Sept. 27, 1932. J. H. BROWNING 1,879,789

WELDING AND CUTTING TORCH

Filed June 11, 1931

Fig. 1.

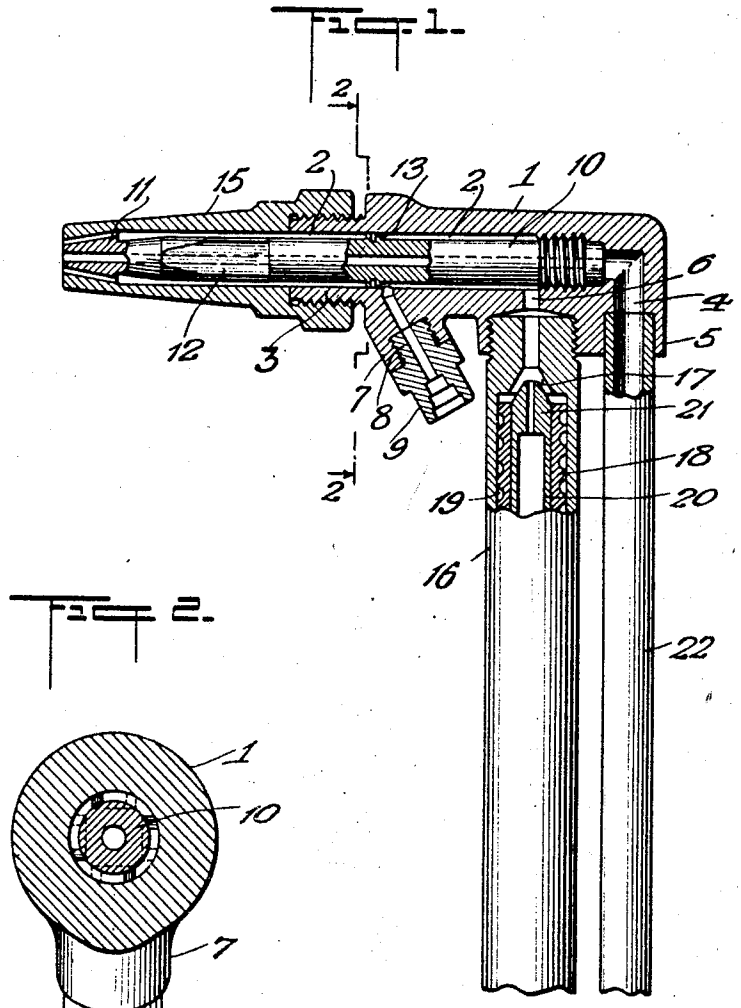


Fig. 2.

Fig. 3.

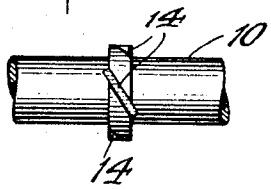
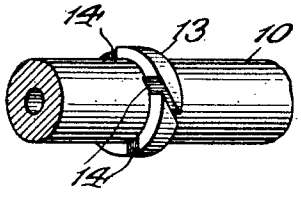


Fig. 4.



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WELDING AND CUTTING TORCH

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My invention relates to a welding and cutting apparatus or torch in which a fuel is mixed with oxygen and the fuel burned in the presence of the oxygen to generate a high temperature. In particular, the invention relates to a burner head for such welding and cutting torches.

Commonly, such welding and cutting torches are provided with a burner head having a flame nozzle at one end and a passage extending longitudinally of the burner head. A lateral passage is also provided which communicates with the longitudinal passage of the burner head. This latter passage is usually adjacent the end of the burner head opposite to the flame nozzle and is adapted to convey fuel and oxygen to the longitudinal passage through the burner head, which passage acts as a mixing chamber wherein the fuel and oxygen are mixed. Extending through the passage there is, in a cutting torch, a tubular member which is adapted to convey an auxiliary supply of oxygen to the flame nozzle. This tubular member communicates with a passage in the burner head which is adapted to be connected to an auxiliary oxygen supply tube. The diameter of the tubular member within the burner head is less than the diameter of the passage through the burner head so that an annular space is provided through which the commingled oxygen and fuel pass to the flame nozzle. The oxygen and the fuel are delivered to the burner head under pressure and pass through the passage in the burner head to the flame nozzle in a relatively short time resulting in poor or unsatisfactory mixing of the oxygen and fuel. It has also been found that the commingled oxygen and fuel are not uniformly distributed about the flame nozzle so that the flame issuing from the torch is not uniform.

In torches utilizing a fuel which must be vaporized prior to being mixed with the oxygen in the burner head, such for instance as liquid fuel torches, there is an auxiliary flame nozzle or burner extending from the burner head and directed towards the wall of a passage through which the liquid fuel passes. This auxiliary burner communicates with the passage in the burner head through which the commingled fuel and oxygen passes to the main flame nozzle. In practice, it has been found that insufficient gas passes through this auxiliary flame nozzle and the pressure of the gas passing therethrough is not the full pressure on the gas which condition results in a flame that is easily extinguished.

By my invention, the fuel and oxygen are thoroughly and intimately mixed during their passage through the burner head and the gases so mixed are uniformly distributed about the flame nozzle. I provide within the passage through the burner head, between the flame nozzle and the lateral passage of the burner head through which the longitudinal passage receives fuel and oxygen, a means for agitating the gases passing through the burner head which agitation of the gases thoroughly and intimately mixes the fuel and oxygen and uniformly distributes the commingled gases about the flame nozzle. This agitation and uniform distribution of the gases within the burner head produces a uniform flame which is more efficient in performance.

In addition to thoroughly mixing the fuel and oxygen passing through the burner head, and distributing the commingled gas uniformly about the flame nozzle, the agitating means of my invention causes a back pressure and when it is located adjacent the point of communication between the auxiliary burner of a liquid fuel torch, the back pressure causes the gases to pass through the auxiliary burner under increased pressure. This increased pressure on the gases passing through the auxiliary burner results in a preheating flame of greater strength which is not readily extinguished by unfavorable weather conditions.

Specifically, I provide in a cutting torch for example a burner head which has a longitudinal passage therethrough. One end of the burner head is provided with a threaded boss. The passage through the burner head terminates in a passage of lesser diameter which communicates with a lateral passage. The portion of the passage of lesser diame-

ter is internally threaded and adapted to receive the threaded end of a tubular member which extends into the passage through the burner head. This tubular member communicates with the aforementioned lateral passage and is adapted to convey an auxiliary supply of oxygen. The outer end of the tubular member is provided with a frusto-conical tip, the outer surface of which is channeled. Adjacent this frusto-conical tip, there is a squared section which is provided for the purpose of assembling the burner head. A burner tip extends over the outer end of the tubular member and is provided with an internally threaded portion which engages the threaded boss of the burner head. The tip is provided with a section complementary to the frusto-conical tip on the tubular member and with the channeled grooves in the tip on the tubular member provide a plurality of orifices through which the mixed fuel and oxygen are ejected. This portion constitutes the flame nozzle of the burner head.

Adjacent the lateral passage communicating with the interior of the tubular member there is another lateral passage parallel thereto which is adapted to convey fuel and oxygen into the annular longitudinal passage through the burner head formed between the outer wall of the tubular member and the wall of the passage through the burner head. Intermediate the ends of the burner head, between the squared section and the threaded end section, there is formed on the tubular member a baffle which is provided with a plurality of channel shaped grooves which extend through the baffle at an angle to the longitudinal axis of the passage through the burner head. The fuel and oxygen passing through the burner head passes through these channeled grooves in the baffle and is forced, by virtue of the inclination of the channeled grooves in the baffle with respect to the passage through the burner head, to assume a swirling motion, thus agitating and intimately mixing the fuel and oxygen. The gases thereafter continue their passage through the burner head in the form of a spiral and are uniformly distributed to the several channels in the tip on the tubular member within the burner head or the orifice of the flame nozzle. In this way, a uniform flame is delivered by the torch.

When the baffle is used in conjunction with a burner head having an auxiliary flame nozzle such as, for example, the burner head utilized on a liquid fuel welding and cutting apparatus, the baffle is located directly behind the point of communication between the auxiliary flame nozzle and the passage through the burner head, relative to the direction of movement of the gases through the burner head. The baffle creates a certain amount of back pressure, and when located directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head, relative to the direction of movement of gases through the burner head, the back pressure created by the baffle results in a better and more efficient distribution of fuel and oxygen to the auxiliary flame nozzle.

Other objects and advantages of my invention will be apparent from the following particular description of one embodiment thereof which is illustrated in the accompanying drawing, in which:

Fig. 1 is a sectional elevation of a burner head constructed in accordance with my invention;

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

Fig. 3 is a fragmentary side elevation of a tubular member with a baffle formed thereon; and

Fig. 4 is a perspective of a portion of a tubular member with the baffle formed thereon.

In the drawing, I have illustrated my invention in connection with a liquid fuel cutting and welding torch. It is, however, to be understood that although the invention has additional advantages when used in connection with a liquid fuel welding and cutting torch it is by no means limited thereto but is equally applicable to any type of welding and cutting apparatus irrespective of the character of fuel utilized. In the drawing, the burner head 1 has a longitudinal passage 2 formed therein. One end of the burner head is shaped to form a boss 3 which is threaded externally for a purpose which will hereinafter appear. The passage through the burner head is reduced in diameter adjacent the end of the burner head opposite to the threaded boss 3 and terminates in a lateral passage 4, lateral to the passage through the burner head. This lateral passage extends through a lateral section 5 formed on one side of the burner head which section has two recesses, one communicating with the lateral passage 4, and another communicating with a lateral passage 6 which is parallel to the lateral passage 4. The burner head shown is also formed with an inclined boss 7 directed towards the plane of the passage 6, which boss has a passage therethrough communicating with the passage through the burner head. The end of this boss 7 is recessed and threaded internally. The internal threads in the inclined boss are adapted to engage threads formed on an extension 8 of a flame tip 9, which flame tip constitutes an auxiliary flame nozzle.

Within the passage 2 through the burner head, there is a tubular member 10 which extends beyond the end of the threaded boss 3 of the burner head. The inner end of this tubular member is threaded exteriorly to engage internal threads formed in the portion

of the passage through the burner head which is of reduced diameter. On the other, or outer, end of the tubular member, there is a frusto-conical tip 11, the surface of which is channeled longitudinally of the tip. Adjacent the tip the tubular member is provided with a squared section 12. Between the inner end of the squared section 12 and the threaded end of the tubular member, there is formed on the tubular member a baffle 13, the outer diameter of which is substantially equal to the inner diameter of the passage through the burner head. This baffle is located, when the tubular member is in position in the burner head, immediately behind the point of communication between the passage through the inclined boss 7 and the passage through the burner head, relative to the direction of movement of the gases through the burner head. The baffle is provided with a plurality of channeled shaped grooves 14 inclined to the axis of the passage through the burner head. The frusto-conical tip 11 of the tubular member is made of Monel metal which exhibits a high resistance to heat. The remainder of the tubular member is made of bronze which radiates heat rapidly. Thus, heat absorbed by the frusto-conical tip is transmitted to the bronze tubular member from which it is radiated.

Over the outer end of the tubular member there is fitted a burner tip 15, one end of which is internally threaded to engage the threads on the boss 5 formed on the burner head. Internally, the opposite end of the burner tip is complementary to the frusto-conical tip 11 on the tubular member 10. The several channel shaped grooves formed in the surface of the tip on the end of the tubular member, in conjunction with the internal wall of the burner tip, form a plurality of orifices and constitute the flame nozzle of the burner head.

The recess in the lateral section 5 of the burner head, which communicates with the lateral passage 6, is internally threaded to receive the threaded end of a tubular member 16 which is in communication with the passage 6. The end of the tubular member, which extends into the recess, is solid and has a passage extending therethrough which expands to the diameter of the tubular member, forming a conical portion 17. Within the tubular member, there is a core 18 which has a spiral groove 19 formed in its outer surface. This core fits snugly within the tubular member and the groove forms, with the inner wall of the tubular member, a spiral passage for liquid fuel. The core is hollow and receives a tubular member 20, which is slidably mounted therein, and which has a solid upper end portion 21 having a passage therethrough in alignment with the passage 6 in the burner head. The upper end of this inner tubular member is frusto-conical in shape and complementary to the conical portion 17 of the passage through the solid end of the external tubular member 16. This conical end of the inner tube constitutes a valve which cooperates with the conical portion of the passage through the solid end section of the external tubular member, acting as a valve seat, to regulate the quantity of vaporized liquid fuel passing from the spiral groove into the passage 6. The inner tube 20 conveys a supply of oxygen which passes through the passage in the solid end thereof and the passage 6 into the passage 2 of the burner head. The other recess in the burner head, which communicates with the passage 4, is adapted to receive a tubular member 22 through which an auxiliary supply of oxygen is conveyed to the interior of the tubular member 10 within the burner head.

The operation of the portion of the torch illustrated is as follows: Liquid fuel is supplied to the spiral passage formed by the spiral groove in the core 18 and the inner wall of the tubular member. This liquid fuel passes spirally up the tubular member past the region of the tubular member on to which the auxiliary flame nozzle is directed. This section of the tubular member constitutes a preheater or vaporizer and the liquid fuel is preheated and vaporized in this section, passing out of the spiral groove as a vapor. Some of the heat from the auxiliary flame is conveyed through the core and the inner tubular member to the oxygen within the inner tubular member which is also preheated. The vaporized fuel passes from the spiral groove into the conical section of the passage through the solid end of the exterior tubular member and to the passage 2 of the burner head. The quantity of vaporized fuel which passes to the burner head is regulated by moving the inner oxygen tube 20 longitudinally to seat and unseat the valve formed on its end. Oxygen passes through the inner tube and into the passage in the solid end section of the exterior tube 16 together with the vaporized fuel and the two gases pass through the passage 6 and into the annular space provided between the interior wall of the tubular member within the burner head and the wall of the passage 2 through the burner head.

The two gases pass longitudinally of the burner head to the baffle formed on the tubular member and by virtue of the inclined passages through the baffle, the gases are agitated, being forced to assume a swirling motion as they pass through the baffle. The gases proceed through the remainder of the passage in the burner head to the burner tip in a swirling, spiral movement and are distributed uniformly to the channels formed in the tip on the end of the tubular member, issuing from the burner tip uniformly distributed about the burner tip.

The baffle, as hereinbefore stated, is located directly behind the point of communication between the passage through the inclined boss 7 and the passage through the burner head. The baffle causes the gases to eddy at this point and create a back pressure. This eddying of the gases intimately mixes the fuel and oxygen and the back pressure insures a steady uniform supply of the commingled gases to the auxiliary flame nozzle.

The auxiliary supply of oxygen, which is delivered through the tube 22 and the passage 4 to the interior of the tubular member 10, passes through the tubular member and issues from the end of the tubular member centrally of the flame.

It is obvious that various changes may be made in the details of construction illustrated in the accompanying drawing and described above, by those skilled in the art, within the principle and scope of my invention as expressed in the appended claims.

I claim:

1. In a cutting and welding apparatus a burner head adapted to be connected to a source of fuel and oxygen supply and having a flame nozzle and a passage therethrough between the flame nozzle and the point of connection to a source of fuel and oxygen supply, an auxiliary flame nozzle extending from said burner head and communicating with the passage therethrough, and means within the passage through the burner head for agitating the gases passing therethrough to thoroughly mix the gases and distribute the gases uniformly about the flame nozzle, said agitating means being directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head relative to the direction of movement of the gases through the burner head.

2. In a cutting and welding apparatus a burner head adapted to be connected to a source of fuel and oxygen supply and having a flame nozzle and a passage therethrough between the flame nozzle and the point adapted to be connected to a source of fuel and oxygen supply, an auxiliary flame nozzle extending from said burner head and communicating with the passage therethrough, and a baffle within the passage through the burner directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head relative to the direction of movement of gases through the burner head, said baffle having passages therethrough inclined to the axis of the passage through the burner head.

3. In a cutting and welding apparatus a burner head adapted to be connected to a source of fuel and oxygen supply and having a flame nozzle and a passage therethrough between the flame nozzle and the point adapted to be connected to a source of fuel and oxygen supply, a tubular member extending through the passage in the burner head, said tubular member being of less diameter than the diameter of the passage through the burner head and adapted to convey an auxiliary supply of oxygen to the flame nozzle, an auxiliary flame nozzle extending from said burner head and communicating with the passage therethrough, and a baffle in the annular space between the tubular member and the walls of the passage directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head relative to the direction of movement of gases through the passage, the baffle having channel shaped grooves therethrough at the periphery thereof inclined to the axis of the passage through the burner.

4. In a cutting and welding torch, a burner head having a flame nozzle at one end thereof, a tubular member connected to the burner head adjacent the other end thereof, the burner head having a passage therethrough between the tubular member and the flame nozzle and the tubular member having passages therethrough adapted to convey fuel and oxygen to the passage through the burner head, an auxiliary flame nozzle extending from the burner head towards said tubular member and communicating with the passage through the burner head, and a baffle within the passage through the burner head directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head relative to the direction of movement of gases through the passage, the baffle having passages therethrough inclined to the axis of the passage through the burner head.

5. In a cutting and welding apparatus, a burner head adapted to be connected to a source of fuel and oxygen supply and having a passage therethrough, longitudinally thereof, a flame nozzle on the end of the burner head, an auxiliary flame nozzle extending from said burner head and communicating with the passage through the burner head, and means within the passage through the burner head for creating a back pressure on the gases flowing therethrough, said means being directly behind the point of communication of the auxiliary flame nozzle with the passage through the burner head relative to the direction of movement of gases through the passage in the burner head.

In witness whereof, I hereunto subscribe my signature.

JAMES H. BROWNING.