

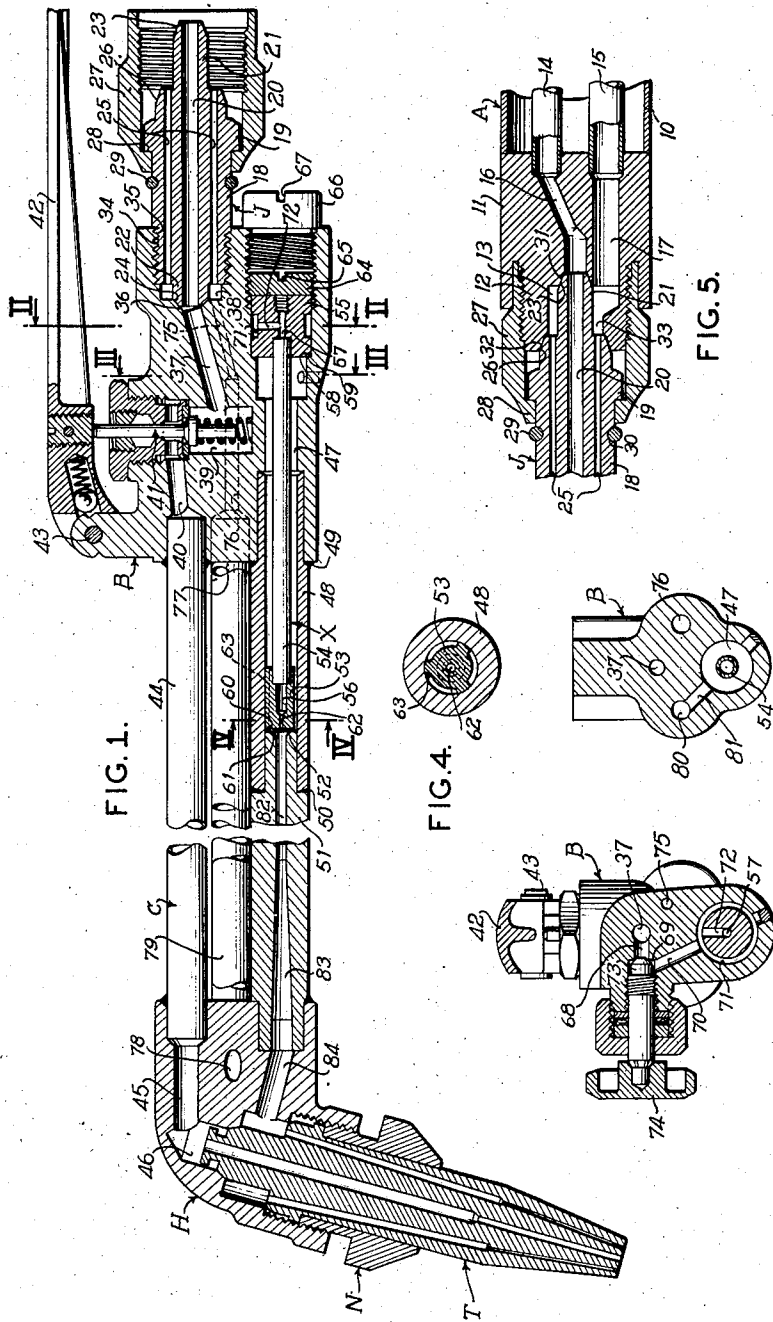
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BLOWPIPE

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BLOWPIPE

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This invention relates to a blowpipe attachment, and more particularly a blowpipe attachment which is adapted to use either low or medium pressure fuel gas. The invention is especially useful as an attachment for existing blowpipes, notably for converting a conventional welding blowpipe into a cutting blowpipe, to which use, however, it is not limited. Some of the features of the invention may be utilized in other types of blowpipes.

Fuel gas (as acetylene) may be available at different places or at different times as low pressure (say less than 1 lb. per square inch) gas or as medium pressure (say 15 lbs. per square inch) gas. As a matter of economy and convenience, therefore, it is desirable for a user to have available a single blowpipe which may be used efficiently with fuel gas at these different pressures. In the past, it has been customary to design blowpipes so that they would not flashback at a given fuel gas pressure. However, increasing or decreasing the pressure to any considerable extent may materially alter the flashback resistance of the blowpipe. For this reason, it has not been possible to use the same blowpipe for low pressure and medium pressure fuel gas, unless mixers or other parts of the blowpipe were changed. Also, when both welding and cutting work is to be carried on in a shop, it is customary to employ separate welding and cutting blowpipes for the respective operations and to keep both blowpipes available in the shop. This practice tends further to multiply the required number of blowpipes and the expense of blowpipe equipment.

One object of the invention is, therefore, to provide a blowpipe which may be used as a cutting attachment and connected to a welding blowpipe, thereby saving the expense of purchasing and maintaining a complete welding blowpipe and also a complete cutting blowpipe for performing the two operations. Another object is to provide a single blowpipe which may be used efficiently over a wide range of fuel gas pressures. A further object is the provision of such a blowpipe which will be substantially free from flashback action over its entire range of operating pressures.

The above and other objects and novel features of the invention will be apparent from the following description taken with the accompanying drawing, in which:

Fig. 1 is a broken longitudinal mid-section through a blowpipe comprising a cutting attachment, constructed in accordance with the invention;

Fig. 2 is a cross-section taken on the line II—II of Fig. 1;

Fig. 3 is a cross-section taken on the line III—III of Fig. 1;

Fig. 4 is a cross-section taken on the line IV—IV of Fig. 1; and

Fig. 5 is a broken longitudinal mid-section showing the connection between the rear end of the attachment and the forward end of a welding blowpipe handle.

In accordance with the invention there is provided a blowpipe comprising a body member, a combustible gas mixture conduit, means providing an elongated cavity terminating at its forward end at the rear end of the mixture conduit, and terminating at its rear end in the body member, and means at the forward end of the blowpipe for discharging a combustible gas mixture. An elongated combustion-supporting gas conduit in the cavity is spaced from the internal cavity wall to provide an elongated annular chamber having an appreciable volume. A mixer nozzle in the cavity is secured to the forward end of the combustion-supporting gas conduit and is so constructed and arranged that backfires will pass into the annular chamber. A generally U-shaped fuel-gas passage having an appreciable volume and being adapted to contain a large volume of fuel gas for receiving and extinguishing backfires, which is disposed between the body member and the forward end of the blowpipe, has a return bend at the front thereof and two terminals at the rear thereof in the body member. A passage in the body member communicates between one of the terminals of the U-shaped passage and the annular chamber. Suitable means are provided for supplying fuel gas and combustion-supporting gas, respectively, to the other terminal of the U-shaped passage and to the combustion-supporting gas conduit. The U-shaped fuel-gas passage and the annular chamber cooperate to contain together a sufficiently large volume of fuel gas to receive and extinguish backfires passing the mixer nozzle, thereby preventing flashbacks.

For convenience, the words "oxygen" and "acetylene" will be used in this specification to denote respectively any appropriate cutting and combustion-supporting gas, and any appropriate fuel gas.

A device constructed in accordance with the invention comprises a body B and a head H connected by conduits generally designated as C. The head H carries the blowpipe tip T at the forward end of the blowpipe which is connected

thereto by an attaching nut N in the usual manner. The body B has gas passages therethrough connecting with the conduits C, and contains the gas control elements of the blowpipe, as the valves and the mixer. In the embodiment which is illustrated in the drawing, the blowpipe is constructed as a cutting attachment, and connecting means J are provided for joining the blowpipe to a welding blowpipe handle A.

The handle A which is illustrated in the drawing (see Fig. 5) is a well-known form of welding blowpipe handle from which the mixer and stem have been removed, and to which the connecting means J may be applied to attach the body B thereto. The handle A comprises the usual hollow shell 10, which is attached at its forward end to a forward block 11. The front end of the forward block 11 is formed as an externally threaded nipple 12 having therein a cavity 13, the nipple and the cavity therein being substantially coaxial with the major axis of the blowpipe handle A. The usual oxygen conduit 14 and the usual acetylene conduit 15 are disposed within the shell 10, and have their forward ends fitted into the forward block 11, where they are secured in any suitable manner, preferably by silver-soldering. A passage 16 in the forward block 11 connects the forward end of the oxygen conduit with the rear center portion of the cavity 13, and a second passage 17 connects the forward end of the acetylene conduit eccentrically with the rear end of the cavity 13.

The connecting means J, by which the body B is connected to the handle A, comprises a nipple 18, having an external annular shoulder 19 formed thereon near its rear end. An axial passage 20 extends through the nipple 18, and is carried rearwardly beyond the rest of the nipple by a projection 21, and is carried forwardly of the rest of the nipple by a projection 22 (see Fig. 1). A conical seat 23 is provided on the nipple at the end of the projection 21, and a conical seat 24 is provided at the end of the projection 22, for a purpose which will later appear. A plurality of longitudinal passages 25 extend through the nipple 18 eccentric to, and in a direction substantially parallel to that of the axial passage 20; and a conical seating surface 26 is provided toward the rear end of the nipple 18 surrounding the ends of the longitudinal passages 25.

A hollow nut 27, having an internal shoulder 28 at its rear end, is formed to fit over the nipple 18 with its internal shoulder in contact with the external shoulder 19 on the nipple. When the hollow nut 27 is in place on the nipple 18 with its shoulder 28 in contact with the shoulder 19 of the nipple, it extends rearwardly beyond the projection 21, thereby protecting the seat 23 thereon. A retaining ring 29 is resiliently held in a groove 30 in the nipple immediately ahead of the hollow nut 27 and maintains the latter in the position which has just been described.

When the hollow nut 27 is screwed upon the externally threaded nipple end 12 of the forward block 11, the conical seats 23 and 24 on the nipple 18 seat in gas-tight contact with corresponding surfaces 31 and 32, respectively, in the cavity 13 of the forward block 11. Thus, the axial passage 20 through the nipple extends in gas-tight continuation of the oxygen passage 16 in the forward block 11; and the plurality of eccentric passages 25 through the nipple extend in continuation of an annular chamber 33 which is formed in the cavity 13 when closed by the nipple 18 with the extension 21 extending therethrough.

The connecting nipple 18 is firmly secured to the body B of the blowpipe by means of external threads 34 on the forward end of the former which may be screwed into an internally threaded recess 35 formed in the body B. When the nipple is thus screwed into place, the forward conical seat 24 thereof, comes tightly against a corresponding seating surface 36 which is formed at the inner end of the recess 35. The seating surface 36 surrounds the end of an oxygen duct 37 which extends forwardly of the recess in the body B. The forward projection 22 on the nipple 18 extends through the recess beyond the rest of the nipple, thus forming with the walls of the recess 35 an annular chamber 38 into which the plurality of eccentric passages 25 lead.

The nipple 18 is preferably made of sturdy construction with heavy tubular walls on the extensions 21 and 22, in order to provide broad seats 23 and 24 thereon. Thus, when the nipple is attached, the seats 23 and 24 come against the corresponding seats 31 and 36 with a definite, sure stop which makes gas-tight assembly certain. Attachment between the nipple and the body B is preferably made permanent. Accordingly, in attaching the nipple 18 to the body B, the threads 34 at the forward end of the nipple and the seat 24 may first be tinned, and the nipple is then sweated into the body B.

It is further preferred to form the body B of pressure-forged metal instead of a casting, in order to attain ample strength with smaller sections and lighter weight of material. Pressure-forged metal does not have the porosity sometimes found to exist in castings. Also, the heat required for silver-soldering and sweating in of parts does not affect a pressure-forging as it does a casting.

The body B has a large oxygen valve chamber 39 therein into which the oxygen duct 37 extends from the forward end of the axial passage 20 in the nipple 18. Any known or convenient high-capacity valve mechanism may be used to control the passage of cutting oxygen through the valve chamber 39 to a discharge duct 40 formed in the body B. The valve mechanism 41 here illustrated is that which is described in our Patent No. 2,213,043 for "Blowpipe," issued August 27, 1940, and is operated by a lever 42 pivoted, as at 43, to the body B, also as described in our aforesaid patent application. Other forms of valve mechanism and other operating means might be employed. A cutting oxygen conduit 44 has one end fitted into the body B at the forward end of the discharge duct 40, and extends to the blowpipe head H, into which its forward end is fitted. A cutting oxygen passage 45 extends forwardly in the head to the rear center portion of the cavity 46 therein in which the tip T is held by the attaching nut N.

The mixer which is employed to form a combustible mixture of acetylene and combustion-supporting oxygen is somewhat similar to that which is described and claimed in Patent 2,198,341 of Wilgot J. Jacobsson, one of the inventors herein, for "Blowpipe," issued April 23, 1940. This mixer is formed by disposing a specially formed mixing assembly in an elongated cavity in the body B, in a manner which will now be explained. A bore 47 extends through the body B, offset from, and substantially parallel to the axis of the recess 35 therein. The cavity thus formed continues forwardly through a tube or large conduit 48 which is gas-tightly connected to the body B, as by silver-soldering at 49. The

large conduit 48 extends forwardly and is silver-soldered, as at 50, or otherwise connected to the rear end of a thick-walled mixture conduit 51 having an annular face 52 at its rear end surrounding the axial passage therethrough. The forward end of the mixture conduit is fitted into the head H.

The mixing assembly X is disposed within the elongated cavity. It comprises a mixing element or mixer nozzle 53, an elongated conduit 54, and a rear block 55, all rigidly connected together in coaxial series alignment and removably disposed in the elongated cavity. A passage 56 extends substantially axially through the mixing element 53, and a passage 57 extends substantially axially through the rear block 55, each passage being a continuation of the passage through the elongated conduit 54. An annular shoulder 58, formed on the rear block 55 adjacent its forward end, contacts an internal shoulder 59 of the bore 47 and thereby limits the axial position of the unitary assembly within the elongated cavity, and also positions the mixing element 53 axially of the elongated cavity. Contact between the annular shoulders 58 and 59 also seals the continuous passage through the mixing assembly from the annular passage or chamber between the elongated conduit 54 and the elongated cavity ahead of the rear block 55 and prevents passage of gas from the elongated cavity on one side of the rear block to the other, except through the passage 57. The rear block 55 is internally threaded in order that an instrument may be inserted therein for withdrawing the unitary assembly from the elongated cavity. An ordinary long machine screw will serve for this purpose.

The mixing element 53 which is illustrated in the drawings is substantially cylindrical in form and its forward end is a plane face 60 transverse to the axis of the element, and preferably stands at substantially right angles to this axis. The length of the mixing assembly is such that when the annular shoulder 58 on the rear block 55 contacts the internal shoulder 59 of the bore 47 the plane face 60 at the forward end of the mixer is closely juxtaposed to, but slightly spaced from, the face 52 at the rear end of the mixture conduit. Thus, a narrow gap 61 is formed between the two faces. The passage 56 through the mixing element 53 is shown as being constricted at its forward end, as at 62, in order to provide a metering orifice and to give increased velocity to the gas passing through the mixing assembly as it issues therefrom. A plurality of widely spaced radial projections 63 around the periphery of the mixing element contact the inner wall of the elongated cavity and space the mixing element therefrom to provide a passage around the mixing element. The gap 61 and the passage along the outside of the mixing element 53 are of sufficient size to permit the passage of backfires. As the diameter of the rear block 55 is so chosen that the block fits exactly within the bore 47, the mixing assembly is thus accurately centered in the elongated cavity.

The bore 47 in the body B is internally threaded at its rear end, and a locking screw 64 may be screwed into the bore to bear upon the rear face of the rear block 55 and thus lock the unitary assembly in place. A kerf 65 in the outer face of the locking screw provides means for turning the latter with an ordinary screw driver. A threaded plug 66 having a kerf 67 in its outer end screws into the internal threads in the bore

47 and closes the end of the bore beyond the locking screw 64.

Combustion-supporting oxygen is carried from the passage 37 to the axial passage through the mixing assembly by means of a duct 68 opening into the passage 37, a valve chamber 69 at the far end of the duct 68, a second duct 70 leading from the valve chamber 69 to an annular groove 71 in the rear block 55, and a radial passage 72 extending from the annular groove 71 through the rear block 55 to the axial passage 57 therein. A valve 73 in the valve chamber 69, operated by a valve wheel 74, controls the passage of combustion-supporting oxygen to the mixing assembly.

Acetylene flows through the eccentric passages 25 in the nipple 18 into the annular chamber 38, whence it passes through a bore 75 in the body B to the rear end of a passage 76 extending forwardly through the body B. One of the conduits 77 of the group generally designated as C has its rear end terminating at and fitted into the body B at the forward end of the passage 76. The conduit 77 is connected at its forward end to the head H where a cross bore or header 78 connects its forward end to the end of a second conduit 79 which extends substantially parallel to the conduit 77 and has its rear end terminating at and fitted into the body B. The conduits 77 and 79 and the header 78 thus provide a generally U-shaped passage, disposed between the body member B and the forward end of the blowpipe, having a return bend at the front and having two terminals at the rear in the body member. A passage 80 in the body B extends substantially parallel to the passage 76 from the rear end of the conduit 79 and is intersected by a cross passage 81 which opens into the bore 47 ahead of the rear block 55. Thus, acetylene from the conduit 15 in the handle A flows forwardly through the passage 17 in the head block 11 to the annular chamber 38. Thence, the acetylene continues forwardly through the eccentric passages 25 in the nipple 18 till it reaches the annular chamber 38. From this point, the acetylene passes forwardly through the bore 75, into the passage 76, thence through the conduit 77 to the head H, through the cross passage 78 in the head, back through the conduit 79 to the body B, and thence through the passage 80 and the cross passage 81 to the bore 47 in the body B.

It will be evident that oxygen passing centrally through the mixing assembly issues from the passage 56, crosses the narrow gap 61 and enters the mixing throat 82, forming the first section of the mixture conduit 51, at a high velocity. The oxygen thus issuing from the passage 56 and entering the mixing throat 82 at a high velocity creates a vacuum in the narrow gap 61. This vacuum causes the acetylene to flow forwardly through the elongated annular chamber around the conduit 54 and along the outside of the mixing element 53 to the narrow gap 61 where it moves inwardly at increasing velocity until it meets the stream of oxygen on all sides thereof and at right angles thereto. The two gases thereupon mix as they enter the mixing throat 82. From the mixing throat, the mixed gases pass into the second section of the mixture conduit 51, namely, an expansion passage 83 where the velocity of the mixed gases is reduced. Thence the mixed gases pass through a passage 84 in the head H to a portion of the cavity 46 therein, whence they enter the usual combustible mixture passages in the tip T in conventional

manner and are discharged from the blowpipe. The two gases thus increase their velocity immediately before they come in contact with one another, and meet at right angles to each other.

The mixing action of the two gases is essentially independent of the acetylene pressure, as, if the acetylene pressure is high, for instance, the needle valve controlling the flow of acetylene may be manipulated to throttle this flow and thereby maintain a fixed vacuum at the gap 61 regardless of the acetylene pressure. The value of the vacuum may be so chosen that the aspiration action of the oxygen on the acetylene will insure the correct gas mixture for the particular nozzle or tip T being used.

Should a backfire occur, it will first enter the mixture conduit 51, which is formed of a metal having high heat conductivity and which has exceedingly thick walls. The mixture conduit will therefore extract and dissipate much of the backfire heat quite rapidly. The danger that this part may be damaged or burnt out is accordingly minimized. Next, the backfire must pass through a metering constriction in either gas line, such as the metering constriction 62 in the oxygen line, or the metering constriction provided by the gap 61 or the space surrounding the mixing element in the acetylene line. The cushioning effect of the large volumes of gas in each supply line back of the mixing element tends to drive the backfire forwardly of the blowpipe again. Should a backfire pass either metering constriction, it would be smothered in the large passage behind that constriction without continuing to burn and become a flashback. Usually, because of the relatively low pressure of the acetylene as compared with that of the oxygen, the major portion of the backfiring gases passes along the outside of the mixer nozzle 53, which is spaced from the internal wall of the cavity and from the rear end of the mixture conduit 51 to provide a passage of sufficient size to permit the passage of backfires. This portion of the backfire then is extinguished in the large volume of acetylene contained in the annular chamber surrounding the combustion-supporting gas conduit 54 and in the U-shaped passage formed by the conduits 77 and 79 and the header 78. By the described construction, therefore, a highly flashback-resistant blowpipe has been provided in which the distance between the rear body member and the forward end of the blowpipe is maintained unusually short, so that the blowpipe may be attached to an ordinary welding blowpipe handle without producing a long and unwieldy assembly.

The large volume of acetylene contained in the space between the elongated conduit 54 and the inner wall of the elongated cavity which surrounds it, and, back of that, in the U-shaped passage having terminals in the body formed by conduits 77 and 79, also assures a steady even flow of acetylene radially inward of the gap 61 regardless of considerable changes in acetylene pressure. Since the mixing action of the mixing element herein described is not dependent upon pressure, the blowpipe may be employed efficiently over wide ranges of fuel gas pressure.

The form of the invention here described and illustrated in the accompanying drawing is disclosed merely to indicate how the invention may be applied. Other forms differing in detail but not in principle from that here shown and described, will, of course, suggest themselves to those skilled in the art.

We claim:

1. A blowpipe comprising, in combination, a body member; a combustible gas mixture conduit; means providing a cavity terminating at its rear end in said body member, and terminating at its forward end at the rear end of said mixture conduit; means at the forward end of said blowpipe for discharging a combustible gas mixture; a mixer nozzle in said cavity, the external wall of said mixer nozzle being spaced from the internal wall of said cavity and from the rear end of said mixture conduit to provide along the outside of said mixer nozzle a passage of sufficient size to permit the passage of backfires; means providing a generally U-shaped fuel-gas passage having an appreciable volume disposed between said body member and the forward end of said blowpipe, said fuel-gas passage having a return bend at the front thereof and having two terminals at the rear thereof in said body member, said fuel-gas passage being adapted to contain a large volume of fuel gas for receiving and extinguishing backfires, thereby preventing flashbacks; means providing a passage communicating between one of said terminals and the passage along the outside of said mixer nozzle; means for supplying fuel gas to the other of said terminals; and means for supplying combustion-supporting gas to said mixer nozzle.

2. A blowpipe comprising, in combination, a body member; a combustible gas mixture conduit; means providing an elongated cavity terminating at its forward end at the rear end of said mixture conduit, and terminating at its rear end in said body member; means at the forward end of said blowpipe for discharging a combustible gas mixture; an elongated combustion-supporting gas conduit in said cavity spaced from the internal wall thereof to provide an elongated annular chamber having an appreciable volume; a mixer nozzle in said cavity secured to the forward end of said combustion-supporting gas conduit, said mixer nozzle being so constructed and arranged that backfires will pass into said annular chamber; means providing a generally U-shaped fuel-gas passage having an appreciable volume disposed between said body member and the forward end of said blowpipe, said fuel-gas passage having a return bend at the front thereof and having two terminals at the rear thereof in said body member; means providing a passage in said body member communicating between one of said terminals and said annular chamber; means for supplying fuel-gas to the other of said terminals; and means for supplying combustion-supporting gas to said combustion-supporting gas conduit; said U-shaped fuel-gas passage and said annular chamber cooperating to contain together a sufficiently large volume of fuel gas to receive and extinguish backfires passing said mixer nozzle, thereby preventing flashbacks.

3. A blowpipe comprising, in combination, a combustible gas mixture conduit; a head member at the forward end of said mixture conduit; a body member; means providing an elongated cavity terminating at its forward end at the rear end of said mixture conduit, and terminating at its rear end in said body member; an elongated combustion-supporting gas conduit in said cavity spaced from the internal wall thereof to provide an elongated annular chamber having an appreciable volume; a mixer nozzle in said cavity secured to the forward end of said combustion-supporting gas conduit, said mixer nozzle being so constructed and arranged that backfires will pass into said annular chamber; means providing

a generally U-shaped fuel-gas passage having an appreciable volume comprising a header in said head member, and two conduits, each conduit being in communication at its forward end with said header and terminating at its rear end in said body member; means providing a passage in said body member communicating between one of said last-named conduits and said annular chamber; means for supplying fuel gas to the other of said last-named conduits; and means for sup-

plying combustion-supporting gas to said combustion-supporting gas conduit; said U-shaped fuel-gas passage and said annular chamber cooperating to contain together a sufficiently large volume of fuel gas to receive and extinguish backfires passing said mixer nozzle, thereby preventing flashbacks.

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