Feb. 23, 1932. J. L. MANDEVILLE 1,846,743

BLOWPIPE

Filed Feb. 26, 1929

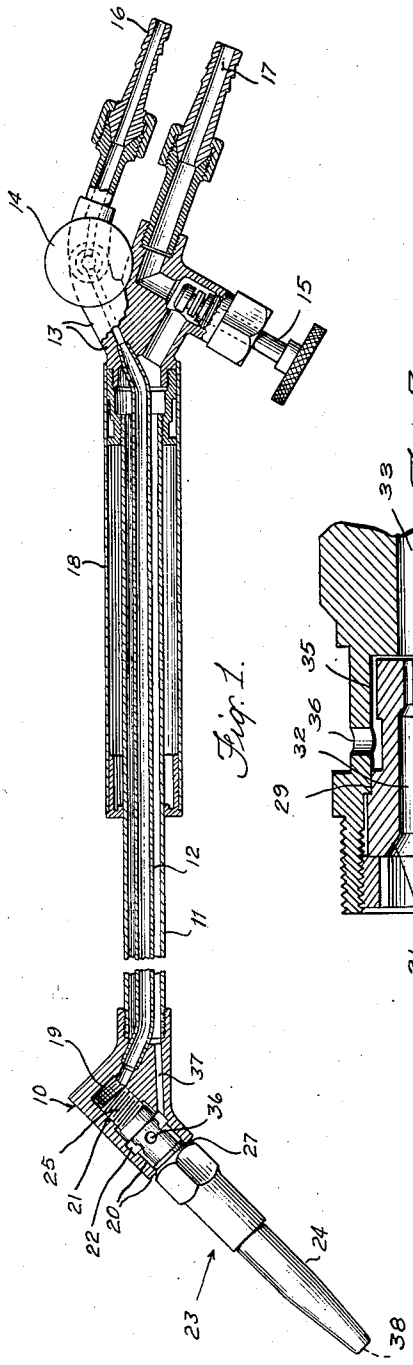

Fig. 1.

Fig. 3.

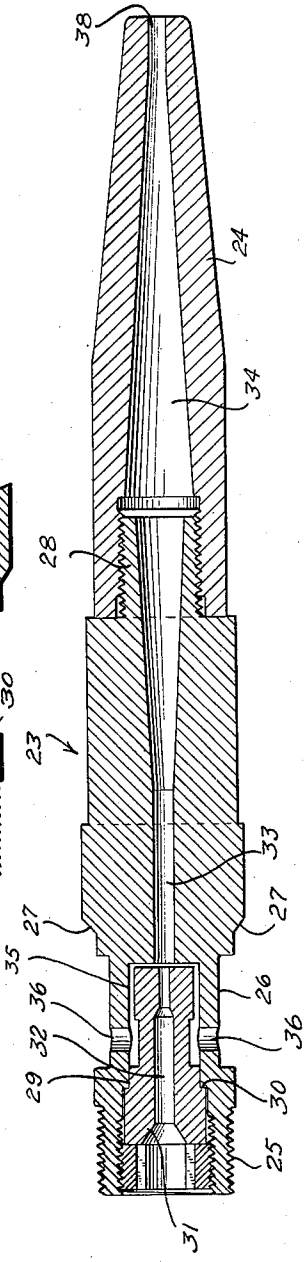

Fig. 2.

John L. Mandeville, INVENTOR,

BY

Byrne, Townsend & Brickenstein, ATTORNEYS.

Patented Feb. 23, 1932 1,846,743

UNITED STATES PATENT OFFICE

JOHN L. MANDEVILLE, OF ARLINGTON, NEW JERSEY, ASSIGNOR TO OXWELD ACETYLENE COMPANY, A CORPORATION OF WEST VIRGINIA

BLOWPIPE

Application filed February 26, 1929. Serial No. 342,789.

This invention pertains to blowpipes and more specifically to a welding blowpipe having a cylindrical injector nozzle with a flat end and a restricted fuel gas passage therearound of such size that a backfire is automatically extinguished and the occurrence of flashbacks is thereby prevented when the blowpipe is used with either medium or low pressure fuel gas; and also a construction wherein the gas mixing injector and the welding tip may be coupled to and removed from the blowpipe as a unit. In this unit the gas mixing passages in the injector are proportioned to the size of the outlet orifice in the tip so that the blowpipe is substantially free from the occurrence of flashbacks.

It is common practice to mix fuel gas and oxygen in a blowpipe by means of an injector having a central oxygen passage joined to a surrounding restricted fuel gas passage. It has been found that an injector having passages suitable for gases at a certain pressure will not work as well when the pressure of either of the gases is altered, and that an injector having passages suitable for a tip with a certain sized orifice will not work as well when the size of the tip orifice is altered. Furthermore, it has been found that an injector having passages suitable for a metal cutting blowpipe may not be suitable for a metal welding blowpipe, and that a very slight change in the size or shape of the injector passages may entirely change the operating characteristic of the blowpipe.

Therefore, one object of this invention is to provide a blowpipe with an injector having a central oxygen passage joined to the flat end of a surrounding gas passage of restricted width that is adapted to automatically extinguish a backfire.

Another object is to provide an injector and tip having properly proportioned gas passages which are combined so that they may be coupled to and removed from the blowpipe as a unit.

Other objects and novel features of the invention will be apparent from the following description and the accompanying drawings, in which

Fig. 1 is a longitudinal sectional view of a blowpipe embodying this invention,

Fig. 2 is an enlarged longitudinal sectional view of a detachable unit comprising the injector and tip, of Fig. 1, and,

Fig. 3 is an enlarged longitudinal sectional view of one end of the unit shown in Fig. 2.

The blowpipe shown in the drawings and embodying this invention may comprise a head 10 of cast metal such as brass that is connected by two metal pipes or tubes 11 and 12 to a rear body casting 13 of similar metal having two valves 14 and 15 therein for respectively controlling the volume of gas flowing through the pipes 12 and 11. Two nipples 16 and 17 may be attached to the rear body casting 13 so that suitable lengths of flexible hose may be attached thereto to connect the blowpipe with the usual sources of gas supply. The nipple 16 should be connected to the source of oxygen supply, and the nipple 17 should be connected to a source supplying fuel gas, such as acetylene. A suitable length of metal tubing 18 may be attached to the rear body casting 13 so it extends forward around the tubes or pipes 11 and 12 and forms a handle by which the blowpipe may be manually held and manipulated.

The head casting 10 may have a recess 19 into which pipes 11 and 12 open and into which the injector may be screwed to couple it and the tip to the head. The recess 19 may have a cylindrical mouth 20, a threaded portion 21 near the bottom, and an internal groove 22 therebetween. The oxygen conducting pipe 12 opens into the side of the threaded portion 21 of the recess 19 near the bottom thereof; and the acetylene conducting pipe 11 opens into the internal groove 22.

The injector 23 may be of brass or similar

metal, generally cylindrical in form, having a reduced portion at one end with an external thread 25 thereon adapted to fit the thread 21 in the recess 19, an external groove 26 therein adapted to communicate with the internal groove 22 when inserted in the recess 19, and terminating in an external shoulder 27 adapted to form a tight joint against the outer end of the mouth 20 of the wall of the recess 19. The other end of the injector 23 may have a reduced threaded portion 28 upon which a threaded recess in the rear of the tip 24 may be screwed to attach the tip 24 to the injector tube 23.

The rear end of the injector 23 may have a cylindrical recess 29 with a threaded mouth, a flat bottom, and an interior intermediate shoulder 30. Within the recess 29 an injector nozzle 31 may be secured by the threads therein so an exterior shoulder rests on the interior shoulder 30 and a cylindrical portion with a flat end is held away from the wall of the recess 29 so a restricted acetylene passage 35 is formed therebetween. An oxygen passage 32 may extend axially through the injector nozzle 31 and join the flat end of the surrounding acetyline passage. From the junction point of the oxygen passage 32 and the acetylene passage 35 a single mixture passage 33 may extend the rest of the way through the injector tube 23 and tip 24 attached thereto. The mixture passage 33 may be enlarged, as at 34, to more thoroughly blend the mixed gases. A plurality of openings 36 in the wall of the recess 29 may connect the rear end of the restricted acetylene passage 35 with the chamber formed by the union of the internal groove 22 and the external groove 26.

When the blowpipe is in operation the oxygen enters through the nipple 16 and flows through a passage in the rear body casting 13, pipe 12, chamber 19, and axial oxygen passage 32 in the injector nozzle 31 where it is joined by a stream of acetylene entering through the nipple 17 and flowing through a passage in the rear body casting 13, pipe 11, passage 37 in the head 10, openings 36 in the injector 23 and restricted acetylene passage 35. The combined gases flow outward through the mixture passage 33 and emerge from the tip 24 through the orifice 38.

An injector such as usually used in a blowpipe for combining the flame producing gases has a nozzle with a conical inner end where the two gas passages meet. While such an injector has been found to work well in metal cutting blowpipes it does not, however, prove effective in preventing flashbacks in a metal welding blowpipe. Nevertheless, it has been found that by making the inner end of the injector plane or flat that its effectiveness in preventing flashbacks is greatly increased.

It has also been found that an injector that works well with a tip having an orifice of a certain size will not work so well when used with a tip having an orifice of a different size and that, therefore, the size of the gas passages in the injector should be proportioned to the size of the orifice in the tip. This has been attained by making the injector so it may be attached to the tip and so both may be coupled to the blowpipe as a unit. Then instead of changing just the tip when a larger or smaller flame is desired, both the injector and the tip are changed. Thus each sized tip may have an associate injector having gas passages of a size that work best with that particular tip orifice. And furthermore, it has been found that for best results the relative size of the gas passages should vary according to the pressure of the flame producing gases. For a tip orifice of a certain size, the gas passages in the injector should usually be made smaller as the gas pressure is increased and larger as it is decreased. Thus the injector and tip of each unit may not only be arranged so they work together but so they also work with flame producing gases having a certain pressure. As a specific illustration, it has been found that for a tip orifice .098 in. in diameter when used with oxygen having a pressure of 21 pounds to the square inch, and acetylene having a pressure equal to that of a water column 10 inches in height; that the central oxygen passage 32 in the injector nozzle 31 should be about .037 in. in diameter; the annular cylindrical portion of the restricted acetylene passage 35 should be about .012 in. wide, and the flat end of this passage should be about .008 in. wide. A blowpipe having such an injector has been found to be substantially flashback resistant and, should a backfire occur it is immediately and automatically extinguished so the blowpipe may be relighted at once without altering the volume adjustment of the flame producing gases.

When making a weld with this blowpipe considerable time is saved over the ordinary blowpipe by the fact that a backfire does not result in a flashback. A backfire is the migration of the welding flame from the tip orifice 38 through the mixture passage 34 to the injector 31. This migration is accompanied by a sharp report. In the ordinary blowpipe this backfire is followed by a flashback or a continued burning of the mixed gases in the mixture passage 34. When this occurs the flame producing gases must be shut off to extinguish the flashback flame and then the blowpipe must be relighted and the welding flame readjusted. In the meantime the weld has cooled so it must be reheated before the operation can continue. This results in a loss of both time and material.

In this blowpipe the size and arrangement of the gas passages are such that a backfire is automatically extinguished when it reaches the injector, and, consequently, the blowpipe may be relighted immediately and the weld-

ing operation continued without loss of either time or material. This desirable operating characteristic is highly important as it saves the frequent loss of time and material resulting from backfiring, and it permits the operator to complete a welding operation without being interrupted or delayed by defective blowpipe performance.

Various changes may be made in the construction and arrangement of the various component parts of this mechanism without departing from the spirit of the invention or sacrificing any of the rights thereof.

I claim:

1. The combination in a welding blowpipe with a body member, of a unit comprising a tip having an orifice and a recessed injector tube adapted to be coupled to and removed from said body; an ejector nozzle in said recess having a cylindrical portion terminating in a plane end; said cylindrical portion being slightly smaller than said recess to provide a narrow restricted fuel gas passage free from chambers inside of the recessed wall; the width of said fuel gas passage being small as compared to the diameter of said orifice the difference being such that a backfire will be automaticaly extinguished.

2. A blowpipe adapted for combining oxygen and acetylene to form a welding flame which comprises an ejector having a cylindrical recess with a flat bottom and an injector nozzle in said recess having lateral cylindrical walls and a flat end said nozzle having an axial oxygen passage through the flattened end portion thereof; said nozzle being slightly smaller than said recess to form an acetylene passage free from chambers therebetween; the width of said passage between the flat end of said nozzle and the bottom of said recess being less than the width of the passage between the cylindrical portion of said nozzle and the cylindrical wall of said recess, and both of said widths being less than the diameter of the nozzle orifice.

3. A blowpipe comprising a head and an injector member, said injector member having an enlarged flat bottomed recess at one end which communicates with a gas supply and a longitudinal passage extending through the member, an inner nozzle member mounted in said recess so as to form a narrow uniform concentric passage surrounding the outer wall of the nozzle and within the inner wall of the recess, said nozzle member having a flattened exterior tip portion which is disposed in parallel relationship to the bottom of said recess so as to form a narrow passage free from chambers which connects peripherally with the concentric passage, said nozzle having a port through the flattened tip which is in alignment with said longitudinal passage.

4. A blowpipe comprising a member having gas supply bores, a tubular head member having free and unrestricted communication with the supply bores, and a demountable injector member having an inner longitudinally bored nozzle with a flattened exterior end portion pierced by the bore, an outer longitudinally bored member having its bore enlarged at one end so as to form a flat bottomed recess, means on said end to mount the outer member in said tubular head so as to cut off direct communication between said gas supply bores and form an oxygen chamber and a gas chamber in said head member, means at one end of the nozzle to mount the nozzle on the inner wall of the recess so as to close the outer end of the recess, the inner end of the nozzle being reduced so as to provide a restricted annular passage between its outer wall and the inner wall of the recess and a uniform communicating passage free from chambers across the flattened end of the nozzle, said outer member having ports forming a communication between the inner annular passage and the gas chamber.

5. A blowpipe comprising a head having a cylindrical recess in unrestricted communication with a fuel-gas supply bore and an oxygen supply bore, a threaded portion in said recess between the entrances of said supply bores, a longitudinally bored injector unit having an enlargement in the bore at one end and an external shoulder intermediate its ends, an externally threaded portion on the end of said unit adapted to engage the threads in the recess to form non-communicating gas chambers therein and to seal the open end of the recess by engagement with said shoulder, an internally threaded portion and a stop member in the enlargement of the bore of said injector unit, a nozzle member having threads on one end adapted to be mounted in said enlargement to close the outer end of said enlargement, said nozzle member having a cylindrical end which is slightly smaller than said enlargement, and a shoulder intermediate the ends of the nozzle adapted to engage the stop member in the enlargement to space the inwardly projecting extremity of the nozzle from the wall of said enlargement.

6. A blowpipe comprising a recessed head connected to gas supply means and having gas supply ports in inner and outer portions of the recess, an injector unit having an enlarged flat bottomed recess in one end and lateral passages extending through its wall into said flat bottomed recessed portion, said injector unit comprising a demountable flat-ended injector nozzle independently secured in its recessed portion, said injector nozzle being disposed to project into said flat bottomed recess and form a concentric passage around the nozzle member with the end in parallel relationship with the bottom of the flat bottomed recess, a reduced portion intermediate the ends of the injector nozzle to form an annular enlargement in said concentric

passage which communicates directly with said lateral passages, means in the recessed portion of the head intermediate said gas supply ports to engage an end portion of the injector unit for demountably attaching the injector unit and forming inner and outer chambers in the recessed head, and means on the injector unit to engage the head and close the outer portion of said outer chamber.

In testimony whereof, I affix my signature.

JOHN L. MANDEVILLE.