Dec. 19, 1944. W. G. SYLVESTER 2,365,308

METHOD FOR SCARFING

Filed March 28, 1942

FIG. 1.

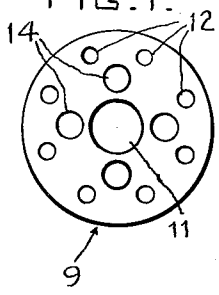


FIG. 2.

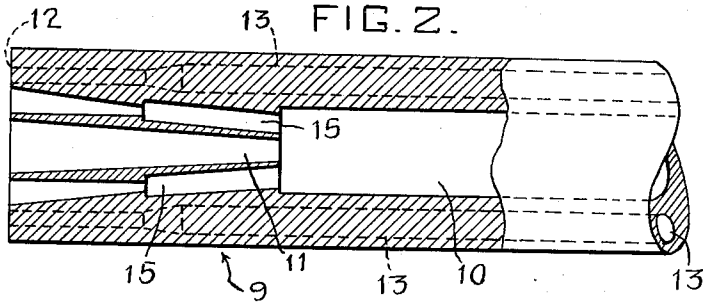


FIG. 3.

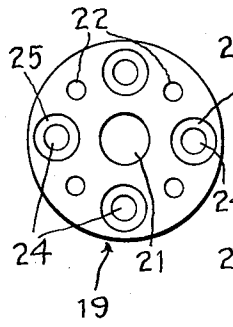


FIG. 4.

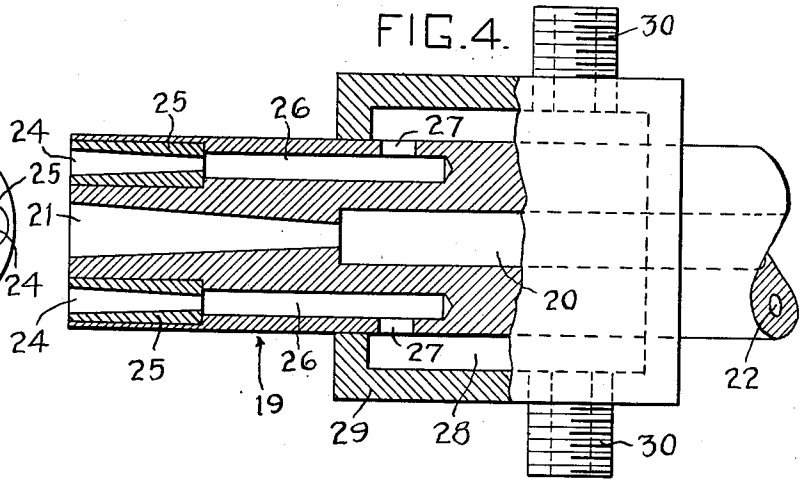


FIG. 5.

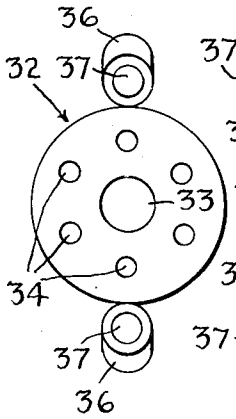
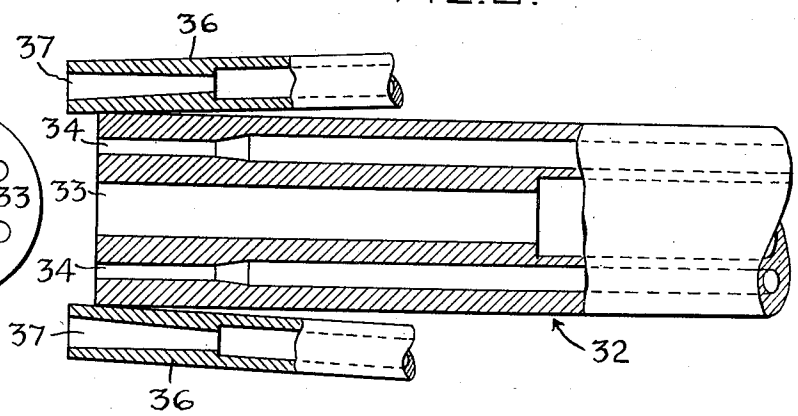


FIG. 6.



INVENTOR.
WALTER G. SYLVESTER

BY

ATTORNEY

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METHOD FOR SCARFING

Walter G. Sylvester, Jersey City, N. J., assignor to Air Reduction Company, Incorporated, New York, N. Y., a corporation of New York

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3 Claims. (Cl. 148—9)

This invention relates to deseaming or scarfing, and more especially to a method for removing metal from a work-piece without leaving fins along the edges of the area from which metal is removed.

When fins are left along the edges of a surfaced area there is some iron in the fins and it is this iron that causes the fins to stick to the work-piece. Auxiliary oxygen streams can be used to complete the oxidation of the iron in the material that would form the fins.

It is an object of this invention to provide an improved method for preventing fin formation by means of auxiliary oxygen jets. In accordance with one feature of the invention the auxiliary jets are small as compared with the scarfing oxygen stream and are of high velocity. Such auxiliary jets conserve oxygen and are easily controlled so that they do not scarf grooves of their own with fins along these extra grooves.

Another object of the invention is to prevent fin formation more effectively by directing the auxiliary oxygen streams from diverging outlet orifices that produce straight parallel-sided jets that penetrate the products of combustion of the main reaction of the scarfing stream with the metal of the work-piece.

Another object of the invention is to provide for removing surface metal from a work-piece without forming fins along the surfaced area. Various features of the invention relate to the positioning of auxiliary oxygen jets with respect to the scarfing jet and preheating flames; to auxiliary jet orifices that have diverging outlets for projecting more effective streams into the main reaction zone; and to the supplying of oxygen for the auxiliary jets from sources outside of the tip that directs the stream of scarfing oxygen against the work-piece. This latter feature has the advantage of making the velocity and volume of the auxiliary jets independent of the pressure and velocity of the oxygen in the tip from which the scarfing stream is directed against the work-piece.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawing, forming a part hereof:

Fig. 1 is an end view of a tip for scarfing in accordance with this invention.

Fig. 2 is a side view, mostly in section, of the tip shown in Fig. 1.

Fig. 3 is an end view of a modified form of tip for scarfing in accordance with this invention.

Fig. 4 is a side view, mostly in section, of the tip shown in Fig. 3.

Figs. 5 and 6 are views similar to Figs. 3 and 4, respectively, but illustrating a second modified tip construction.

The tip 9 shown in Figs. 1 and 2 has a central bore 10 and a diverging outlet orifice 11 in axial alinement with the central bore 10. The scarfing oxygen stream is discharged from the orifice 11.

A circle of preheating flame orifices 12 that open through the end face of the tip are supplied with an oxy-fuel gas mixture through passages 13 in the tip. Between the scarfing oxygen orifice 11 and the preheating flame orifices 12, there are a number of auxiliary diverging orifices 14. These orifices 14 are supplied with oxygen through passages 15 directly from the central bore 10 of the tip. The passages 15, like the orifice 11, open through an end wall of the central bore 10.

The diverging orifices 14 are designed to expand gas from the pressure in the passages 15 to an outlet pressure substantially equal to atmospheric. The auxiliary jets issuing from the diverging orifices 14 have high velocity, preferably of the order of 900 feet per second, or greater, and the fact that they issue from the tip at atmospheric pressure makes the sides of these jets parallel so that the stream of gas in each of the auxiliary jets does not expand. Such streams have the advantage of more effectively penetrating the products of combustion of the main reaction of the scarfing oxygen of the central jet with the metal of the work-piece.

Although the expression "diverging orifices" is used in this specification and in the claims to describe an orifice having a tapered passage that increases in cross-section toward its outlet end, the axes of the diverging orifices 14 also diverge. This permits the auxiliary jets, that issue from the orifices 14 in a region between the scarfing oxygen jet and the preheating flame jets, to strike the work-piece along the edges of the reaction zone of the central scarfing jet. The scarfing jet spreads out when it strikes the work and the area from which metal is removed is therefore wider than the scarfing jet that issues from the tip.

Figs. 3 and 4 show a tip 19 that has a central bore 20 and a diverging outlet orifice 21 in axial alinement with the central bore 20. The scarfing oxygen stream is discharged from the orifice 21 as in the tip of Figs. 1 and 2.

The tip 19 has preheating flame jet orifices 22 that are the same as the preheating flame orifices 12 of Figs. 1 and 2, but not so numerous and more

widely spaced. Between the preheating flame orifices 22 are auxiliary diverging orifices 24 which are preferably formed in inserts 25 pressed into recesses in the face of the tip. The oxygen for the auxiliary orifices 22 is supplied from passages 26 that are of larger diameter than the inlet ends of the diverging orifices 24, but that extend for only a limited distance within the tip.

There is an opening 27 in the side of the tip through which each of the passages 26 communicates with an annular supply chamber 28 that surrounds the tip. The chamber 28 is formed by a housing 29 connected to the tip. Oxygen is supplied to the chamber 28 through pipes or tubing connections 30 threaded into the wall of the housing 29. Pipes 30 comprise a supply source for the orifices 24 separate from the supply source for orifice 21.

The advantage of this construction over that shown in Figs. 1 and 2 is that the velocity and volume of the auxiliary oxygen jets that are projected against the work-piece from the orifices 24 are not dependent upon the pressure or velocity of the oxygen in the central bore 20. The pressure at which oxygen is supplied to the chamber 28 may be different from that at which oxygen is supplied to the central bore of the tip 19.

The axes of the diverging orifices 24 are parallel, their spacing being about equal to the width of the area from which metal is removed by the oxygen scarfing jet from the orifice 21.

Figs. 5 and 6 show a conventional scarfing tip 32 with a central orifice 33 from which the scarfing jet is directed against the work, and a circle of smaller orifices 34 for directing the preheating flames against the work-piece to raise the surface metal to kindling temperature for reaction with the scarfing jet.

For preventing the formation of fins, the tip 32 is equipped with pipes 36 having diverging orifices 37 at their outlet ends. The pipes 36 comprise a supply source for the orifices 37 separate from the supply source for orifice 33. As in the case of the chamber 28 in Fig. 4, the pipes 36 are supplied with oxygen from some source outside of the tip and the auxiliary orifices 37 positioned with slightly-converging axes because the distance between the orifices 37 is somewhat greater than the width of the reaction zone along which the fins would be formed, if the auxiliary oxygen jets were not used to complete the oxidation and prevent any of the metal residue from sticking to the surface of the work-piece as a fin.

The tip 32, equipped with the pipes 36, is used with the pipes 36 horizontally spaced from one another on opposite sides of the central scarfing jet when scarfing a horizontal surface. With the auxiliary jet pipes 36 in the positions shown in Figs. 5 and 6, the tip 32 is disposed for scarfing a vertical surface.

With all of the tips shown in the drawing, the auxiliary oxygen jets preferably have high velocity and are of a restricted volume so that they react with the products of combustion from the scarfing reaction, but do not attack the surface of the work-piece to produce additional grooves which might themselves leave fins along their edges.

Several embodiments of the invention have been described, but various other changes and modifications can be made and some features of the invention can be used without others.

I claim:

1. The method of removing surface metal from a ferrous metal work-piece which comprises directing an oxygen scarfing stream against the surface of the work-piece with the metal at ignition temperature, and, while producing relative movement of the stream and work-piece, directing auxiliary, high-velocity streams of oxygen against the work-piece on both sides of the scarfing stream and close to the sides of the scarfing stream, said auxiliary high-velocity streams of oxygen being substantially smaller than the oxygen scarfing stream and delivered at substantially atmospheric pressure from orifices which individually diverge outwardly so that they will not scarf the work-piece.

2. The method of removing surface metal from a ferrous metal work-piece which comprises directing an oxygen scarfing stream against the surface of the work-piece with the metal at ignition temperature, and, while producing relative movement of the stream and work-piece, directing auxiliary high velocity streams of oxygen against the work-piece on both sides of the scarfing stream and close to the sides of the scarfing stream, said auxiliary high velocity streams of oxygen being substantially smaller than the oxygen scarfing stream and delivered at substantially atmospheric pressure from orifices which diverge outwardly from one another and which individually diverge outwardly so that they will not scarf the work-piece.

3. The method of removing surface metal from a work piece as set forth in claim 1 in which the auxiliary oxygen is delivered at a velocity and in a volume independent of the velocity and pressure of the oxygen of the scarfing-oxygen stream.

WALTER G. SYLVESTER.