April 1, 1947. G. L. WALKER 2,418,208

GAS TORCH

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Fig. 1.

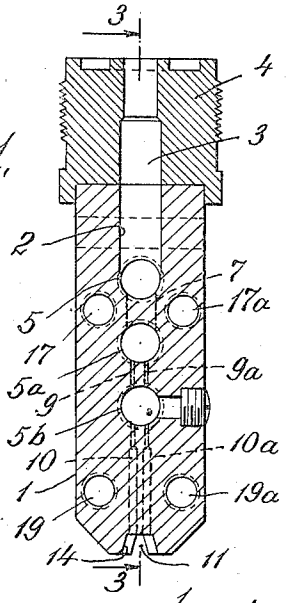


Fig. 2.

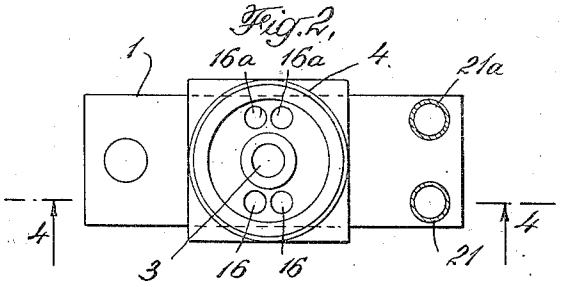


Fig. 3.

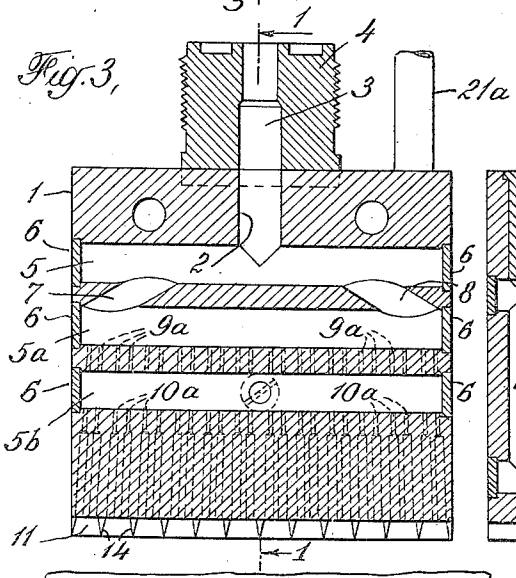


Fig. 4.

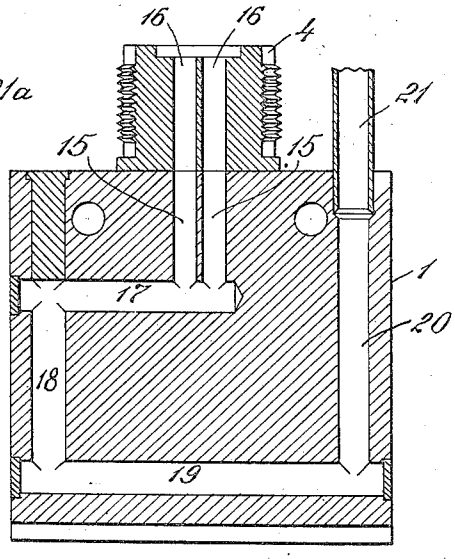
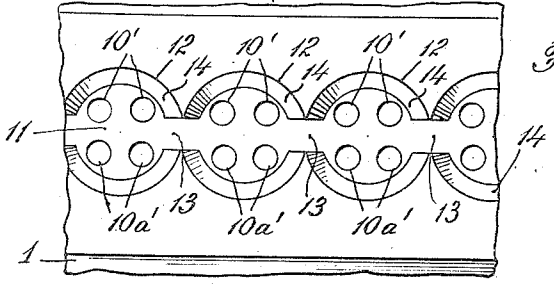


Fig. 5.



INVENTOR.
GEORGE L. WALKER

BY

Pennie Davis Marvin & Edmonds

ATTORNEYS

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GAS TORCH

George L. Walker, Jersey City, N. J., assignor to Air Reduction Company, Incorporated, New York, N. Y., a corporation of New York

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6 Claims. (Cl. 158—27.4)

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This invention relates to gas torches and more particularly to gas torches intended for use in flame hardening metal.

When propane is used as the fuel-gas for flame hardening or other types of torches, there is a tendency for the flames to blow away from the tip and even blow out altogether, due to the fact that propane combines with oxygen in a ratio of 1 to 4 as distinguished from a ratio of 1 to 1 for acetylene. Therefore, more gas must be put through the tip when propane is used than when acetylene is used as the fuel. Consequently, when propane is used, the gas mixture necessarily must be supplied at a higher velocity in order to provide sufficient heating. The tendency for the flames to blow away from the tip, and even blow out also applies to other fuel gases such as acetylene if high velocity jets are employed. Such blowing away of the flame can be prevented by causing a sudden decrease in the gas velocity just as it issues from the discharge orifice, without limiting the amount of gas passing through the orifice. The advantages of using high velocity jets are well understood in the art. Among other things they produce a faster heat transmission to the work and more heat is developed since the quantity of gas burned is greater. It has been found that if the torch tip is recessed so that the discharge orifices open through a portion of the tip face that is set back with respect to the surrounding portion of the tip face, the tendency of propane flames to blow away is lessened, and with any fuel gas higher velocities can be used. It also has been found that if the discharge orifices are grouped or clustered, the tendency of propane flames to blow away is lessened. In either case, the gas stream, as it leaves the discharge orifice, is broadened by what is known as the Bernoulli effect, that is, a low pressure region which occurs between a rapidly moving gas stream and a stationary wall, or between two moving gas streams. When the gas is discharged into a recess the low pressure region between the moving gas stream and the wall of the recess causes the gas stream to expand as soon as it leaves the discharge orifice with a consequent decrease in the velocity of the gas. When the discharge orifices are grouped or clustered, the low pressure region between the closely positioned gas jets similarly causes the gas streams to expand as soon as they leave the discharge orifices, thereby reducing the velocity of the gas. However, experience has shown that a multi-jet tip having a separate individual recess for each jet does not operate very well; nor

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is the operation entirely satisfactory if the jet orifices open into a continuous recess in the tip in the form of an elongated straight channel closed at both ends, because there is not sufficient Bernoulli effect, especially when the discharge orifices are not closely grouped.

All factors considered, it now has been found that the best results are obtained when the recess in the torch tip is elongated and formed in accordance with the present invention, that is, so that the side walls of the recess are scalloped to produce in effect overlapping or communicating circular recesses, or so that it has a series of closely spaced communicating laterally-enlarged portions formed in some other way, and when each of such laterally-enlarged portions accommodates three or four of the jet orifices. With the side walls of the recess so formed, a Bernoulli effect is obtained between the walls of the skirt and the jets and also between the gas jets themselves. Also, as the enlarged portions of the recess are in communication, the desired single sheet-like flame is produced.

A torch embodying the invention is illustrated in the accompanying drawing, in which:

Figure 1 is a vertical transverse section through the torch;

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

Fig. 3 is a vertical longitudinal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical longitudinal section taken on the line 4—4 of Fig. 2; and

Fig. 5 is a bottom view of the torch drawn to an enlarged scale and showing a portion of the face of the torch tip with the recess therein.

The torch has a tip 1 of the elongated block type. A mixture of oxygen, and fuel gas such as acetylene or propane, enters the torch tip through a vertical passage 2 communicating with an inlet passage 3 in a suitable fitting 4. The vertical passage 2 delivers the gas mixture to the first of three horizontal distributing chambers shown at 5, 5a and 5b (Figs. 1 and 3). These distributing chambers are drilled longitudinally through the block and their axes are arranged in a vertical plane as shown. The ends of the distributing chambers are plugged as shown at 6 (Fig. 3). The gas mixture passes from the first distributing chamber 5 into the second chamber 5a by means of two diverging passages 7 and 8 located near the opposite ends of the distributing chambers. The gas mixture then passes to the third distributing chamber 5b through two sets of vertical metering ports 9

and 9a (Figs. 1 and 3). The ports of each set are substantially evenly spaced along the entire length of the tip as shown in Fig. 3. The distributing chamber 5b delivers the gas mixture to two sets of vertical jet passages 10 and 10a leading to the face of the tip. The jet passages 10 and 10a terminate at the face of the tip in a double row of discharge orifices 10' and 10a' extending lengthwise of the tip face.

The elongated recess in the tip face is designated 11 in its entirety (Figs. 1, 3 and 5). The above-mentioned laterally enlarged portions are preferably produced in the manner shown in Fig. 5 by so forming the elongated recess that it is in effect a series of adjoining circular recesses 12 which overlap so that they are all in communication, or if the circular recesses do not sufficiently overlap to establish the communication each pair may be placed in communication by a short longitudinal recess 13. Forming the elongated recess in this manner gives each of its side walls a scalloped shape, as clearly shown in Fig. 5, each scallop in one wall forming with the opposing scallop in the opposite wall one of the circular recesses. The side walls 14 of the circular recesses are tapered so that the diameter of each circular recess is greater at the extreme face of the tip than at the bottom of the recess.

The jet passages discharge into the enlarged or circular portions of the elongated recess and preferably more than one jet passage discharges into each of them so that there will be a group of flames in each enlargement of the recess. While any desired number of jet passages may discharge into each enlargement of the recess, it is preferred that at least three of them do so. However, a more symmetrical and convenient arrangement is to have four jet passages discharging into each of them, this being the arrangement shown in Fig. 5. It will be noted from this figure that two discharge orifices 10' of one row and two corresponding discharge orifices 10a' of the other row are located in each of the circular recesses.

When a torch is constructed as above described propane can be used as the fuel gas without the flames blowing away from the torch tip, and with any fuel gas relatively high velocity jets can be employed without this happening.

The particular torch tip shown in the drawing happens to be water-cooled which accounts for the presence of the additional openings 17, 17a and 19, 19a shown in Fig. 1. One set of the cooling water passages is shown in Fig. 4. The water enters the block through a pair of vertical passages 15 communicating with corresponding inlet passages 16 at one side of the fitting 4. The water then passes through a horizontal passage 17, a vertical passage 18, another horizontal passage 19, and is then discharged by means of a vertical passage 20 into a discharge pipe 21. Fig. 4, being a

section taken on the line 4—4 of Fig. 2, shows only the water passages at one side of the block. A similar set of passages exists at the opposite side of the block to which water is supplied by inlet passages 16a at the opposite side of the fitting 4, and from which it is discharged by a second discharge pipe 21a.

I claim:

1. A gas torch having an elongated block constituting the torch tip, said block having a longitudinally-extending recess in the face thereof, said recess being defined at opposite sides by continuous walls each formed to provide a series of closely-positioned, laterally-enlarged portions in the recess, said block having gas passages so formed therein that a plurality of discharge orifices therefrom open into each of said enlarged portions in the recess, the total area of said discharge orifices in each laterally-enlarged portion being substantially less than the area of said laterally-enlarged portion.

2. A gas torch as defined in claim 1 in which two discharge orifices from the gas passage open into each enlarged portion of the recess at each side of the longitudinal center thereof.

3. A gas torch as defined in claim 1 in which the enlarged portions of the recess are formed by scallops in the side walls defining the recess, and the scallops in the side walls defining the space are arranged in pairs transversely opposite one another.

4. A gas torch as defined in claim 1 in which the enlarged portions of the recess are formed by a series of overlapping circular recesses, the opposite sides of which are formed in the respective side walls defining the longitudinally-extending recess.

5. A gas torch as defined in claim 1 in which the walls at the opposite sides of the longitudinally-extending recess defining the enlarged portions diverge towards the face of the torch.

6. A gas torch as defined in claim 1 in which the walls at the opposite sides of the longitudinally-extending recess defining the enlarged portions diverge towards the face of the torch and in which at least two discharge orifices from the gas passage in said block open into each enlarged portion of the recess at each side of the longitudinal center thereof.

GEORGE L. WALKER.

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