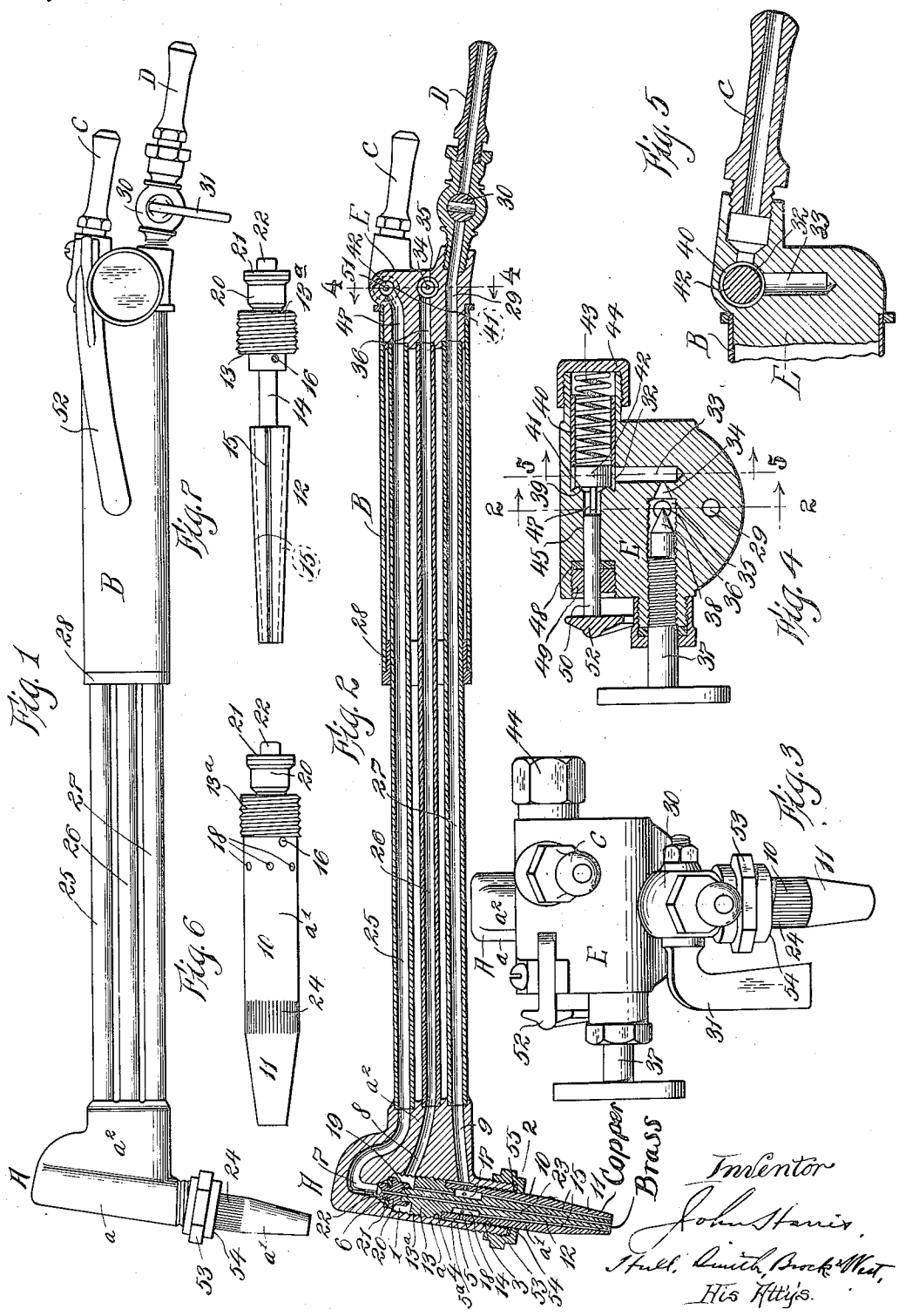
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BLOWPIPE AND CUTTING TORCH.

APPLICATION FILED JAN. 12, 1916.

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UNITED STATES PATENT OFFICE.

JOHN HARRIS, OF CLEVELAND, OHIO.

BLOWPIPE AND CUTTING-TORCH.

1,282,416. Specification of Letters Patent. Patented Oct. 22, 1918.

Application filed January 12, 1916. Serial No. 71,626.

To all whom it may concern:

Be it known that I, JOHN HARRIS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Blowpipes and Cutting-Torches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to blowpipes or cutting torches, and more particularly to torches of the character described in my application Serial No. 877,649, filed December 17, 1914, Patent 1,217,119, Feb. 20, 1917.

Among the objects to be secured in and through the use of my invention is the provision of a blowpipe or torch that can be used for cutting purposes alike with a gas which is particularly rich in carbon and hydrogen (as acetylene), and a gas which is relatively poor in such constituent elements—(as for instance, hydrogen alone).

An important advantage of my invention is to provide a pipe of the character described whereby, with the employment of a high-pressure oxygen bore of varying cross section, no increase or decrease in the size and number of the passageways for preheating gases will be necessary.

A further object and advantage of my invention is to provide a pipe of the character described with means whereby the flashing back of the gases will be prevented; also one whereby a concentrated flame will be produced that will reduce the slagging of the metal to a minimum.

A further object of the invention is to provide a blowpipe or torch of the character described which is capable of withstanding as well the cutting action of the oxygen and the melting action of the slag with which it may come into contact.

Further objects of the invention are generally to improve the efficiency and convenience of operation of pipes of the character referred to.

In the drawings forming part hereof, Figure 1 represents a side elevation of a torch or blowpipe constructed in accordance with my invention; Fig. 2 is a longitudinal sectional view taken through the central portion of the blowpipe shown in Fig. 1 and corresponding substantially to the line 2—2 of Fig. 4; Fig. 3 is a rear end elevation of the blowpipe; Fig. 4 an enlarged sectional detail corresponding to the line 4—4 of Fig. 2; Fig. 5 an enlarged sectional detail corresponding to the line 5—5 of Fig. 4; Fig. 6 a side elevation of the burner tip of my blowpipe; and Fig. 7 a similar view of such tip, the outer sleeve being removed.

Describing by reference characters the various parts illustrated herein, A denotes generally a burner head, B a tubular handle for operating the blowpipe or torch, C the connection through which oxygen is supplied for the preheating flame as well as for cutting purposes, and D the connection for the combustible gas for preheating.

The burner head A comprises a body a having connected thereto a detachable tip a' and an extension a^2 which is preferably cast with the head proper and provided with a plurality of passageways arranged to supply oxygen for the preheating mixture and for the cutting jet as well as for the combustible gas or gases mixed with the oxygen for the production of the preheating flame. For convenience of description, the blowpipe or torch will be considered as being used in the position shown in Figs. 1 and 2, and the terms "top" and "bottom" will be employed accordingly.

The body a is provided with an enlarged cylindrical chamber 1 extending upwardly from the lower end 2 of said body. This chamber is interiorly threaded at the lower end, as shown at 3, and at the upper end, as shown at 4, there being a portion 5 intermediate of the threaded portions 3 and 4 which is relatively smooth, the threads being removed whereby an annular space 5^a will be provided between such wall portion 5 and the outer wall of the tip (to be described hereinafter).

At its upper end, the chamber 1 is provided with a frusto-conical seat 6 and from the upper end of said seat there extends a passageway 7, said passageway being bent or deflected laterally whereby it may register with the upper oxygen supply tube. From the upper portion of the chamber 1 there extends a passageway 8, said passageway being located in the extension a^2 of the head and communicating with a second oxygen tube. The space 5^a communicates with a third passageway 9 which is provided in the lateral extension a^2 of the head and which passageway in turn communicates with a third tube—the one conducting combustible fluid to the head.

Coöperating with the aforesaid passage-

ways and the chamber 1 is the tip. This tip comprises generally an outer sleeve member, which sleeve is secured to an inner body member. The sleeve is indicated at 10, the lower end being preferably tapered, as indicated at 11. This sleeve is slid upon the lower end of the body forming the inner tip member. This inner tip member comprises a lower plug 12 and an upper plug 13 united by a reduced intermediate portion 14. The lower plug 12 is slightly tapered or frusto-conical, is nearly two inches in length, and is provided with a plurality of slots 15 extending the length thereof. Six such slots are preferably provided, and these slots are substantially rectangular in section, the slots extending inwardly from the outer surface of such plug. The upper plug 13 is externally threaded, as shown at 13^a, the plug being reduced at its lower end to substantially the diameter of the plug 12, whereby the sleeve 10 may be conveniently applied to the inner member by being slipped over the lower end of such inner member until the upper end of the sleeve abuts against the enlarged portion of the plug 13.

The sleeve may be secured in place as by means of a pin 16. When thus assembled, it will be evident that a chamber 17 is provided between the sleeve and the reduced portion 14 of the inner tip member. The portion of the sleeve which surrounds this reduced portion 14 is provided with a series of apertures 18 extending therearound and communicating with the annular chamber 5^a provided between the sleeve and the smooth wall. The plug 13 is also provided with a bore 19 which communicates at its lower end with the chamber 17 and at its upper end with the chamber 1. At its upper end, the inner tip member is provided with a head 20 having an annular seat for a packing ring 21, said ring being slipped over a reduced extension 22 of said head. The inner tip member is provided with a central bore 23 extending centrally the full length thereof, this central bore, when the tip is seated, registering with the passageway 7.

The tip, comprising an inner and an outer member suitably connected by the pin 16, is applied to the head by screwing the plug or body 4 into the head until the projection 20 with the packing ring 21 abuts against the seat 6. The outer tip member will preferably be knurled, as indicated at 24, to facilitate the operation of applying the tip to and removing it from the head. The inner member of the tip is made of brass whereas the outer member is made of copper. The advantages in employing these materials will be explained hereinafter.

25, 26 and 27 denote three tubes connected to the head A and communicating respectively with the passageways 7, 8 and 9. These tubes at their rear ends (the ends remote from the blowpipe head) are connected to a body E which contains the chambers and coöperating valve construction for controlling the flow of oxygen and combustible gases to the blowpipe head. The tubular handle B is sleeved upon the body E and upon a suitable cup-shaped support 28 which surrounds the tubes 25, 26 and 27 and through which said tubes extend.

The connection D is for the application of a hose (or similar conduit) through which the combustible gas is supplied to the head. It will be observed that the tube 27 communicates with a passageway 29 which extends through the head E and registers with the bore of the connection D. The passageway through this connection is controlled by means of a rotary valve 30 having an operating handle 31. The connection C is provided for the application of a hose (or similar conduit) for the oxygen. The oxygen connection C communicates with a chamber 32 from which the passageway 33 is adapted to conduct the oxygen to a valve-controlled passageway 34 and, from said passageway, to a chamber 35 with which the pipe 26 communicates through the passageway 36. 37 denotes a needle valve which is threaded into the plug or body E and which is provided with a needle point 38 coöperating with the tapered passageway 34 to control and cut off the supply of oxygen to the chamber 35 and thence to the chamber 17 within the outer sleeve member of the tip. The chamber 32 is shown as a cylindrical chamber, the inner end whereof is provided with a frusto-conical valve seat 39. In this chamber there is mounted a sleeve 40 having a seat 41 near its inner end for the valve proper 42, which valve proper may be of any suitable material. Within the sleeve 40 is located a helical spring 43, the inner end whereof is adapted to engage the seat 41 while the outer end projects beyond the sleeve and is compressed against the seat 41 by means of a nut 44 threaded on to a nipple extension of the plug or body E.

From the valve seat 39 there extends a passageway 45 which in turn communicates with a passageway 47 in the body E, said passageway communicating with and forming an extension of the tube 25. The passageway 45 is bored or extended from the valve seat 39 to the side of the head or body E which is opposite the nut 44. At its outer end, the passageway 45 is enlarged in order to receive a suitable packing ring 48 which may be compressed by means of a nut 49, countersunk within the enlargement or cup thus formed. Through this nut, and packed by the ring 48, there extends a stem or plunger 50, the inner end whereof is reduced, as shown at 51, in order to provide clearance for the passage of gas therearound, the extreme end being adapted to engage the

valve 42. The outer end of the stem or plunger 50 is in position to be engaged and operated by means of a lever 52 which is shown as extending along the handle sleeve B in position to be conveniently grasped by the operator.

In order to prevent any leakage of gases between the lower end of the head A and the outer wall of the tip, a gland nut 53 is threaded onto the lower end of the head, said nut having a flange 54 having a central aperture substantially sizing or fitting the exterior of the tip sleeve, said flange forming a support for packing material 55 which is adapted to bear against the lower end of the head, thereby to close the joint between such head and the outer sleeve of the tip.

With the parts constructed and arranged as illustrated and described, the operation will be as follows:

The supply of acetylene (or other preheating combustible gas) is turned onto the tip by opening the valve 30, the supply passing through the passageways 27, 29, openings 18, chamber 17 and passageways 15. Oxygen under low pressure and in sufficient quantity to produce with this combustible gas a preheating flame, is supplied by opening the valve 37, permitting a part of the oxygen conducted through the connection C to pass through the bore 19 into the chamber 17. The oxygen and the combustible gas are mixed and are supplied in such mixed condition through the passageways 15. When the metal to be cut has been heated sufficiently by the combustion of the gases supplied through the passageways 15, an independent supply of high-pressure oxygen is turned on by manipulating the valve lever 52. This independent supply passes through the central bore 23 and operates in the usual manner to cut the metal thus preheated. By the employment of the chamber 17, a more efficient mixing of the oxygen with combustible gas is secured than where the mixing is accomplished only in a restricted passageway. Furthermore, without this chamber, the flame is extremely liable to be blown out, especially after the tip becomes heated by the flame and by reason of its proximity to the metal which is being heated thereby.

In practice, where acetylene is to be used as the combustible preheating gas, I have found that very satisfactory results can be obtained by making the lower portion of the body 12 of the inner tip member about 2 inches in length, the central bore being made with a No. 53 drill while the slots 15 are about 24/1000 inch deep and wide. With these dimensions and using the oxygen and the acetylene under the pressures which are ordinarily employed in this art, the pipe will work satisfactorily in cutting metal up to five (5) inches in thickness. A great advantage of my construction is that, should it be desired to cut metal of greater thickness than that specified, this result can be secured by merely increasing the diameter of the central bore but without the necessity for increasing the dimensions of the passageways for the preheating mixture. Furthermore, the convergence of the passageways 15 toward the discharge end of the central bore 23 produces a concentrated preheating flame and enables me to preheat the metal very quickly and without the necessity for shifting the blowpipe in order to secure the necessary preheating temperature.

The pressure of the oxygen which is supplied through the passageway 8 should be at least as great as that of the acetylene supplied through the passageway 9. In practice, it is preferable to have the pressure of the oxygen greater than that of the acetylene so as to avoid any danger of the acetylene working back into the oxygen pipe.

Reference has been made hereinbefore to the fact that the outer tip member or jacket is made of copper while the inner or body member is made of brass. Both the brass and the copper will withstand the cutting action of the oxygen jet. However, brass is liable to be melted by contact with the slag which is produced during the cutting operation. I have found, however, that by making the outer member or sleeve of the tip of copper, the melting of this tip by slag is practically overcome and the tip is not injured by the oxygen. I am thus enabled to increase the efficiency of the blowpipe and at the same time to reduce the cost of production thereof. By the construction employed, the outer member of the tip is continuous and is fitted within the blowpipe head without the necessity for threading the same and the tip is held in place within the head by means of a packed joint. This construction avoids a brass-and-copper connection, which, on account of the unequal expansion of the metals mentioned, is a source of leaky joints. For tips intended to be used with hydrogen I preferably employ six slots in the body 12 and five when the tip is to be used with acetylene.

When it is intended to use hydrogen for the preheating gas, the blowpipe will be substantially identical with that employed for acetylene, the only difference being that the passageways for the preheating gases will be larger. Where hydrogen is used the passageways 15 should be 41/1000 inch deep and wide as against 24/1000 inch deep and wide, as specified in connection with the use of acetylene. In all other respects the tips will be identical and the capacity of the pipes will be identical so far as cutting is concerned. Where hydrogen is used for the preheating gas, if it is desired to increase the capacity of the pipe (as to cut metal

more than five inches thick) the cross-sectional areas of the preheating mixture passageways must be increased in accordance with the increase in the cross-sectional area of the central oxygen passageway. This is because of the difference in the characteristics of the two gases, it being necessary, where acetylene is used, that the preheating flame should be kept small in size, or concentrated, in order to prevent slagging, because of the higher temperature of the acetylene preheating flame than that of the hydrogen preheating flame.

Having thus described my invention, what I claim is:—

1. In a blowpipe of the character described, the combination of a head, a tip associated therewith, there being a mixing chamber within said tip from which passageways extend to the discharge end of the tip for conducting a preheating mixture to said end, means for conducting a combustible gas to said chamber, and means for conducting oxygen into said chamber, there being an independent central passageway through the tip through which oxygen under pressure may be conducted to the discharge end of the tip for the purpose of cutting.

2. In a device of the character described, the combination of a head, a tip detachably connected with said head, said tip being provided with a mixing chamber intermediate its ends, and said head having a passageway for combustible gas communicating with said chamber and a second passageway through which oxygen may be admitted to said chamber and mix with the combustible gas, said tip being provided with a centrally arranged bore for oxygen and said head being provided with a passageway through which oxygen may be supplied to said central bore.

3. In a device of the character described, the combination of a head, said head having a passageway for combustible gas and two passageways for oxygen therewithin, a tip within said head, said tip being provided with a mixing chamber with which the passageway for combustible gas communicates and with passageways leading from the mixing chamber to the discharge end of the tip, there being a passageway provided in said tip whereby oxygen may be conducted to the mixing chamber from one of the oxygen passageways in said head, and said tip being provided with a central passageway through which oxygen from the other oxygen passageway in the head may be conducted for purposes of cutting.

4. The combination, with a head having an interiorly threaded bore, of a tip having a mixing chamber intermediate the ends thereof and provided with an exterior thread whereby it may be detachably connected to said bore, said tip having a plurality of passageways for a mixture of oxygen and a combustible gas, said passageways extending from the mixing chamber and said head having passageways for conducting combustible gas and oxygen to the chamber, said tip having a central passageway for oxygen under pressure and said head having a passageway through which cutting oxygen may be supplied to said central passageway.

5. In a device of the character described, the combination, with a head having three passageways therein and an internally threaded bore with which said passageways may communicate, of a tip comprising an inner body provided with an externally threaded portion which is adapted to engage the thread on the interior of the said bore, said body being reduced intermediate its ends, an external sleeve surrounding the lower and unthreaded portion of the tip body and forming with such reduced portion a chamber, said sleeve having a plurality of openings therethrough located within an annular space in the head with which one of the head passageways communicates, there being passageways extending from said chamber to the discharge end of the tip, there being a passageway through the threaded portion of the tip body through which oxygen may be supplied from another passageway in the head to the aforesaid chamber and such tip being provided with a central bore for oxygen adapted to communicate with the third passageway in the head.

6. The combination, with a head having an internally threaded bore extending upwardly from the bottom end thereof and having a tapered seat at the upper end of said bore, said head having a passageway adapted to communicate with the tapered seating portion of the bore and provided with vertically spaced passageways below the first mentioned passageway, of a tip comprising an inner body having near its upper end an externally threaded enlargement whereby the tip may be secured within the bore of the head, said body having a reduced portion below said threaded enlargement and provided with a central bore and with a passageway at one side of said bore and extending through said enlargement, said tip including an outer sleeve member surrounding the lower portion of the inner body member and covering the reduced portion of such inner member, said sleeve being provided with openings adapted to communicate with such reduced portion, there being passageways extending from the chamber thus formed within the sleeve to the discharge end of the tip, said inner member also having a portion adapted to seat against the tapered seat provided at the upper end of the bore in the head and

provided with a central bore adapted to register with the central bore of said body and with the first mentioned passageway in the head, means for supplying combustible gas through one of the passageways in the head to the chamber formed within the sleeve, means for supplying to another passageway in the head oxygen which enters said chamber through the passageway in the enlarged portion of the tip, and means for supplying oxygen through the first passageway in the head and through the central bore of the tip.

7. The combination, with a head having a passageway for combustible gas and two passageways for oxygen, of a tip within such head having a mixing chamber adapted to receive combustible gas from the first passageway in said head and oxygen from one of the oxygen passageways in said head and to conduct the same to the tip for the purpose of providing a preheating flame, said tip having a central bore for conducting oxygen from the second oxygen passageway in the head to the discharge end thereof for the purpose of cutting.

8. The combination, with a head having a passageway for combustible gas and two passageways for oxygen, of a tip within such head and having a mixing chamber adapted to receive the combustible gas from the first passageway and the oxygen from one of the oxygen passageways and conduct the same to the discharge end of the tip thereby to produce a preheating flame, said tip having a central bore for conducting oxygen from the third passageway to the discharge end of the tip thereby to produce a cutting action.

9. The combination, with a head having therein a passageway for combustible gas and a pair of passageways for oxygen, of a tip connected with such head, said tip having a mixing chamber intermediate of the ends thereof, means for supplying combustible gas from the appropriate passageway in the head to said mixing chamber, means for injecting oxygen under low pressure from one of the oxygen passageways into said chamber, there being passageways extending from such chamber to the discharge end of the tip, said tip having a central bore, and means for conducting oxygen under higher pressure for cutting purposes from the other oxygen passageway of the head through such central bore.

10. A tip for the purpose described having a central passageway of substantially the diameter of a No. 53-gage drill and having passageways surrounding the central passageway extending to the discharge end of the tip, the last mentioned passageways being substantially square in section and not materially in excess of 40/1000th inch deep and wide and converging toward the discharge end of the central bore or passageway.

11. As a new article of manufacture a tip for blow pipes having a central bore or passageway of substantially the diameter of a No. 53 gage drill, and also having surrounding the central passageway extending to the discharge end thereof a plurality of substantially square passageways, each passageway being in width and depth about 24/1000th inch and converging toward the discharge end of the central bore or passageway.

12. A tip of the character described comprising an inner body or plug of brass having passageways therein for preheating and cutting gases, of a copper sleeve surrounding the lower or discharge end of the said inner body and extending into the head, and means including a flexible joint for securing the said sleeve within the head.

13. The combination, with an inner tip member comprising a body having a central bore or passageway therethrough, said body being of brass, of a copper sleeve surrounding the lower portion of said inner body, there being passageways formed in the inner body and covered by said sleeve and extending to the discharge end of said body and extending into the head, and means including a flexible joint for securing the said sleeve within the head.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JOHN HARRIS.

Witnesses:
CHAS. E. BROCK,
HUGH B. MCGILL.