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BLOWPIPE

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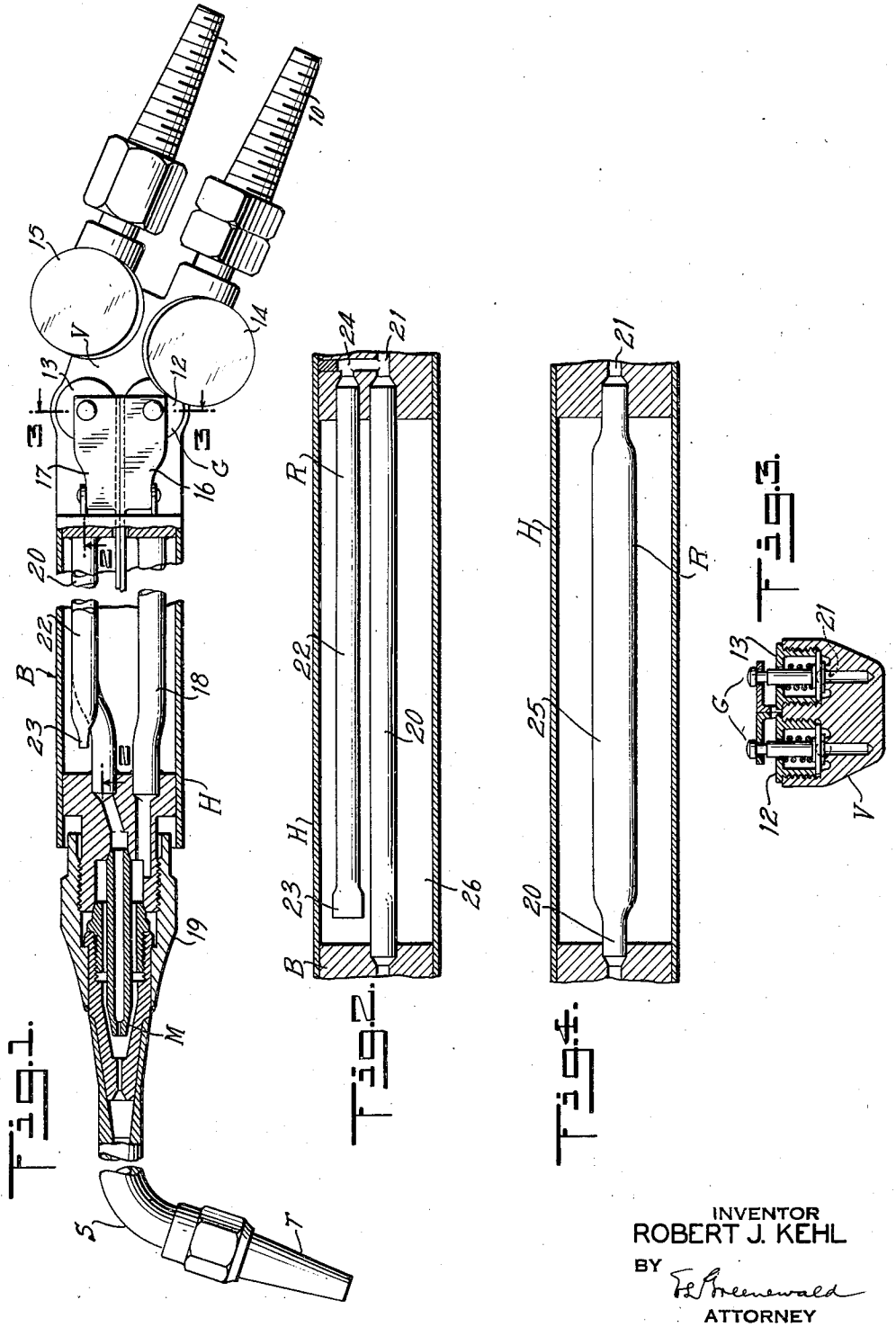

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

INVENTOR
ROBERT J. KEHL
BY F. E. Greenewald
ATTORNEY

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BLOWPIPE

Robert J. Kehl, Manhasset, N. Y., assignor to Oxweld Acetylene Company, a corporation of West Virginia

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This invention relates to blowpipes such as those used for welding and cutting metals, and more particularly to means for eliminating backfiring within the blowpipe when the gas supply is shut off.

Blowpipes frequently are provided with two pairs of valves, the main pair being used to carefully adjust the mixture of oxygen and acetylene to the desired proportions, and an auxiliary pair of valves being employed to quickly turn on and shut off the flow of gas without disturbing the mixture proportions. Accordingly, the main or mixture-controlling valves when once adjusted may be left untouched during an entire working day, while the flow of gas mixture may be controlled by operation of the auxiliary or gas-saver valves which are quickly and conveniently operated at the beginning and end of each heating operation. A blowpipe having such main mixture valves and auxiliary or gas-saver valves is disclosed in my Patent 2,191,078, dated February 20, 1940.

It has been found that when the gas-saver valves are operated simultaneously to shut off the flow of combustible mixture to the tip, popping or backfiring may result as soon as the forward velocity of the gases falls below the backward flame propagation rate, producing a small explosion that deposits soot within the blowpipe stem, and which is otherwise annoying to the operator. The explosion hazard may be substantially eliminated by rapidly expelling the residual gas mixture immediately after the supply of gas is shut off. As described in the said Patent No. 2,191,078, this result may be effected by causing the gas-saver valves to operate in sequence, for example, by so releasing the gas-saver valve lever, that it closes off the supply of acetylene at a moment before shutting off the oxygen. The momentary continued flow of oxygen is effective to maintain the exit velocity of the mixture at the tip sufficiently high to prevent backward flame propagation, while diluting the combustible mixture so that at the time the velocity of gases within the blowpipe diminishes to below the backward flame propagation rate, no tendency for popping exists.

Frequently the respective gas-saver valves are operated in such rapid succession that insufficient time remains for one gas to evacuate the other, and a tendency toward backfiring persists. Devices, such as dash-pots, and the like, have been proposed to delay the operation of one valve and thus insure substantially complete evacuation of the residual mixture by one of the gases. Such devices are relatively elaborate and expensive and may require maintenance and repair.

According to the present invention, simplified means is provided for evacuating the residual mixture immediately upon closing of the gas-saver valves. The simplified means produces an effect similar to that obtained by retarding the operation of the second valve. By proper design, the improved means may be employed to evacuate the residual gas mixture even though the gas-saver valves are operated simultaneously rather than in sequence. The invention requires no moving parts and no complicated structure such as would require adjustment or repair.

Accordingly, the principal objects of the present invention are: to provide an improved blowpipe having quick-acting gas-saver valves and improved means for eliminating the tendency for the gases to backfire when the gas-saver valves are closed; to provide, in a blowpipe having sequentially operated gas-saver valves, means for assisting the evacuation of the residual gas mixture when the valves are shut off; and to provide means having no moving parts, adapted to operate in conjunction with quick-acting gas-saver valves to assist in evacuating the residual gas mixture. These and other objects and the novel features will appear from the present specification and the accompanying drawing, disclosing one embodiment of the present invention. In the drawing—

Fig. 1 is a side elevational view of a welding blowpipe with portions of the handle broken away to disclose the internal structure;

Fig. 2 is a longitudinal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1; and

Fig. 4 is a longitudinal sectional view of a slightly modified construction.

The invention is herein disclosed in conjunction with a welding blowpipe for purposes of illustration although the principles may be applied equally well for evacuating the residual preheating mixture from the passages of a cutting or similar blowpipe. As shown in Fig. 1, the invention is adapted for use with a blowpipe B having a tubular handle portion H, through which gases flow from a rear valve block V to a blowpipe stem S at the forward end of the blowpipe. The flow of fuel gas and combustion-supporting gas, hereinafter referred to as acetylene and oxygen respectively, is controlled by a pair of quick-acting gas-saver valves G. The valves G are locat-

ed in the gas conduits through which the gases flow and are constructed so as to close automatically and may be opened manually by depressing a lever. A reservoir R is located in one of the conduits, preferably in the oxygen conduit, at a point between the gas-saver valves and a mixer M to serve as a fluid cushion for assisting in the discharge of residual gases when the gas supply is suddenly shut off by the gas-saver valves G.

The blowpipe B is provided with inlet nipples 10 and 11 for connection with sources of acetylene and oxygen respectively. The gases enter the valve block V where the correct proportions of the respective gases are initially adjusted, as by means of a pair of main mixture-controlling valves 14 and 15. The flow of gas may be additionally controlled, that is, completely turned on or shut off, by a pair of auxiliary valves G comprising manually openable and automatically closing acetylene and oxygen valves 12 and 13, respectively. The valves G are normally resiliently held in closed position but may be opened either concurrently or in sequential order by a pair of manually depressible levers 16 and 17 which engage the stems of the respective valves and extend forwardly adjacent to the handle H for convenient manipulation by the operator. Further details of construction of the valves G and their operating levers are fully disclosed in my Patent 2,191,078, dated February 20, 1940. An acetylene conduit 18 and an oxygen conduit 20 deliver the respective gases from the discharge end of the valves G to the mixer M from whence the gas mixture may pass through the stem S to a burner tip T. The stem S is secured to the handle H by means of a conventional coupling nut 19.

An unventilated reservoir or large-capacity chamber R communicates with the oxygen passage at a point between the discharge port of the oxygen valve 13 and the mixer M. As shown in Fig. 2, the reservoir R may comprise a branch tube 22 sealed at one end 23, as by flattening and soldering. The opposite end of the branch tube 22 connects with an inlet passage 24 which communicates with the discharge duct 21 of the oxygen valve 13. The reservoir R is disclosed in Fig. 2 as an additional dead-end tube inserted in the handle and having relatively small dimensions to leave sufficient space for the levers 16 and 17. If space is not a critical factor, as for example, when the gas-saver valve lever or levers are located externally of the handle, the reservoir R may comprise a suitable enlarged zone 25 of the oxygen conduit 20, as shown in Fig. 4. Otherwise, if a chamber 26 (Fig. 2) may be formed and hermetically sealed within the handle H, it may serve as an enlarged reservoir in place of the tube 22, connection being made with the oxygen conduit 21 through the inlet passage 24.

The functioning of the improved means will become obvious from the following description of the operation of the blowpipe. With the inlet nipples 10 and 11 suitably connected to the respective sources of gas supply, the levers 16 and 17 are manipulated so as to open the valves G, and the mixture-control valves 14 and 15 are adjusted to deliver the desired mixture, as evidenced by the appearance of the flame issuing from the tip T. At the completion of a heating operation, the operator releases the levers 16 and 17 so as to shut off the supply of gases abruptly without disturbing the mixture adjustment. Even though the respective gas-saver valves 12 and 13 operate successively, the delayed operation of, for example, the oxygen valve 13, may not be sufficient to completely evacuate the residual combustible mixture from the stem S by the time the supply of oxygen is shut off. The reservoir R contains a predetermined quantity of oxygen at substantially operating pressure, for example, from 15 to 30 pounds per square inch, which oxygen communicates with the atmosphere only through the tip T. As soon as the supply of gas to the reservoir is shut off by the operation of the gas-saver valve, the compressed gas within the oxygen reservoir, including the conduit 20, flows toward the outlet in the tip T, which outlet forms the only exit passage from the unventilated chamber or reservoir R and the gas conduits. The flow initially progresses at high speed because of the relatively high pressure within the reservoir, and the quantity of released gas is sufficient to evacuate substantially all of the residual combustible mixture located between the mixer and the tip T, at a high exit velocity. If the valves G are operated in sequence, the exhausting of the combustible mixture by the gas released from the reservoir R, is assisted by the continued momentary flow from the oxygen conduit. Thus, the gas from the reservoir is capable of acting alone to exhaust the residual gases, that is, when both gas-saver valves are operated concurrently, or the gas from the reservoir may assist in the evacuation produced by a retarded operation of the oxygen valve, in which event the trapped gas in the reservoir provides a continued flow of oxygen over a longer period than is ordinarily obtained by sequential operation of the valves 12 and 13.

Although a separate reservoir R has been shown in Fig. 2, the reservoir includes, in effect, the volume of the oxygen conduit between the valves G and the mixer M, which conduit or reservoir communicates with the atmosphere only through the tip T. Similar results are obtainable by an enlargement of the conduit 20 as shown in Fig. 4. Ordinarily, the volume of the oxygen conduit is less than that of the acetylene conduit because of the larger tubing required to provide the necessary flow of acetylene at the usual low operating pressures. In the present case, however, the total volume of the combined oxygen conduit 20 and the reservoir R is substantially equal to the volume of the acetylene conduit. Under typical operating conditions, as when the oxygen pressure is 30 pounds per square inch, and the acetylene pressure is a two pound vacuum, the oxygen conduit contains almost three times as much gas as the acetylene passage so that the quantity of acetylene which may be aspirated from the tube 18 after the gas-saver valves have closed is relatively small as compared to the available quantity of oxygen. Also since the reservoir contains gas under moderately high pressure, whereas the stem contains a mixture at relatively low pressure, the capacity or quantity of gas in the reservoir may greatly exceed that of the mixture in the stem, even when the water-volume of one is substantially equal to that of the other.

Under certain conditions, it may be desirable to employ a small pilot light at the tip T through the use of an acetylene by-pass which permits flow of a moderate amount of acetylene even when the gas-saver valves are closed. Under these circumstances, it is desirable to reverse the sequence of operations of the valves 12 and 13 so that the oxygen supply is shut off first. If acetylene of medium pressure is employed, the

principles of the present invention may be utilized by incorporating the reservoir in the medium pressure acetylene line, preferably in conjunction with successively-operated gas-saver valves. The reserve supply of acetylene in the reservoir thus accentuates the continued flow of acetylene produced by delayed action of the gas-saver valve 12, to evacuate the combustible mixture in the stem S.

It is desirable that the volume of the reserve oxygen supply contained in the reservoir and the delivery conduit, be so proportioned at ordinary operating pressures that the combustible mixture in the stem is evacuated after the gas-saver valves are closed, at such a velocity that the tendency toward backfiring is substantially eliminated. A decrease in the capacity of the reservoir increases the tendency toward backfire, while an increase in the capacity tends toward a waste of gas.

Various modifications of the herein disclosed invention may be made without departing from the scope thereof, or sacrificing any of its advantages.

I claim:

1. An oxy-acetylene blowpipe comprising substantially simultaneously-closing valves for abruptly shutting off the flow of oxygen and acetylene; a mixer; a blowpipe tip; a stem extending from said mixer for conveying combustible mixture from said mixer to said tip; and conduits communicating with the atmosphere only through said tip and connecting said respective valves with said mixer, one of said conduits having a relatively large gas capacity to maintain a pressure therein long enough to evacuate a substantial portion of residual combustible mixture from said stem after said valves are closed.

2. A blowpipe as claimed in claim 1, wherein said conduit of large capacity communicates with the discharge port of the oxygen shut-off valve.

3. In a blowpipe, a tubular handle; a mixer in the forward portion of said handle; a blowpipe tip; acetylene and oxygen gas conduits communicating with the atmosphere only through said tip and extending through said handle to said mixer; and substantially concurrently operable valves for abruptly stopping the flow of oxygen through said conduits, said oxygen conduit having a portion between such oxygen valve and said mixer of relatively high gas capacity to maintain the gas velocity issuing from said tip above the backward flame propagation rate after said valves have been closed, until substantially all of the combustible mixture has passed from the blowpipe.

4. In a blowpipe, substantially instantaneously operable simultaneously-closing shut-off valves controlling the flow of oxygen and acetylene to said blowpipe; a mixer; a tip communicating with said mixer; oxygen and acetylene conduits extending from said respective shut-off valves to said mixer, said conduits being sealed from the atmosphere except through said tip, such oxygen conduit having sufficient gas capacity to maintain for an appreciable time a relatively high gas velocity issuing from said tip after said valves have been closed, and until substantially all of the combustible mixture has passed from the blowpipe.

5. A blowpipe comprising substantially concurrently-operable quick-acting shut-off valves for oxygen and acetylene respectively; a mixer; a tip; a stem for delivering a gas mixture from said mixer to said tip; a conduit connecting one of said valves with said mixer; and a second conduit of considerably greater capacity connecting the other valve with said mixer, said second conduit communicating with the atmosphere only through said tip, said second conduit holding a sufficient volume of gas at substantially line pressure to clear said stem and tip of a substantial portion of the residual combustible gas mixture therein after said valves have been closed.

6. A blowpipe having respective oxygen and acetylene connections; a mixer; a tip; a stem for supplying a combustible gas mixture from said mixer to said tip; substantially concurrently-operable quick-acting valves for controlling the supply of oxygen and acetylene to said mixer; and oxygen and acetylene conduits connecting said respective valves with said mixer, one of said conduits comprising an unventilated reservoir having a gas capacity in excess of that of said stem, said reservoir being operable when said valves are closed, to discharge the gas contained therein initially at line pressure during a sufficient period to clear said stem of substantially all of said combustible mixture.

7. A blowpipe as claimed in claim 6 wherein said reservoir comprises an enlarged zone in said oxygen conduit.

8. A blowpipe as claimed in claim 6 wherein said reservoir comprises a branch tube closed at one end and communicating at its other end with said oxygen conduit.

9. In a blowpipe, a fuel gas valve and a combustion-supporting gas valve, said valves operating abruptly and substantially concurrently; a mixer; a fuel gas conduit connecting said fuel gas valve with said mixer, and a combustion-supporting gas conduit connecting said combustion-supporting gas valve with said mixer; in combination with an unventilated reservoir connected with said combustion-supporting gas conduit, said reservoir having a sufficiently large gas capacity to maintain a relatively high gas velocity issuing from the blowpipe tip after said valves are closed, until substantially all of the combustible mixture has passed from the blowpipe.

ROBERT J. KEHL.