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MEANS FOR CUTTING METAL

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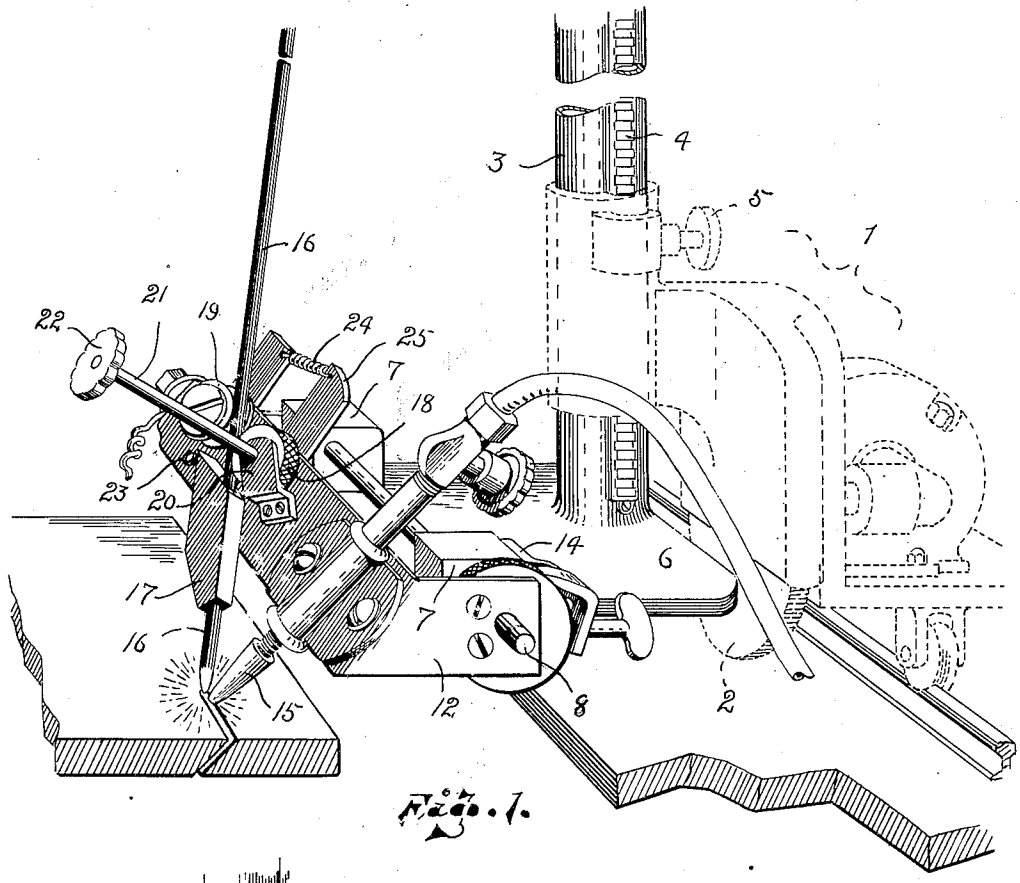


Fig. 1.

Fig. 2.

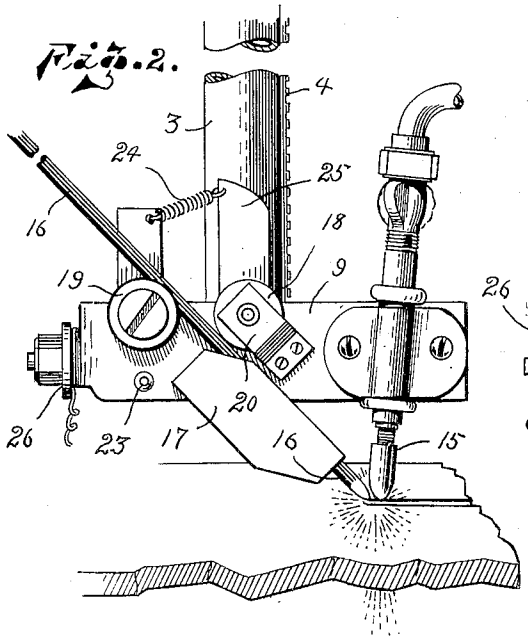
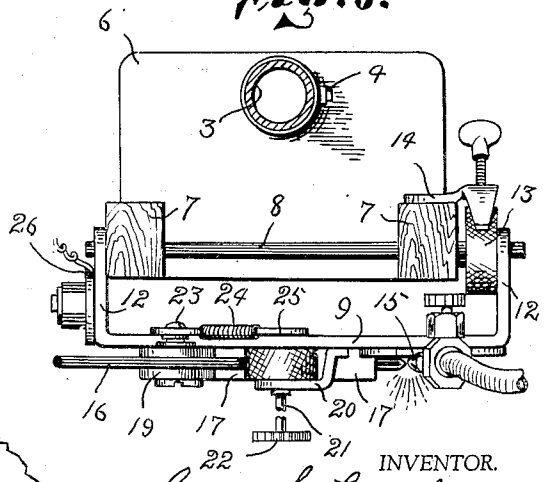


Fig. 3.



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MEANS FOR CUTTING METAL

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3 Claims. (Cl. 219—15)

This invention relates to the fusing of metal by autogenous means and method associated therewith, having special reference to such employed in the cutting of what is known as non-magnetic ballistic steel and now commonly used in shipbuilding.

It is well known that many difficulties are encountered in the cutting of this metal by use of the common instrumentalities now at hand such as oxy-acetylene torches, electric carbon arc, and the like and when accomplished by such, the job is rarely satisfactory and requires much trimming and grinding to make it so.

Now one principal object of the instant invention is to provide a simple readily adjustable and easily controlled burner that will overcome these difficulties and prove a much more efficient and speedy machine and one that involves a method of using in combination an oxygen jet and carbon arc in a manner to produce an ideally smooth and clean cut thereby materially reducing the cost and time of subsequent fabrication of the severed parts so cut.

In developing the instrument here shown to accomplish the desired results it was discovered that a critical relation existed in respect to the relative position of the active points of the burner as well as their relation to the surface being acted upon which it is believed involves a novel method in the cooperative use of these two heat producing elements, and which will be more clearly pointed out in the further description of the invention.

Referring now to the accompanying drawing forming part of this application and in which like reference characters represent like parts—

Figure 1 is a perspective view of one of the improved machines operating at an angle diagonally disposed to the base upon which it is supported.

Figure 2 is a front elevation of the machine with the torch elements perpendicular to the supporting base and,

Figure 3 is a top plan view of Figure 2.

The vehicle upon which the instant assembly of active points are shown is similar to that used for the common portable oxy-weld cutting machine as illustrated at 1, it being provided with a propelling motor, usual speed controls, traction wheel 2, and suitable track for either straight or arcuate work as may be required.

Such carriages are usually provided with an upright standard, or column 3, for vertical adjustment of the torch as required, the column being provided with a suitable rack 4 and friction governed spur gear not shown, but operated manually by the thumb knob 5.

To the bottom of this column I have attached the flat rectangularly shaped base plate 6 extending laterally away from the carriage 1 and upon each of the opposite outer corners of which is mounted a block 7 of suitable insulating material such as Bakelite, fiber, or the like, through which is rotatably mounted the shaft 8 which forms the pivotal support for the face plate 9 upon which are carried the oxygen nozzle 15 and carbon stick 11.

The face plate 9 is of channel shape in plan view, see Figure 3, having its ends 12—12 bent at right angles to form a bracket like structure and through which the ends of the shaft 8 extend and are journalled as clearly seen. At one end of this shaft a flat faced wheel-like member 13 is fixed either to the shaft or to the adjacent end member 12 of the face plate so as to form a control member for selective angular adjustment of the face plate 9. Attached to the block 7 adjacent this end of the shaft is carried a bracket 14 extending outwardly in close proximity to the face of the wheel 13 and having a thumb screw mounted therein for engagement with the face of the wheel providing simple means for holding the face plate in any desired angle within the limits of its movement.

Upon the face of the plate 9 and adjacent one end is installed in any desired manner, though well insulated therefrom, the oxygen jet nozzle 15, it being disposed at an angle of approximately 7 degrees from vertical as shown and the necessity of which will be described later. Adjacent the opposite end of the plate 9 is also installed the adjustable carbon stick or electrode 16, it being disposed at an angle of approximately 37 degrees to vertical in the opposite direction to that of the oxygen nozzle, the ultimate object being to have the approximate meeting point of the arc and jet materially below the lower edge of the face plate for most convenient use and minimum heat objection.

A further novel feature of the jet and arc assembly is that the carbon 16 is fed and aligned through the angularly disposed guiding block 17 fixed adjacent the lower edge of the plate 9. This block 17 not only acts as a guide but functions also as a non-conductor of heat, it being preferably of stainless steel and found to function admirably as in the initial experiments without this block the transmission of heat to the adjacent parts of the device was quite objectionable.

It is also true that the knurled feeding roller 18

as well as the fluted guiding roller 19 functions to best advantage in being of stainless steel.

The feeding roller 18 is journalled intermediate of the face plate 9 and suitable bracket 20 and shown with its spindle-like shaft 21 extending well outwardly from the face of the device and terminating in a hand operating wheel 22, though obviously such control may be automatically accomplished as in common carbon arc burning devices.

It is to be noted that the guiding roller 19 is carried upon a lever-like arm, pivotally fixed to the inside of the face plate 9 as at 23 and the upper end biased by the contractile spring 24 towards the fixed extension 25 of the face plate so as to insure a suitable constant frictional contact of the carbon 16 above the guiding block 17 and intermediate of the two contacting rollers.

One terminal of the electric circuit used in the embodiment here shown is connected at 26 and it is to be understood that the entire apparatus must be insulated from the vehicle or machine upon which it is mounted.

It has been proven in actual practise that for best results in the cutting of non-magnetic ballistic steel the oxygen jet should be as nearly as possible between one-sixteenth and one-eighth of an inch away from the surface being operated upon and should be so positioned in relation to the carbon stick as not to blow directly thereupon but should strike a point immediately behind the apex thereof at a distance of approximately one-eighth of an inch as the oxygen, if blowing directly upon the carbon, will cause objectionable oxidation of the stick, besides the latter having a tendency to spread the flow of oxygen and result in an abnormally wide cut and waste of material.

Furthermore, it is deemed that the relative angle of the oxygen nozzle and carbon stick is critical for best results and particularly in that the heat is confined to as limited a space as possible thus avoiding disturbance of the non-magnet qualities of the steel being operated upon.

This is readily observed when watching the action of the burner for as soon as the arc is formed by the electrode it digs into the surface of the metal and then may be lowered to possibly half the depth of the plate which with the oxygen jet directing a gentle flow into the narrow track thus heated, quick and complete oxidation of the metal takes place.

In operation it was discovered that best results were obtained by using an electric current of about 20 volts and 250 amperes and negative or straight polarity as indicated on the generator, a pressure of from 3 to 5 pounds on the oxygen supply and setting the apparatus to travel at a speed of from six to eight inches per minute.

In this novel combination of elements, evidently the heat is so intense and concentrated that the melting point of the various metals in the non-magnetic ballistic steel is quickly reached and such preheating together with the oxygen completes the process very rapidly leaving a cut with exceptionally smooth and satisfactory edges for subsequent fabrication, welding or the like.

Having thus described one embodiment of my invention what I claim and desire to secure by Letters Patent is:

1. In an autogenous cutting torch, the combination with a self-propelled supporting carriage having a laterally projecting supporting shelf thereupon, of a pivotally mounted face plate carried upon said shelf and adjacent to the outermost edge thereof, means for holding said face plate at certain predetermined angles, an oxygen supplying nozzle fixed to the front of said face plate and extending downwardly beyond the lowermost edge of same at a certain predetermined angle, an electric carbon stick longitudinally adjustably carried upon the front of said face plate at a materially greater angle from vertical than that of said oxygen nozzle and designed to preceed the tip of said oxygen nozzle during the action thereof, and means for adjustment of said carbon stick.

2. A burner for a metal cutting torch of the type described comprising a relatively slight angularly disposed oxygen supplying nozzle and an electric carbon arc supplying electrode disposed at a considerably greater angularity than said nozzle with its arc producing tip constantly in advance of the tip of said nozzle, and pointing directly towards the discharge thereof.

3. In a metal cutting torch of the type described comprising an oxygen supplying nozzle disposed at a material angle from vertical backwardly in respect to the direction of the cut being made, a carbon arc supplying electrode disposed at a considerably greater angle from vertical than said nozzle and in the lead of same, and a comparatively large hollow fixed sheath and guide for said electrode extending relatively close to the meeting point of discharge from said nozzle and said electrode whereby to insure minimum radiation of heat from said electrode.

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