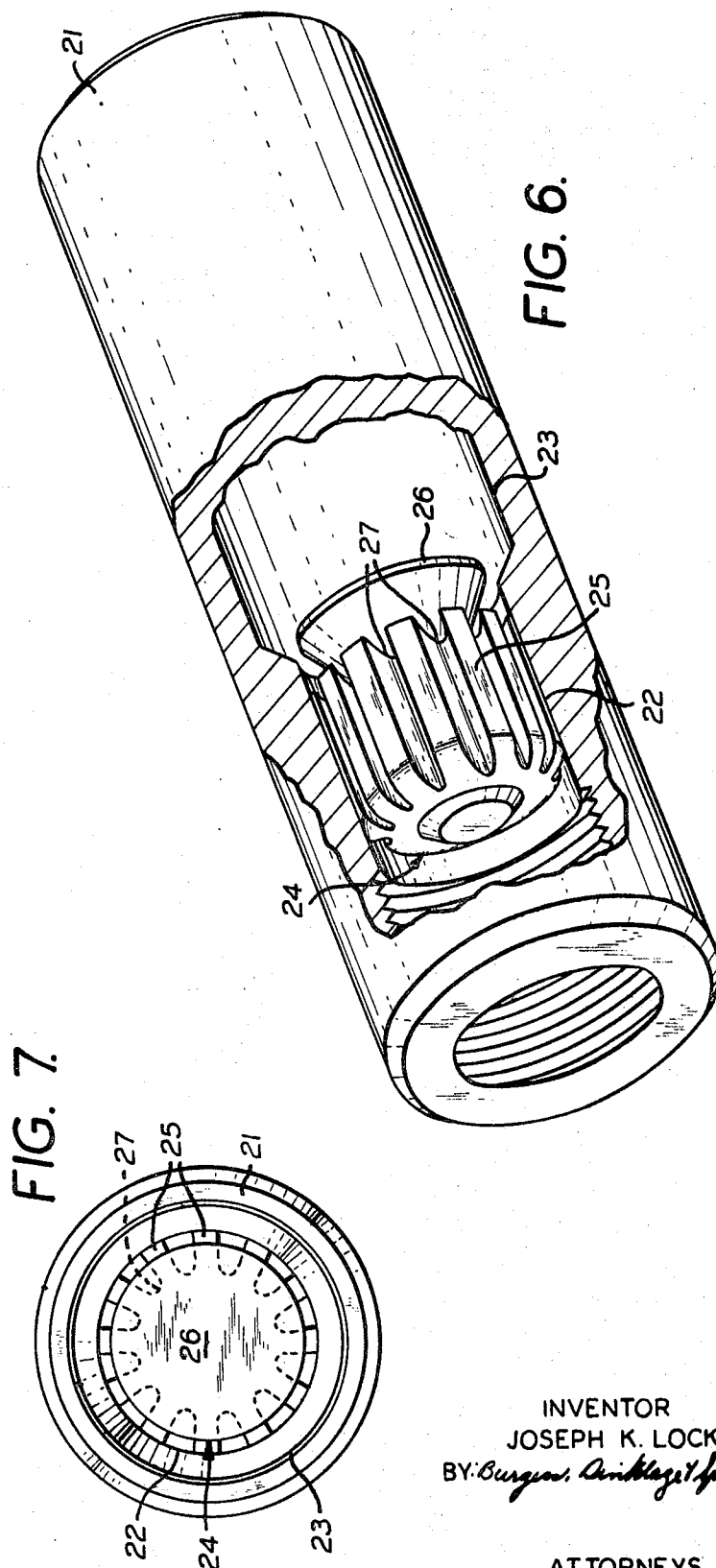
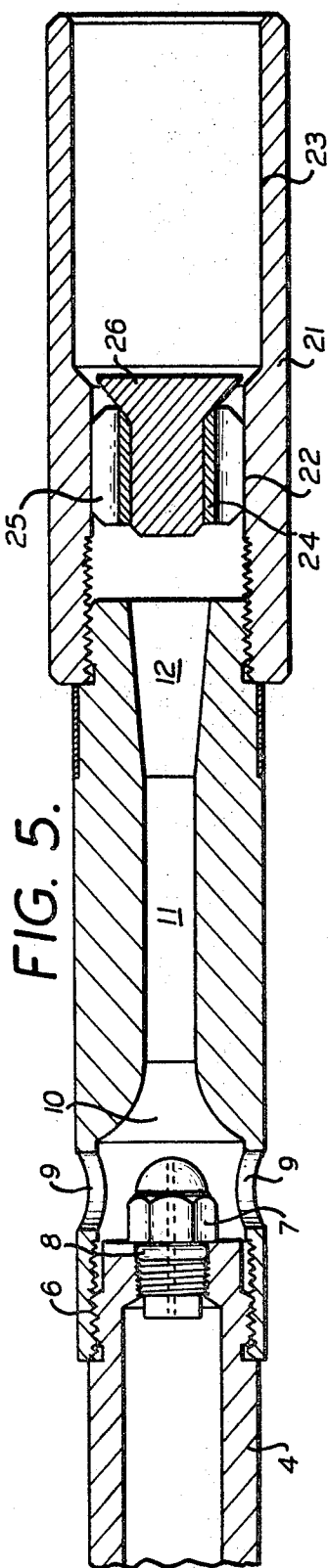


FIG. 4.



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BLOW TORCH BURNER

This invention relates to a blowtorch burner.

The invention more particularly relates to an improved burner construction for a blowtorch operated off LP gas, such as propane. Blowtorches which utilize combustible gases released from a cylinder under pressure are widely known. In such torches the fuel is generally maintained in a cylinder or other container under pressure, and in connection with LP gases under a pressure sufficient to maintain a liquid phase in the cylinder. The gas is released from the cylinder, as for example through an adjustable valve, and passes through a conduit to a burner head. A jet of the gas passes through the head and is admixed with air to form a combustible mixture ignited in the form of a flame which is used for the desired heating purpose. The cylinder providing the supply of fuel may be remote from the torch head connected by a flexible hose, or may be in the form of a portable hand-held cylinder with the torch head and valve mounted directly thereon. In this latter connection disposable LP gas cylinders are widely used.

The temperature and heat transfer characteristics of the torches which utilize the conventional LP gases, such as propane or butane, while being sufficient for many heating purposes and soft soldering, is generally not sufficient for any practical brazing, silver soldering, or other applications which require a higher heat output. For this purpose it is generally necessary to utilize acetylene or an acetylenic compound as the fuel, or to utilize special torches which are provided with a separate source of compressed oxygen. The burner of the torches may be so constructed that the flame is emitted in the form of a well-defined cone which may be used for precise heating of a given point or area, in which case the same is often designated as a pencil burner. The burner may also be so constructed that the flame is not sharply defined but covers a wider area, in which connection the same is often designated as a utility burner.

One object of this invention is a blowtorch burner which is capable of producing a substantially hotter flame with higher heat transfer characteristics than the prior known burners and which, for example, when using conventional LP fuel such as propane, is capable of producing a heating effect almost equaling that attained when burning air-acetylene in a torch of a compatible size.

A further object of this invention is a blowtorch burner construction of simplicity in design, ease in manufacture, and which has improved heating characteristics as compared with the prior known burners.

This and still further objects will become apparent from the following description read in conjunction with the drawings in which:

FIG. 1 is a perspective view of an embodiment of a blowtorch having a torch burner constructed in accordance with the invention;

FIG. 2 is a cross section of the blowtorch burner of the torch shown in FIG. 1;

FIG. 3 is a front elevation of the burner shown in FIG. 2;

FIG. 4 is a perspective view, partially in section, of the burner tip showing the flame holder;

FIG. 5 is a cross section of a further embodiment of a blowtorch burner in accordance with the invention;

FIG. 6 is a perspective view, partially in section, of the tip of the burner shown in FIG. 5; and

FIG. 7 is a front elevation of the burner shown in FIG. 5.

The blowtorch burner in accordance with the invention has a section formed as a jet pump. This jet pump is basically of conventional jet pump construction having a diffuser with an inlet section having peripheral air inlet ports, a central mixing tube of reduced diameter and a progressively widening diffuser outlet. A gas conduit, such as the conventional tube extending from the control valve of the torch, leads into the inlet section of the pump and terminates with an orifice, as for example through a gas spud which is adjacent the inlet ports.

This orifice constitutes the nozzle for the jet pump. A cylindrical sleeve forms an extension of the diffuser outlet and is provided with a flame holder. The cylindrical sleeve forming the extension of the diffuser preferably has a larger inner diameter than the largest diameter of the diffuser outlet, and most preferably itself has a cylindrical outlet section of increased inner diameter which acts as a flame shield. In order to produce a "pencil" type flame, the flame holder has a central axial gas passage and peripheral gas flow passages extending about its circumference. These peripheral gas flow passages preferably have a greater cross-sectional area at the exit than the inlet end in order to provide a mantle of slower moving gas. Most preferably the peripheral gas flow passages are formed by fluted ribs extending about the periphery of a cylindrical flame holder tube.

In connection with the burner for producing a utility-type flame, the flame holder is preferably in the form of a conically diverging diverter, centrally coaxially positioned in the cylindrical sleeve so as to define a peripheral annular gas flow passage. Most preferably, extending before the diverter in the upstream direction, there is an imperforate cylindrical central section surrounded by fluted ribs which form peripheral gas flow passages directed against the diverter.

Referring to the drawings FIG. 1 shows a conventional, disposable propane cylinder 1, for example of the type marketed under the trade mark "BernzOmatic" by the BernzOmatic Corporation of Rochester, New York. Detachably connected to the cylinder is tap connection 2 provided with shutoff and flow-adjustment valve 3.

The cylinder tap connection and valve may, for example, have the construction as shown in U. S. Pat. 2,793,504. Extending from the tap connection 2 is the gas tube 4, on which is mounted the torch burner designated 5. Referring to FIGS. 2, 3 and 4, the end of the gas tube 4 is threaded at 6 and sealed by a gas spud 7, sealed in place with the O-ring gasket 8. The gas spud 7 has a gas flow orifice of small diameter extending coaxially therethrough.

Screwed on to the gas tube 4 at the threads 6 is a jet pump section of the blowtorch burner. This has the conventional and well known construction of a jet pump being provided with an induced fluid inlet, a diffuser having an inlet section, a central mixing tube, and an outlet. The induced fluid inlet is in the form of the peripheral air inlet ports 9, four being provided, distributed about the circumference.

The diffuser inlet section is cylindrical in the area of these ports and then reduces in a funnel or venturi throatlike manner at 10 to the cylindrical diffuser mixing section 11 having a diameter no larger than the reduced diameter of the diffuser inlet section. The orifice extending through the spud 7 acts as the jet pump nozzle leading into the diffuser inlet section. The diffuser also has a conically widening outlet section 12.

Screwed over the end of the jet pump section is the cylindrical sleeve 13. This sleeve has an annular shoulder 14 of reduced diameter, into which the flame holder 15 is pressed. The flame holder 15 has a central axial gas flow passage 16, a section for the fluted ribs 17 and a further section for the fluted ribs 18. Peripheral gas flow passages 19 are defined between the ribs 17 and peripheral gas flow passages 20 are defined between the ribs 18. The passages 20 have a larger, overall flow area than the passages 19.

In operation the valve 3 is open in the conventional manner, causing gas to flow through the central orifice of the spud 7 into the inlet section of the diffuser 10, through the mixing section 11 and out through the outlet section 12. In the manner of a conventional jet pump air is drawn in the ports 9, at least partially mixed with the gas in the mixing section 11, and flows out of the outlet section 12. Due to the construction of the diffuser, the velocity of the gas is substantially increased and the high velocity stream flows into the sleeve 13. A portion of the stream flows at high velocity through the central axial passage 16 of the flame holder 15, and a partial stream flows around the periphery of the flame holder 15 through the

peripheral passages 19 and 20. As the gas emerges from the end of the sleeve it is ignited in the conventional manner, as for example by means of a match, spark, or the like and forms a well-defined pencil flame of high-velocity burning gas. The peripheral gas flow passages provide a mantle of slower moving gases which ignite easily and support combustion of the gas mixture flowing at higher velocity through the central passage 16 of the holder. This effect is enhanced by having peripheral gas flow passages with greater cross-sectional area at the exit than the inlet end, such as by having a larger flow area in the passages 20 than in the passages 19. Furthermore, with the construction shown, the annular space between the ribs 17 and 18 serves as a mixing area to further enhance mixing of the fuel gas and air for a more uniform and reliable combustion.

The high velocity flame produced has a heating effect and an effective heating temperature which is substantially greater than that achieved in conventional torches utilizing the same gas and, for example, when using propane approaches that obtained when using air-acetylene mixtures.

As a specific embodiment of a torch which may be used, for example, with a throwaway propane fuel cylinder and valve arrangement of the type described in U.S. Pat. 2,739,504, the gas tube 4 may have an unobstructed inner diameter of 0.250 inch, the spud 7 may have an orifice of 0.005 inch, the air ports may have a diameter of 0.200 inch, the inner diameter of the inlet of the diffuser at the area of the ports 9 may be 0.401 inch, the inlet section 10 may reduce with a shoulder radius of 0.210 inch to an inner diameter of 0.130 inch for the mixing section 11 of the diffuser. The collective length of the sections 10 and 11 may be 0.750 inch and the length of the outlet section 12 may be 0.690 inch. The outlet section 12 may conically widen at an angle of 10° from the axis of the mixing section 11. The length of the threaded section at the end of the pump may be 0.220 inch and the overall length of the sleeve 13, 1.50 inch. The inner diameter of the cylinder sleeve 13 may be 0.405 inch and the inner diameter at the shoulder 14, 0.300 inch. The inner diameter of the passage 16 may be 0.136 inch and its outer diameter 0.250 inch. The axial length of the flame holder 15 may be 0.620 inch, the axial length of the ribs 17, 0.250 inch, the axial length of the ribs 18, 0.120 inch, and the distance between these ribs 0.250 inch. There may be 12 ribs 17 and 12 ribs 18, with the width of the passages 19 and 20 therebetween of 0.06 inch. The roots of these passages may have a radius of 0.030 inch. The inlet end of the passage 16 may conically narrow at an angle of 50° with the axis of the passage. With a torch of this construction and dimensions, operating on propane gas it is possible to heat a 1½ inch square brass block to an actual temperature of 2100° F. whereas the conventional torch of similar dimensions operating on the same gas cannot heat the same block to a temperature of 2000° F. Furthermore, the heating rate is much quicker and the flame on the torch much more stable, and shows much less tendency to be blown out by a windstream or the like.

The embodiment as shown in FIGS. 5, 6 and 7, is identical with the embodiment previously described except for the torch tip and most notably the flame holder which is designed for producing a utility-type flame. As shown, in this embodiment the same gas tube 4 and jet pump section are used. The cylindrical sleeve 21 has initial section 22 of reduced diameter and an outlet section 23 of increased diameter, the diameter of the sleeve conically widening from the diameter at 22 to the diameter at 23. Positioned in section 22 is a flame holder and diverter, the flame holder consisting of the member 24 with the fluted ribs 25, and the diverter consisting of the conical member 26. The ribs 25 form the peripheral gas flow passage 27, and the gas flowing therethrough is forced outwardly by the diverter 26 forming a diffuse utility-type flame. Operation of the device up and through the jet pump is identical to that described in the previous embodiment. The high velocity gas stream emerging from the jet pump flows through the passages 27, is diverted

by the diverter 26 and forced to flow outwardly through the annular passage formed between this diverter and the inner wall of the sleeve 23. The end of the sleeve 23 acts as a flame shield.

As a specific embodiment of this construction, assuming the same dimensions up through the jet pump as given for the embodiment in FIGS. 1 through 4, the sleeve 23 may have an overall length of 1.750 inches, an inner diameter at 23 of 0.500 inch, and an inner diameter at 22 of 0.405 inch. The length of the section 23 may be 0.9250 inch, the length of the flame holder 24, 0.310 inch, and the construction of the ribs 25 identical to those of the ribs 18 in connection with the previous figures. The axial length of the conical diverter 26 may be 0.112 inch, its maximum diameter 0.187 inch, and its maximum diameter 0.375 inch. The utility burner though making a softer and more diffused-type flame will produce a higher effective temperature and better heat transfer than conventional, compatible utility burners, and will be more resistant to blowout and more stable and uniform in operation.

While the invention has been described in detail with reference to certain specific embodiments, various changes and modifications which fall within the spirit of the invention will become apparent to the skilled artisan. The invention is therefore only intended to be limited by the appended claims or their equivalents, wherein I have endeavored to claim all inherent novelty.

I claim:

1. A blowtorch burner comprising a jet pump having a diffuser with an inlet section provided with peripheral air inlet ports that reduces in diameter to a central mixing tube having a diameter no larger than the reduced diameter of said inlet section and a diffuser outlet that substantially progressively increases in diameter from said mixing tube, a gas conduit with a gas flow orifice leading into said inlet section, said orifice constituting a nozzle for said jet pump, a cylindrical sleeve forming an extension of said diffuser outlet and defining a flame shield at its outlet section, said cylindrical sleeve having a greater inner diameter than the diameter of said diffuser outlet, and a flame holder positioned in said sleeve adjacent to said diffuser outlet whereby the velocity of gas flowing through said gas conduit and out of said gas flow orifice is substantially increased by said jet pump so that a high velocity gas stream flows from said jet pump into said cylindrical sleeve.

2. A blowtorch burner according to claim 1 in which said flame holder is coaxially positioned within said cylindrical sleeve and has longitudinally extending fluted peripheral ribs defining gas flow passages therebetween.

3. A blowtorch burner according to claim 1 in which said flame holder is axially positioned within said cylindrical sleeve, defines a central axial gas flow passage therethrough and peripheral gas flow passages distributed about its circumference, said peripheral gas flow passages having a greater cross-sectional area at their exit than their inlet end, to provide a mantle of slower moving gas.

4. A blowtorch burner according to claim 3 in which said flame holder is in the form of a cylindrical tube coaxially positioned within said cylindrical cylinder and having longitudinally extending fluted ribs surrounding its periphery, defining said peripheral gas flow passages therebetween.

5. A blowtorch burner according to claim 4 in which said flame holder has fluted ribs at each end thereof and defines an annular mixing chamber between said ribs.

6. A blowtorch burner according to claim 5 in which said cylindrical sleeve has an annular inner shoulder and in which said fluted ribs at the end of said flame holder adjacent said jet pump are of shorter radial length than the fluted ribs at the other end of said flame holder, and are pressed in contact with said annular shoulder.

7. A blowtorch burner according to claim 6 in which said gas flow orifice is defined through a gas spud positioned at the end of said gas conduit and extending into the inlet section of said diffuser, with said air inlet ports peripherally surrounding the same.

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8. A blowtorch burner according to claim 1 in which said gas conduit is mounted on a tap connection for a disposable LP cylinder, said tap connection being provided with a shutoff and flow-adjustment valve.

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9. A blowtorch burner according to claim 1 in which the outlet section of said cylindrical sleeve has an enlarged inner diameter with respect to the inlet section thereof.

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