

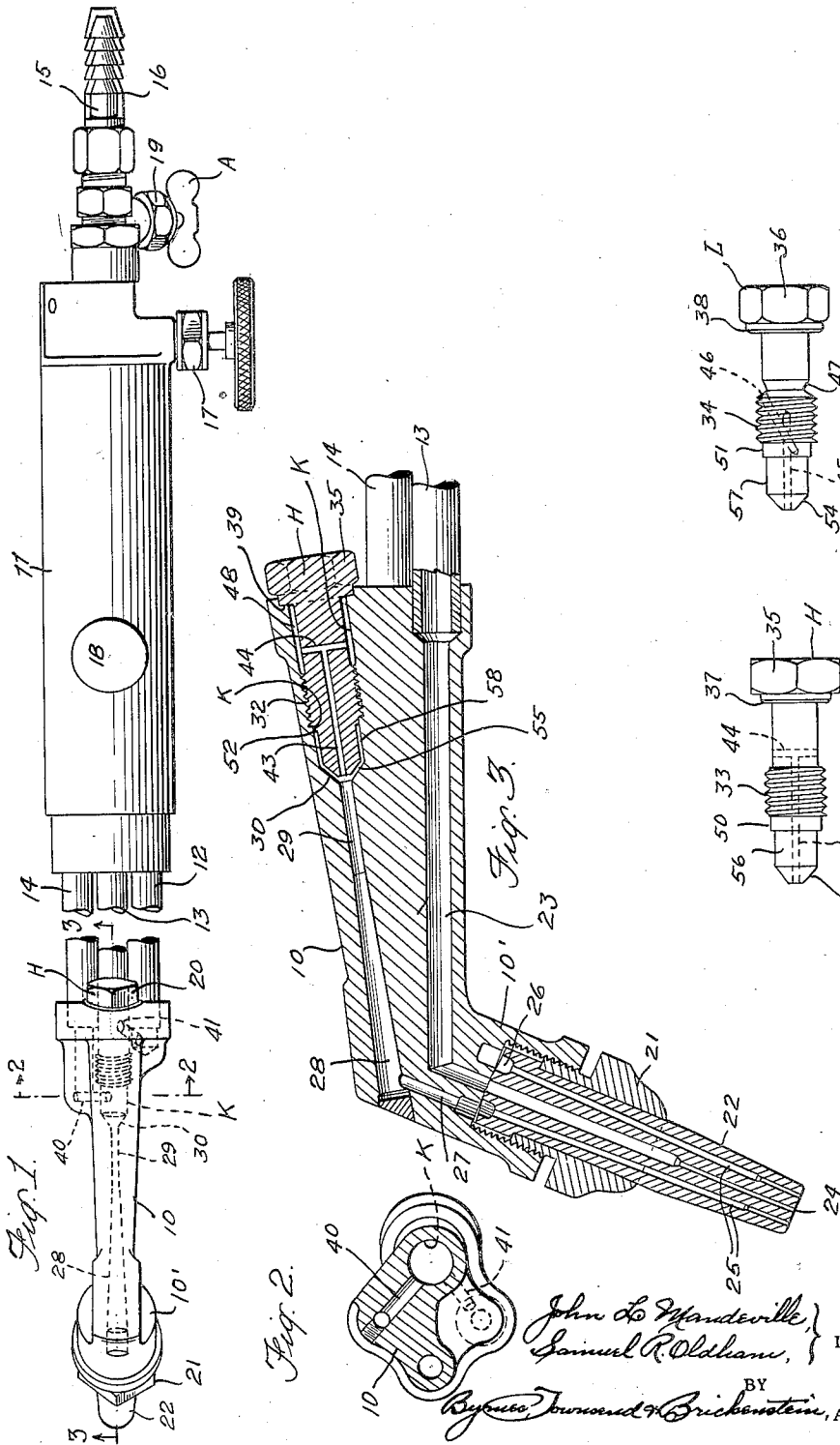
Feb. 23, 1932.

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1,846,742

METAL WORKING BLOWPIPE

Filed Sept. 22, 1928



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UNITED STATES PATENT OFFICE

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METAL WORKING BLOWPIPE

Application filed September 22, 1928. Serial No. 307,609.

This invention relates to metal working blowpipes, and more particularly to an improved blowpipe adapted to utilize oxygen under pressure with either high or low pressure fuel gas to produce a heating flame; and to a blowpipe construction whereby back firing or burning of the gases within the blowpipe is checked or quickly extinguished to prevent the continuous burning of the gases within the blowpipe passages. Although the improvements are herein disclosed as applied to one form of metal cutting blowpipe, it is to be understood that the principles of the invention may be incorporated in other types of cutting blowpipes and in metal welding blowpipes.

The flames of metal working blowpipes have given considerable trouble heretofore by traveling back along the gas stream and burning inside the blowpipes. The momentary recession of the flame into the combustible mixture passage is known as a backfire and this phenomenon is usually accompanied by a sharp explosion. If the flame continues to burn within the combustible gas mixture passages this phenomenon is known as a flashback. When a flashback occurs it is necessary to stop the metal working operation and close one of the gas regulating valves of the blowpipe to extinguish the flame, and then re-light the gas and readjust the flame before the operation can be resumed. During this time the work being operated upon has cooled to such an extent that considerable time and material is spent in reheating it and resuming operation.

Blowpipes may be constructed so they will not flashback when used with fuel gas at a certain pressure, but when so constructed they will flashback when the pressure of the fuel gas is increased or decreased to any great extent. This inability of blowpipes to adapt themselves to various pressures of fuel gas has required users to have certain blowpipes for low pressure fuel gas and other blowpipes for a higher or medium pressure fuel gas. This is an expensive duplication of equipment.

Therefore, one of the objects of this invention is to provide a metal working blowpipe

that may be adapted to utilize either medium or low pressure fuel gas with oxygen. Another object of this invention is to provide a blowpipe that will not flashback under normal working conditions when used with either medium or low pressure fuel gas and oxygen. Another object is to provide a blowpipe that will automatically extinguish a backfiring flame and thus prevent the occurrence of a flashback, when used with either medium or low pressure fuel gas. Other aims and objects will be apparent from the description and illustration.

A preferred embodiment of this invention whereby these objects are attained is illustrated in the accompanying drawings, in which:

Fig. 1 is a top view of a metal cutting blowpipe embodying this invention, certain passages being shown in dotted lines;

Fig. 2 is a transverse section of the same along the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal section of the same along the line 3—3 of Fig. 1; and

Figs. 4 and 5 are side views of nozzles adapted to be interchangeably coupled to the blowpipe head shown in Figs. 1 and 3.

The blowpipe shown in the drawings comprises a head fitting 10 and a handle body 11 joined by three gas conducting pipes or tubes 12, 13 and 14. Attached to the rear end of the body 11 is a nipple 15 having an outer end adapted for coupling to a flexible rubber hose used to convey oxygen to the blowpipe from a container such as a standard tank or cylinder of compressed oxygen. Attached to the rear end of the body 11 there is also a nipple 16 having an outer end adapted for coupling to a flexible rubber hose used to convey a fuel gas such as acetylene to the blowpipe from an acetylene generator or a container such as a commercial tank or cylinder of compressed acetylene.

The oxygen inlet nipple 15 is connected by suitable conduits inside the body of the blowpipe to the connecting pipes 12 and 13. A valve 17 located at the rear of the body 11 is adapted for controlling the volume of oxygen entering the connecting pipe 12, and a valve located within the body 11 and oper-

able by means of the button 18 is adapted for controlling the volume of cutting oxygen entering the connecting pipe 13. The acetylene inlet nipple 16 is connected to the connecting pipe 14 by means of suitable conduits within the handle body 11 and a valve 19 located at the rear of the body 11 is adapted for controlling the volume of acetylene entering the pipe 14 from the inlet nipple 16.

A suitable cutting blowpipe tip 22, which may be one of a series of different sized but similar and interchangeable tips, may be removably secured by a coupling nut 21 to an angular extension 10' of the head 10. A gas passage 23 extending longitudinally through the lower part of the head 10 conducts cutting oxygen from the pipe 13 to a passage 24 extending centrally through the tip 22. This tip has a number of heating mixture passages 25 extending therethrough which have their inner ends opening into an annular distributing chamber 26 that communicates through a passage 27 with the larger end of a flaring expansion and mixing chamber 28. The smaller end of the chamber 28 communicates with a cylindrical throat 29, the inlet of which opens into the apex of the tapering bottom portion 30 of a cavity K. The chamber 28, throat 29, and cavity K are desirably in axial alinement lengthwise of the blowpipe and in the upper part of the head fitting 10, and their axis may be in the same plane with but above and inclined to the axis of the passage 23. As previously stated, the single blowpipe here shown is so constructed that a simple interchangement of parts will adapt it to deliver the proper heating mixture of fuel gas and oxygen, either when changing from a low pressure fuel gas supply to medium or higher pressure fuel gas, or vice versa. The mixer nozzle H of Fig. 4 and the injector nozzle L of Fig. 5 are examples of nozzles which may be used to this end. Each of these nozzles is preferably of one-piece or unitary construction; they are interchangeable in the cavity K; and are readily insertable or removable through the open rear end of the cavity without disturbing any other parts, the nozzle H being inserted when medium or higher pressure fuel gas is utilized and the nozzle L in case low pressure fuel gas is employed. The cavity K has threads 32 between its ends to fit the correspondingly threaded portions 33, 34 of the nozzles H and L. Each nozzle may have a hexagonal head 35, 36 on its rear outer end that is readily accessible for tightening and loosening the nozzle; and a chamfered enlargement 37, 38 at the inner side of each nozzle head seats in a recess 39 at the mouth of the cavity K to seal the latter against gas leakage.

The fuel gas, such as acetylene, is delivered to the cavity K by an upwardly extending gas passage 40 which communicates with

the acetylene supply pipe 14 and opens into the cavity in front of the threads 32; and oxygen is delivered to the cavity by an upwardly extending gas passage 41 which communicates with the oxygen supply pipe 12 and opens into the cavity behind the threads 32.

The interchangeable nozzles are provided with suitable passages for delivering oxygen axially into the entrance of the throat 29. The mixer nozzle H, shown in section in the cavity K and in elevation in Fig. 4, has an axial oxygen passage 43 extending from its front end to a point back of its threaded portion where it communicates with a cross passage 44 extending diametrically through the nozzle. The injector nozzle L, shown in Fig. 5, has an axial passage 45 extending from its front end to an inclined passage 46 which opens into a peripheral groove 47 on the nozzle back of its threaded portion 34. Both nozzles are slightly reduced in section between their threaded portions and the enlargements on the inner sides of their heads, and the cavity K is correspondingly slightly enlarged in section so that an oxygen distributing chamber 48 is provided which establishes communication between the oxygen inlet passage 41 and either the cross passage 44 or the groove 47 and inclined passage 46, depending on whether the nozzle H or the nozzle L is inserted. Since the nozzles are for use with different fuel gas pressures, the axial passage of the nozzle H is preferably of greater cross-sectional area or larger diameter than that of the nozzle L, and in those here illustrated as examples, the diameter of passage 43 of nozzle H is about .073", while that of passage 45 of nozzle L is about .031", the cross passage 44 being about .086" diameter and the inclined passage 46 being about .060" diameter.

Directly in front of the threaded portion of each nozzle there is a shoulder (50 on the nozzle H and 51 on the nozzle L) to cooperate with a seat 52 in the cavity K. The front end of each nozzle has tapered part as at 53 in nozzle H and at 54 in nozzle L, spaced from but corresponding to the tapered bottom 30 of the cavity to leave an annular substantially conical acetylene passage 55 which opens into the entrance of the throat 29. Between their tapered ends 53, 54 and their shoulders 50, 51, the nozzles have cylindrical sections (56 in nozzle H and 57 in nozzle L) of smaller diameter than the opposed wall of the cavity to provide an acetylene or fuel gas distributing chamber 58 which establishes communication between the acetylene inlet passage 40 and the annular conical passage 55.

In order that the correct volume of fuel gas shall be supplied, depending on whether low pressure or higher pressure fuel gas is utilized, it is important that the cross-

tional area or the radial width or thickness of the conical passage 55 shall be smaller when the nozzle H is inserted than when the nozzle L is inserted, which may be accomplished by making the cylindrical section 56 of the nozzle H slightly longer than the cylindrical section 57 of the nozzle L, so that the tapering end of the former will be a trifle closer than the tapering end of the latter to the bottom 30 of the cavity. For example, satisfactory results were obtained in practice where the annular acetylene chamber 58 for both the mixer and the injector nozzles was from about .012" to .016" in radial width, and where the conical passage 55 was between about .010" and .020" in radial width for the mixer nozzle H, and between about .014" and .024" in radial width for the injector nozzle L. The annular passage 58 in each instance is desirably slightly narrower radially than the conical passage. Accordingly, the proper mixture of oxygen and acetylene will be produced when either of the nozzles is secured in place, depending of course upon whether low pressure or higher pressure acetylene is supplied to the blowpipe and the corresponding nozzle is used. The location of the mixing chamber cavity and nozzle on the upper side of the head 10 is advantageous because these parts are thus protected by the head 10 from the heat of the blowpipe flame and the nozzles are also more easily accessible for interchanging them.

By virtue of the improved construction herein described another important advantage is attained, which is that this blowpipe is substantially flashback resistant when either low or higher pressure acetylene is used, and backfires therein are immediately extinguished and the occurrence of flashbacks are prevented in most cases. The head 10 and both nozzles are preferably made of brass, bronze or other good heat-conducting metals. Hence, should a backfire occur, the mass of metal constituting the walls of the conical passage 55 and the annular passage 58; in other words, the mass of metal adjoining the cavity and that comprising the nozzle therein, quickly absorbs the heat of any flame traveling back into said passages, thereby extinguishing it and checking its further passage. The thinness of the said passages, also contribute materially toward checking and extinguishing a backfiring flame because the gas stream passing therethrough is also thin and the heat of combustion is distributed over a large area.

Acetylene or other fuel gas under a pressure of less than one pound per square inch at the inlet 40 of the cavity may be considered to be low pressure fuel gas, a pressure of one-half pound per square inch and less being usually delivered by a low pressure acetylene generator and utilized in low pressure blowpipes. For such fuel gas pressures, the in-

jector nozzle L is secured in the cavity K and provides the proper mixture of acetylene and oxygen for the heating flame. On the other hand, acetylene or other fuel gas under a pressure of more than one pound per square inch at the inlet 40 may be considered to be medium or high pressure fuel gas. For utilizing such medium and high pressure fuel gases, the mixer nozzle H is secured in the cavity K and provides the proper mixture of oxygen and acetylene for the heating flame. The oxygen pressure at the cavity inlet 41 may vary from ten to forty pounds per square inch when the nozzle L is used, the particular oxygen pressure depending on the thickness of metal to be heated and the speed of the operation. When the nozzle H is used the oxygen pressure at the inlet may be about five pounds per square inch.

The operation of a blowpipe embodying this invention will be apparent from the foregoing description, but the operation of the example herein shown may be briefly described as follows: When the nipples 15 and 16 of the blowpipe illustrated by Fig. 1 are connected respectively to suitable oxygen and acetylene supply lines, the acetylene control valve 19 may be opened and the gas issuing from the outer end of the tip 22 may be lighted in the usual manner. The oxygen control valve 17 may then be opened and both the valves 17 and 19 adjusted to produce the desired heating flame at the end of the tip. By depressing the valve control button 18, oxygen may be delivered through tube 13 and passages 23, 24 to produce an oxidizing or cutting jet.

The heating flame is produced by the combustion of the mixture of proper volumes of oxygen and acetylene delivered, respectively, from the nozzle passage 43 and the conical passage 30 into the throat 29 and flaring chamber 28, where the gases are thoroughly blended so the mixture is of uniform composition throughout.

If low pressure acetylene is to be used in the blowpipe shown in Fig. 1, it is merely necessary to remove the nozzle H and substitute the nozzle L therefore. The operation of the blowpipe is then substantially the same as when the nozzle H is used. In both cases the blowpipe is substantially free from the occurrence of flashbacks. When it does backfire, however, the flame will be automatically and quickly extinguished so that it may be relighted immediately.

The construction herein illustrated wherein the nozzles H and L are readily interchangeable and both check or substantially prevent flashbacks, has decided advantages and is therefore a preferred embodiment of the invention. However, various parts may be modified in shape and rearranged without departing from the invention or sacrificing its advantages.

We claim:

1. The combination in a metal working blowpipe adapted for receiving oxygen and acetylene under pressure, of a blowpipe head comprising means adapted for mixing said oxygen and acetylene to form a combustible mixture; means adapted for extinguishing a backfiring flame in said mixture comprising a narrow annular acetylene passage having a cylindrical portion and a conical portion; and means adapted for varying the cross-sectional area of said acetylene passage to adapt said blowpipe for various pressures of said acetylene.
2. The combination in a metal working blowpipe adapted for receiving oxygen and acetylene under pressure, of a blowpipe head comprising mixing means including an oxygen passage adapted for combining said oxygen and acetylene to form a combustible mixture; a tip adapted for burning said mixture; means adapted for extinguishing a backfiring flame in said mixture comprising a narrow annular acetylene passage having a cylindrical portion and a conical portion in front of said cylindrical portion; and means adapted for varying the cross-sectional area of said acetylene passage and said oxygen passage to adapt said blowpipe for various pressures of said acetylene.
3. The combination in a metal working blowpipe adapted for receiving oxygen and low pressure acetylene, of a blowpipe head comprising mixing means including an annular acetylene passage and a central oxygen passage adapted for combining said oxygen and acetylene to form a combustible mixture; and means adapted for decreasing the cross-sectional area of said acetylene passage and increasing the cross-sectional area of said oxygen passage to adapt said blowpipe for higher pressure acetylene.
4. A metal working blowpipe comprising the combination of a head having a mixing chamber extending lengthwise thereof but at an angle to the longitudinal center line of said head; fuel gas and oxygen supply pipes connected to the rear end of said head and parallel to said center line; said head having a cavity in the rear end thereof axially in line with said chamber; passages connecting said cavity with said pipes; and a nozzle removably fitting said cavity, said nozzle having a passage for delivering oxygen from said cavity to said chamber and also having a portion cooperating with the wall of said cavity to provide a passage for delivering fuel gas from said cavity to said chamber.
5. A metal working blowpipe comprising the combination of a head having a mixing chamber extending rearwardly and upwardly from adjacent the front end of said head; fuel gas and oxygen supply pipes connected to the rear end of said head; a cavity in the rear portion of said head above the points

of connection of said pipes; passages extending downwardly from said cavity and communicating with said pipes; and a nozzle removably fitting said cavity and having an end projecting outside said cavity above said pipes where said end is accessible from the upper side of said head for manipulating and removing or inserting said nozzle, said nozzle having a passage therethrough for delivering oxygen from said cavity to said chamber, and also having its inner end cooperating with the wall of said cavity to provide an annular passage for delivering fuel gas from said cavity to said chamber.

6. A metal working blowpipe comprising the combination of a head fitting having a cavity provided with threads intermediate its ends, said cavity also having a tapering bottom; said head having a fuel gas passage and an oxygen passage opening into the side wall of said cavity in front of and behind said threads, respectively; and a nozzle having a threaded portion intermediate its ends interfitting with the threads in the cavity, the part of the nozzle in front of its threads being spaced from the opposed wall of the cavity to provide a fuel gas distributing chamber and a substantially conical discharge passage, the part of the nozzle behind said threads being spaced from the opposed wall of said cavity to provide an oxygen distributing chamber, said nozzle having a passage communicating with said oxygen distributing chamber and having an outlet orifice adjacent the apex of said conical passage, part of said nozzle projecting outside said cavity and head and provided with means whereby it may be turned to secure the nozzle into or remove it from said cavity.

7. A metal working blowpipe comprising the combination of a fitting provided with a cavity having a tapering bottom, said cavity having inlets in the side wall of said cavity for fuel gas and oxygen and also having an outlet at the center of said bottom; and unitary interchangeable nozzles removable from and insertible in said cavity without disturbing other parts of the blowpipe, each nozzle having a tapering portion cooperating with said bottom to provide a restricted substantially conical passage communicating with said outlet and with the fuel gas inlet, each nozzle also having a passage discharging into said outlet and communicating with the oxygen inlet.

8. A metal working blowpipe comprising the combination of a fitting provided with a cavity having inlets for fuel gas and oxygen and an outlet at the center of its bottom; said fitting also having therein a mixing passage and a cutting oxygen passage extending lengthwise of each other; said mixing passage communicating with the outlet of said cavity, said mixing passage and cavity being disposed above said cutting oxygen passage and

inclined thereto and the rear end of said cavity being adjacent the top of the rear end of said fitting; and a nozzle removably secured in said cavity, said nozzle having a passage for delivering oxygen from one of said inlets to said outlet and also having a portion cooperating with a wall of said cavity to provide a passage for delivering fuel gas from the other of said inlets to said outlet.

9. A blowpipe comprising a head having a cavity therein, a body, means for supplying suitable gases to said cavity; and gas mixing means comprising interchangeable nozzles having openings of various sizes therein adapted for being inserted in said cavity to provide openings of various sizes between said nozzles and the wall of said cavity to adapt said blowpipe to various pressures of said gases and to extinguish backfiring flames at such pressures.

10. A blowpipe comprising a body, a head having a cavity therein, means for supplying suitable gases to said cavity; and mixing means comprising interchangeable nozzles having different external dimensions adapted for being inserted in said cavity to provide openings of different sizes between said nozzle and the wall of said cavity to adapt said blowpipe to different pressures of said gases and to extinguish backfiring flames at such pressures.

11. A blowpipe comprising a body, a head having a cavity therein with an internal thread forming a portion of the wall thereof, means for supplying suitable gases to said body, means for conducting said gases from said body to said cavity, and a plurality of nozzles interchangeable in said cavity; each of said nozzles having an oxygen passage therein of a size suitable for a certain oxygen pressure; an unthreaded portion in front of said thread adapted for forming a gas passage between said nozzle and said cavity suitable for a certain gas pressure; an unthreaded portion back of said thread forming an oxygen distributing chamber between said nozzle and said cavity; and an enlarged head outside of said cavity by which said nozzles may be removed and replaced.

12. A metal working blowpipe comprising the combination of a head having a mixing chamber extending lengthwise of but at an angle to the longitudinal center line of the blowpipe, said head comprising a downward extension at its front end disposed at an angle to said center line and having a mixture passage communicating with said mixing chamber; a tip coupled to said extension and having a mixture outlet passage communicating with said mixture passage in the extension; fuel gas and oxygen supply pipes connected to the rear end of said head; said head having a cavity in the rear end thereof axially in line with said mixing chamber; passages in said head establishing communication be-

tween said cavity and said pipes; and a nozzle removably fitting in said cavity, said nozzle having a passage for delivering oxygen from said cavity to said mixing chamber and also having a portion cooperating with the wall of said cavity to provide a passage for delivering fuel gas from said cavity to said mixing chamber.

13. A metal working blowpipe according to claim 12, in which said tip and said head have communicating cutting oxygen passages, the cutting oxygen passage in said head being located below said mixing chamber and said cavity, whereby said mixing chamber and said cavity are protected from the heat produced by said blowpipe and whereby said cavity is readily accessible from the upper side of the blowpipe for the insertion and removal of said nozzle.

In testimony whereof, we affix our signatures.

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