April 12, 1927. 1,624,377

G. L. WALKER

CUTTING TIP OR THE LIKE

Filed Oct. 12, 1925

Fig. 1.

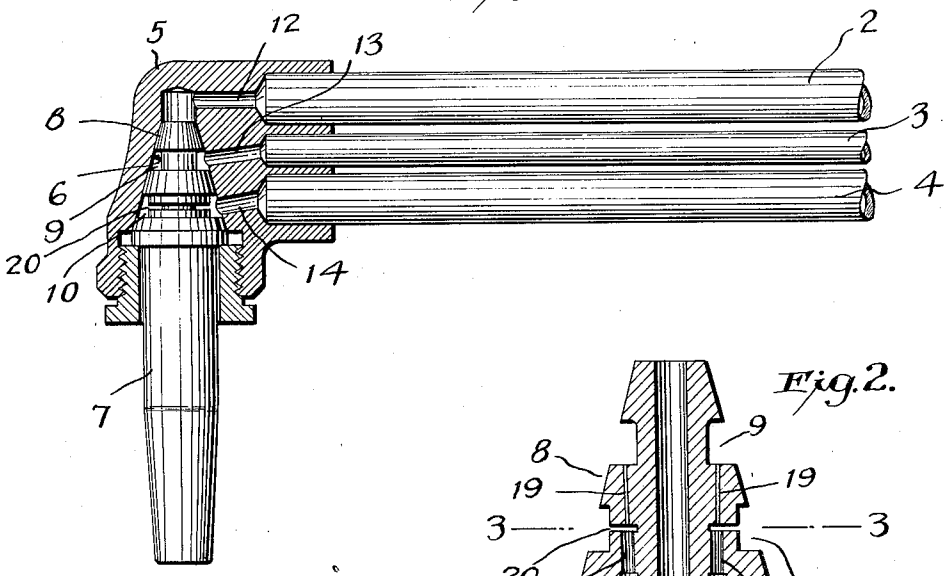


Fig. 2.

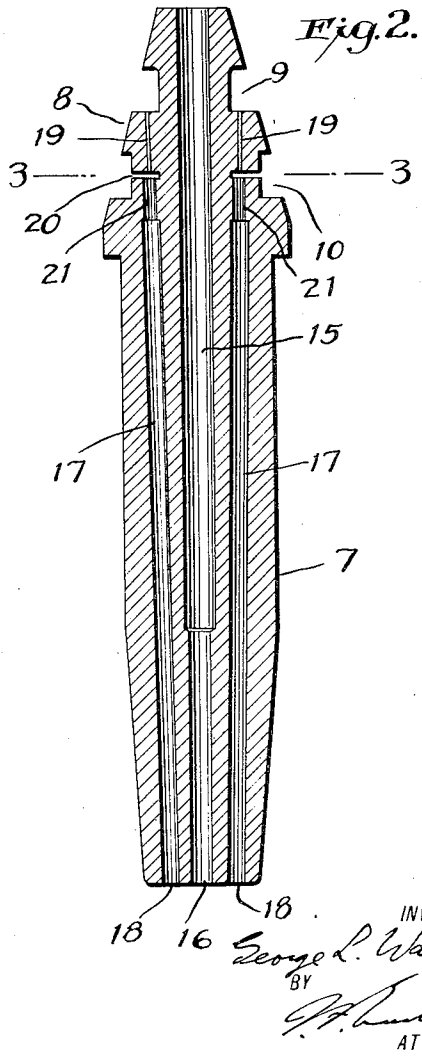


Fig. 3.

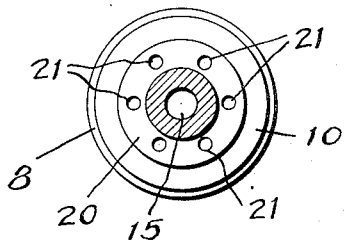
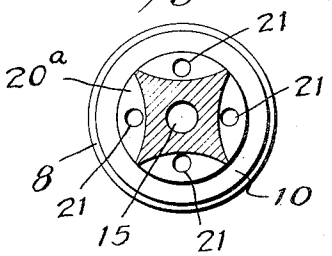


Fig. 4.



INVENTOR
George L. Walker
BY
ATTORNEY

Patented Apr. 12, 1927. 1,624,377

UNITED STATES PATENT OFFICE.

GEORGE L. WALKER, OF NEW YORK, N. Y., ASSIGNOR TO AIR REDUCTION COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CUTTING TIP OR THE LIKE.

Application filed October 12, 1925. Serial No. 62,183.

This invention relates to torches for cutting metal by means of an oxygen jet assisted by one or more heating, or "preheating", jets composed of a mixture of oxygen and a combustible gas. These torches are customarily provided with removable and interchangeable members or tips, which are inserted in or applied to the heads of the torches to receive and conduct the gases for the several jets and to combine the gases for the preheating jets. The purpose of this invention is to provide a cutting tip, plug, or the like, having important advantages over prior cutting members; one of these advantages being the lowness of the pressures that can be employed, and another being the improved mixing of the gases for the preheating flames, and the increased stability of these flames, whether the combustible gas is one under very low pressure or one under substantial pressure.

The cutting tips heretofore commonly employed have been suitable for acetylene or other gases available under some pounds of pressure, but are not suitable for use with ordinary illuminating gas, which is at a very low pressure. For a great deal of cutting, a combustible gas of high calorific value, such as acetylene for instance, is not really required; and it would be a saving, as well as a great convenience, if illuminating gas, which is piped everywhere, could be used satisfactorily with torches of standard design and dimensions.

The limits of space and possible arrangement in the rear ends of tips of these torches have made it impossible to drill passages in such number and relation as to introduce an adequate amount of very low pressure combustible gas to mix with the high pressure oxygen for the preheating jets. The difficulty is met in the present invention by a construction wherein the low pressure gas for the preheating jets is admitted, not by laterally drilled bores, but by means of a transverse slot or cut, which slot intervenes between each oxygen inlet jet bore and the rear or combining end of each preheating mixture passage, in such manner that the oxygen jets striking across the slot entrain a full complement of the low-pressure gas.

The construction produces a very advantageous mixing of the gases, and the preheating flames are of excellent character. These advantages are equally noticeable in cases where the combustible gas is under a considerable degree of pressure. The tip has been found, for example, to give especially good results with calorine gas under pressures of from a few ounces up to 5 pounds, or more; calorine being a combustible gas with which it is usually somewhat difficult to obtain stable and reliable preheating flames for cutting purposes. The object of the invention is to secure these advantages in a construction which is simple and inexpensive to make, and which is adapted for tips of all sizes and with any number of preheating jets each provided with its own mixing arrangement.

In the accompanying drawings, forming part hereof:

Fig. 1 is a side view of the forward part of a cutting torch, showing the supply conduits in elevation, the head of the torch in central vertical section, and the tip in elevation;

Fig. 2 is an enlarged axial section through the tip;

Fig. 3 is a cross-section on the line 3—3 of Fig. 2; and

Fig. 4 is a similar view illustrating a modification.

The torch has conduit pipes 2, 3, 4, for cutting oxygen, preheating oxygen, and combustible gas, respectively. These pipes form part of, or extend through, the handle, arm or stock of the torch, and the connections at the rear end may be of the customary character. It will, therefore, be understood, that the illustration represents an apparatus so designed and connected that the pipe 2 conducts oxygen under high pressure, for cutting, the pipe 3 conducts oxygen under a lower, but still substantially high, pressure, to serve the preheating jets, while the pipe 4 conducts very low pressure combustible gas, for the same jets.

The several pipes deliver into ducts 12, 13 and 14 drilled in the head 5, and having their forward ends opening, at different points, into a truncated conical, or like, cavity 6 in the head.

The tip 7 has a truncated conical rear portion 8, which fits said cavity, and is finished to make seals therewith between the respective gases. Within this sealing portion, the tip is formed with ample annular grooves, or circumferential recesses, 9, 10, which register, respectively, with the ducts

13 and 14 in the head. The duct 12 of the head delivers into the rear or upper extension of the cavity 6, the cutting oxygen there entering the rear end of a longitudinal cutting oxygen passage 15, extending through the tip and delivering at the forward end through the central cutting jet orifice 16.

In addition to the cutting oxygen passage 15, these tips are drilled with a plurality of longitudinal combustible mixture passages 17, for delivering a group of preheating flame jets, through orifices 18, about and adjacent the cutting oxygen jet. In some instances a single preheating jet, placed eccentrically or laterally from the cutting jet passage, may be employed.

The preheating mixture passages are supplied with oxygen for supporting combustion, through restricted bores 19 which are drilled longitudinally to intersect the side chamber 9. These bores are quite restricted, to deliver velocity jets of the high-pressure oxygen gas, and are in line with the rear ends of the preheating mixture passages 17.

A comparatively narrow, annular slot or cut 20 is made in the rear part of the tip, transversely inward from the side chamber 10, to intersect the alined axes of the bores 19 and 17. This slot extends inward somewhat beyond the passages 17, still leaving, however, sufficient wall about the central passage 15, and affords an aspirating chamber, across which strike the jets from the oxygen inlets 19, so as to entrain the low, or relatively low, pressure combustible gas into the exits 21. In this way an ample proportion of low-pressure illuminating gas is injected and driven along in mixture with oxygen to feed the preheating jets of one of these cutting tips. Furthermore, superior gas mixing and flame are obtained, either with illuminating gas or with other kinds of gases under higher pressures, as heretofore stated.

The forward or delivery ends of the oxygen jet bores 19 terminate at the rear face of the narrow slot 20. The construction does not require the insertion of projecting jet nozzles to secure the desired degree of aspirating effect, the purpose of the invention being to obtain a very efficient action under the conditions indicated by a very simple and inexpensive construction, which is well adapted to the restricted space in the rear end of the tip. It will be apparent that the construction can be readily embodied in small as well as in large or medium sized tips, and in tips of any size having numerous preheating jet passages each provided with its individual entraining oxygen jet. By properly proportioning the passages 17 and 19, or 21 and 19, and the width of the slot, the exact relation for the desired degree of aspiration can be fixed and can be reproduced substantially without variation in all tips of a given size and character. The effect of the oxygen jet striking across the narrow slot occupied by the combustible gas has been found to be advantageous for moving the low pressure gas, for proportioning the gases and for initiating a thorough mixing.

The result is more effective, especially in large size tips, when the rear ends, 21, of the preheating mixture passages are reduced with reference to the major portion of the length of these passages, so as to form short, comparatively narrow tubes, within which the combined gases are first injected by the entraining action of the oxygen jets, the gases thence spreading out to fill the long, comparatively wide bores within which the mixing is completed before the gases escape from the flame jet orifices 18.

The passages 17, 21 and 19 are formed by counter-boring from the front end of the tip, the bores 17 being comparatively wide up to the short tubes 21, which are materially narrower than the long bores 17, and the bores 19 being quite fine. Proportions may, of course, be varied, but satisfactory results are secured, for example, when the oxygen jet bores 19 are about one-sixth the diameter of the rear ends of the mixing passages, and the width of the slot 20 is about one-half that diameter. The diameter of the bores 17 is determined by the desired size of the preheating jets. In smaller tips the passages 17, 21 may be of one diameter.

Fig. 4 illustrates a modification wherein the slot or cut 20^a forming the aspirating chamber, instead of being a continuous annular groove, is cut in by a suitable cutter from the several sides so as to intersect the bores 19 and 21.

Various other forms will suggest themselves. I do not necessarily limit the invention to embodiment in an integral tip including the delivery orifices, as sometimes these structures are divided into a rear part which fits into the head, and a delivery part or nozzle which can be taken out and replaced with another, if desired, without replacing the rear part at each exchange.

I claim:

1. A cutting torch tip or member having one or more preheating mixture passages, with a restricted oxygen jet bore in line with each preheating mixture passage, said member being formed with a narrow transverse slot to afford inlet for combustible gas, the delivery ends of said oxygen jet bores terminating at the rear face of said slot, said slot intervening between the delivery ends of said oxygen jet bores and the rear ends of said preheating mixture passages, in such manner that the oxygen jets striking across the slot entrain the combustible gas.

2. A cutting torch tip or member provided with a central cutting oxygen passage and

one or more eccentric preheating mixture passages, with a restricted oxygen jet bore in line with each preheating mixture passage, said member being formed with a narrow transverse slot to afford inlet for combustible gas, the delivery ends of said oxygen jet bores terminating at the rear face of said slot, said slot intervening between the delivery ends of said oxygen jet bores and the rear ends of said preheating mixture passages in such manner that the oxygen jets striking across the slot entrain the combustible gas, each preheating mixture passage comprising a relatively wide bore throughout the greater part of its length with a relatively reduced bore at the rear end forming a short, comparatively narrow tube into which the gases are injected.

GEORGE L. WALKER.