Aug. 8, 1950 R. S. BABCOCK 2,517,622

PIERCE SEVERING

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Fig. 1.

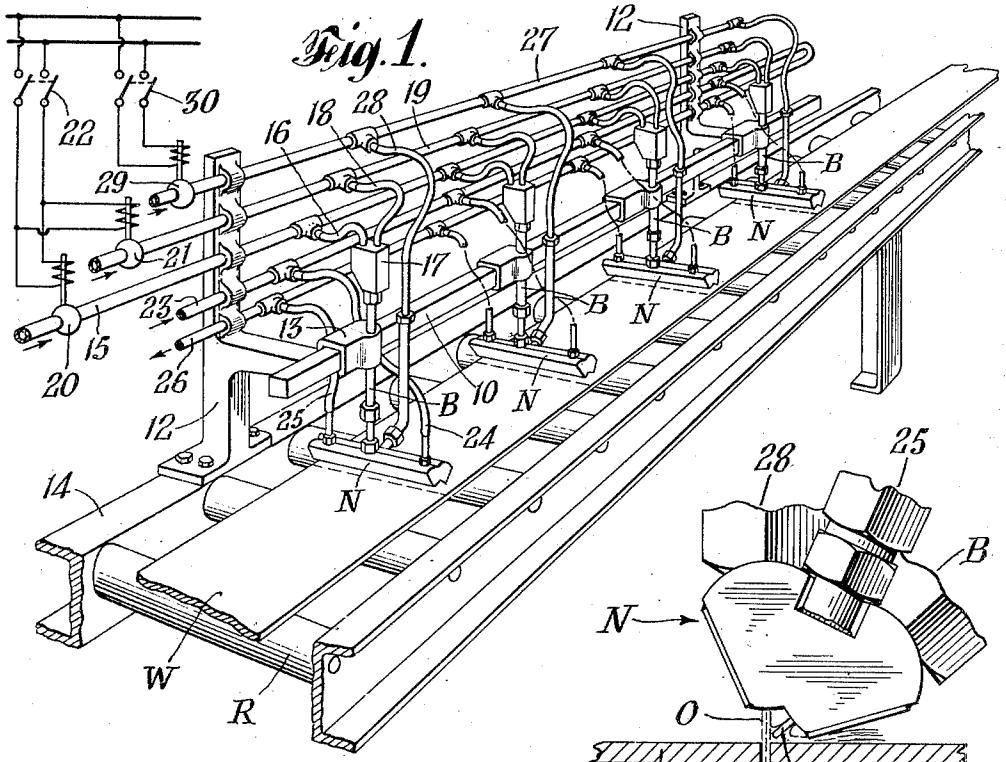
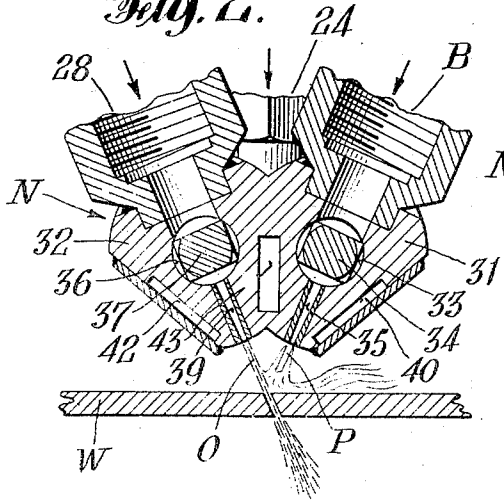


Fig. 3.

Fig. 2.



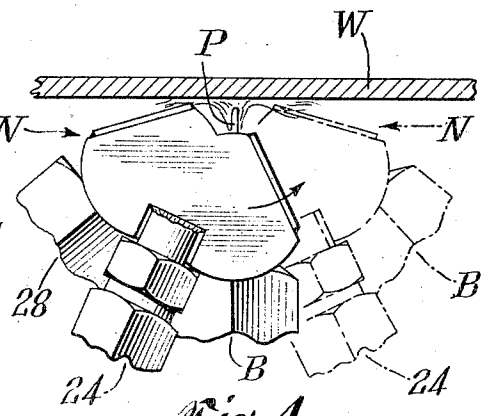


Fig. 4.

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Fig. 5.

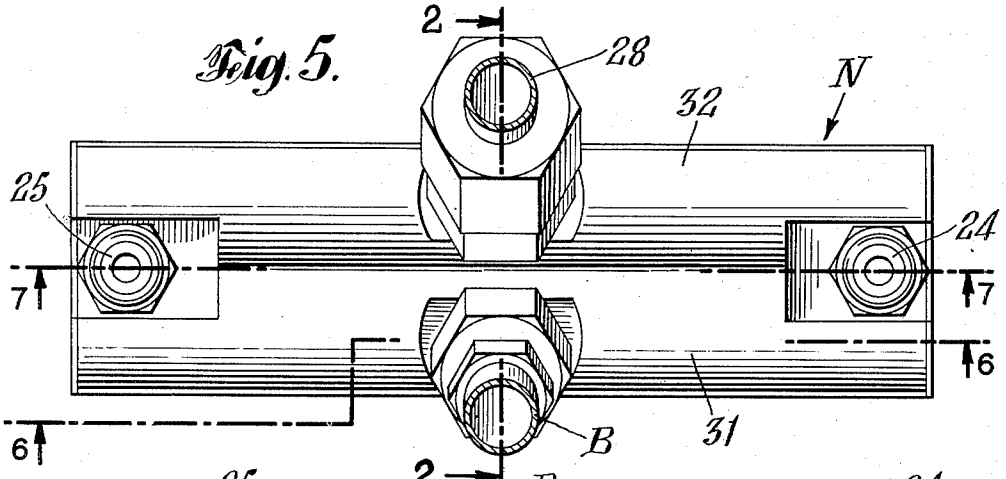


Fig. 6.

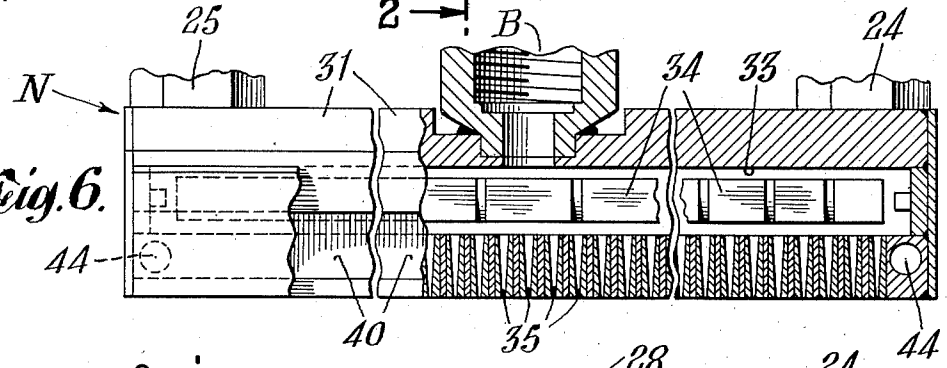


Fig. 7.

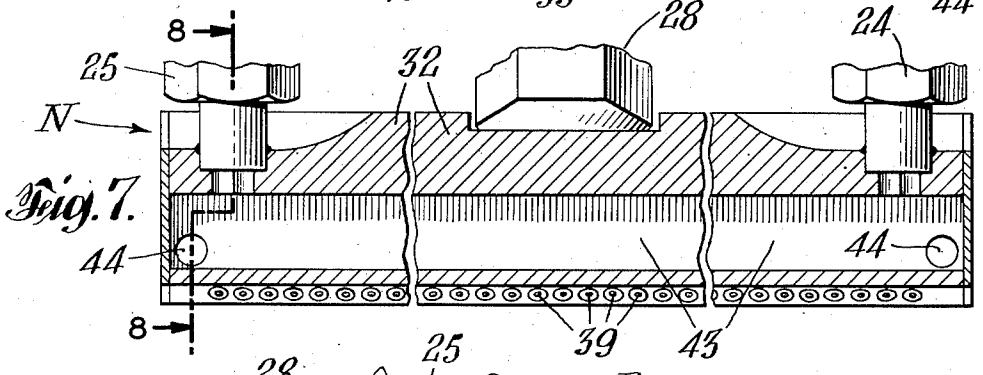
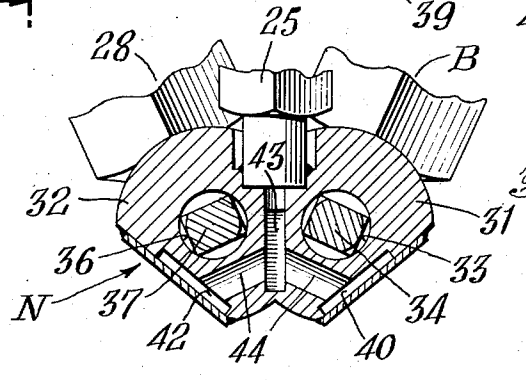


Fig. 8.



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PIERCE SEVERING

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Application June 20, 1947, Serial No. 756,057

11 Claims. (Cl. 148—9)

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This invention relates to pierce severing of rolled metal stock, and more particularly to method and apparatus for cutting thin flat metal strip into lengths by the oxy-fuel blowpipe.

It is necessary in a number of metal fabricating procedures, for instance in the rolling of wheel rim stock, to cut strip produced in lengths of for example 125 feet into shorter lengths for more convenient handling. Mechanical shears for this purpose are expensive, and conventional methods employing an oxy-fuel cutting blowpipe to traverse the width of the strip are too slow to keep up with other units in the usual production line.

Objects of the present invention are to provide a simple, rapid and economical method and apparatus for oxy-fuel severing of thin flat metal strip, to permit preheating and cutting through the strip without movement of the nozzle or cutting oxygen jet relative to the strip.

Other objects and features of novelty will be apparent from the following description and the accompanying drawings, in which:

Fig. 1 is a perspective view of apparatus for carrying out the method, both according to the preferred embodiment of the present invention;

Fig. 2 is a section through the nozzle, taken along the line 2—2 of Fig. 5;

Fig. 3 is an end elevation of the nozzle in position to project the cutting oxygen perpendicularly to the strip;

Fig. 4 is an end elevation of the nozzle in position beneath the strip, to project the heating flames perpendicularly to the strip, and showing in dotted lines the position to project the cutting oxygen perpendicularly to the strip from below;

Fig. 5 is a plan view of the nozzle shown in Fig. 1;

Fig. 6 is a longitudinal vertical section taken along the line 6—6 of Fig. 5;

Fig. 7 is a longitudinal vertical section taken along the line 7—7 of Fig. 5; and

Fig. 8 is a transverse vertical section taken along the line 8—8 of Fig. 7.

According to the present invention the thin flat metal strip is severed by directing against one surface of the strip a sheet of oxy-fuel preheat flame extending transversely of the strip for the full width thereof to heat a narrow transverse band of the metal to oxygen ignition temperature, and thereafter directing a similar sheet of cutting oxygen against the preheated band to pierce through the metal and sever the strip.

The gases are projected by an integral or double nozzle, which has respective rows of preheat gas

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and oxygen passages spaced sufficiently close to project sheet or ribbon jets. The rows of passages preferably converge to the same band on the surface of the strip. The nozzle may be stationary during the preheat and cutting steps, the separate steps being controlled by valve manipulation.

Alternatively the nozzle may be positioned to impinge the preheat flame vertically, and thereafter pivoted to project the cutting oxygen vertically against the preheated band. The nozzle may be positioned either above or below the strip for any of these operations.

As shown in Fig. 1, the strip W is supported on rolls R of a cooling bed or roll table, preferably in heated condition as delivered thereto from the rolling operation. Spaced along the roll table are a plurality of oxy-fuel blowpipes B terminating in transversely elongated nozzles N which extend the full width of the strip W. The nozzles N are provided with a row of closely spaced orifices which project a sheet of preheating flame P to impinge against a narrow transverse band on the surface of the strip W and heat it to oxygen ignition temperature.

The nozzles N also have another row of closely spaced orifices which project a sheet of cutting oxygen O against the preheated band, to pierce through the metal and sever the strip.

The blowpipes B are supported in spaced relation along the path of the strip W, by means of a bar 10 extending parallel to the strip, and mounted on a pair of brackets 12 for example secured to a channel 14 extending along or forming part of one side of the roll table.

Longitudinally movable along the bar 10 are a plurality of slides 13 in which the blowpipes B are vertically adjustably mounted, the slides being adjustable along the bar to adjust the spacing of the cuts.

Fuel gas such as acetylene is supplied by a pipe 15 through branch tubes 16 to the mixers 17 of the blowpipes B, and preheat oxygen is supplied to these mixers through branch tubes 18 from a pipe 19. The pipes 15 and 19 respectively contain solenoid valves 20 and 21 both actuated by a switch 22.

Cooling fluid such as water is supplied by a pipe 23 through branch tubes 24 to the nozzles N, and returned through branch tubes 25 and return pipe 26.

Cutting oxygen is supplied by a pipe 27 through branch tubes 28 to the oxygen jets of the nozzles N. The pipe 27 contains a solenoid valve 29 actuated by a switch 30.

The nozzles N each comprise a preheat block 31 and a cutting oxygen block 32, each block being constructed as described in detail in Deck Patent No. 2,337,087. The preheat block 31 has a central bore 33 containing a baffle 34. The bore 33 receives preheat mixture from the blowpipe B, and delivers the mixture through a row of passages 35 sufficiently closely spaced to project the sheet of preheat flame P.

The cutting oxygen block 32 has a longitudinal bore 36 containing a baffle 37. The bore 36 receives cutting oxygen from the branch tube 28, and delivers the cutting oxygen through a row of passages 39 sufficiently closely spaced to project the cutting oxygen sheet O.

The preheat block 31 has a longitudinal side channel 40 for cooling medium, and the cutting oxygen block 32 has a similar longitudinal side channel 42. A third channel 43 is located between the blocks. As shown in Fig. 8, these channels are connected by transverse passages 44. Cooling medium such as water from the tube 24 flows through the passages 44, channels 40, 42, and 43 and out through the return tube 25.

In operation, the strip W delivered from the rolling step is arrested in a stationary position with respect to the nozzles, the slides 13 having been adjusted according to the spacing of the cuts desired. The switch 22 is closed to open simultaneously the solenoid valve 20 for preheat fuel and solenoid valve 21 for preheat oxygen, thus simultaneously projecting the sheets of preheat gases, which, when ignited, deliver sheets of preheat flames from the nozzle N against the respective bands on the strip W. After these bands have been heated to oxygen ignition temperature, the switch 30 controlling cutting oxygen is closed to open the solenoid valve 29 for the cutting oxygen, thus simultaneously projecting sheets of cutting oxygen against the preheated bands to pierce through the metal and simultaneously sever the strip at the several bands.

In the procedure shown in Fig. 2, the nozzle N is maintained stationary during the preheating and cutting steps, the preheat flame P being first projected against the strip W at an obtuse angle thereto in a vertical longitudinal plane, and the oxygen sheet O later projected against the preheated band at an angle inclined in the opposite direction. In the procedure shown in Fig. 3, the preheat flame P is first projected against the strip at a sharper angle, and the cutting oxygen sheet O is projected vertically at right angles to the strip. In Fig. 4 in the position shown in full lines, the nozzle is positioned below the strip W, and the preheat flame P is first projected vertically against the underside of the strip. The nozzle N is then moved to the position shown in dotted lines, to project the cutting oxygen sheet vertically against the underside of the preheated band.

What is claimed is:

1. Method of thermochemically severing thin flat metal strip, to separate a length of said strip from the remainder thereof which comprises directing against one surface of the strip a sheet of oxy-fuel preheat flame extending transversely of the strip for the full width thereof to heat a narrow transverse band of the metal to oxygen ignition temperature, thereafter directing a similar sheet of cutting oxygen against said preheated band in a plane intersecting the plane of said strip, and maintaining said cutting oxygen sheet so directed until it penetrates the metal of said preheated narrow transverse band on one side of said strip, pierces through the metal of the entire thickness and width of said strip, completely severs the length of said strip ahead of said preheated narrow transverse band from the length of said strip behind said narrow transverse band, and emerges at the other side of said strip between the severed edges of the separate lengths of said strip.

2. Method of thermochemically severing thin flat metal strip into separate lengths, which comprises simultaneously directing against one surface of the strip a plurality of longtudinally spaced rows of coplanar oxy-fuel jets transversely sufficiently closely spaced to project flat sheets of preheat flame extending for the full width of the strip in planes intersecting the plane of the strip to heat longitudinally spaced narrow transverse bands of the metal to oxygen ignition temperature, and thereafter simultaneously directing rows of coplanar cutting oxygen jets similarly spaced to project flat sheets of cutting oxygen against said preheated bands, and maintaining said rows of coplanar cutting oxygen jets so directed until said flat sheets of cutting oxygen penetrate the metal of said preheated narrow transverse bands on one side of said strip, pierce through the metal of the entire thickness and width of said strip, completely sever the length of said strip between adjacent narrow transverse bands from the lengths respectively ahead of and behind the same, and emerge at the other side of said strip between the severed edges of the separate lengths of said strip.

3. Method as claimed in claim 1, in which said sheets of preheat flame and cutting oxygen respectively are directed against the underside of the strip.

4. Method as claimed in claim 1, in which said sheets of preheat flame are directed against the strip at an obtuse angle in the vertical longitudinal plane of the strip, and said sheets of cutting oxygen are directed against the preheated band at right angles to the strip.

5. Method as claimed in claim 1, in which said sheets of preheat flame and cutting oxygen are projected by a double nozzle first positioned to project said sheets of preheat flame normal to the strip, and thereafter positioned to project said sheets of cutting oxygen normal to the strip and against said preheated band.

6. Method of thermochemically severing thin flat metal strip, which comprises directing against one surface of the strip a row of oxy-fuel gas jets sufficiently closely spaced to project a sheet of preheat flame extending the full width of the strip in a plane transverse to the strip to heat a narrow transverse band of the metal to oxygen ignition temperature, and thereafter directing against said band a row of cutting oxygen jets similarly spaced to project a sheet of cutting oxygen in a plane transverse to said strip but inclined thereto at an acute angle in a longitudinal plane and intersecting the plane of the preheating flame at said band to pierce through the metal and sever the strip.

7. Apparatus for thermochemically severing thin flat metal strip, which comprises supports for holding said strip stationary during the severing operation, means for directing against one surface of the strip a sheet of oxy-fuel preheat flame extending transversely of the strip for the full width thereof to heat a narrow transverse band of the metal to the oxygen ignition temperature, means for thereafter directing a similar sheet of cutting oxygen against said band to pierce through the metal and sever the strip,

and a support for holding said cutting oxygen sheet directing means stationary during the severing operation.

8. Apparatus for thermochemically severing thin flat metal strip into lengths, which comprises supports for holding said strip stationary during the severing operation, means for directing against one surface of the strip a plurality of longitudinally spaced rows of oxy-fuel jets transversely sufficiently closely spaced to project a sheet of preheat flame extending for the full width of the strip to heat longitudinally spaced narrow transverse bands of the metal to oxygen ignition temperature, means for thereafter directing rows of cutting oxygen jets similarly spaced to project a sheet of cutting oxygen against said preheated bands to pierce through the metal and sever the strip into lengths, and supports for holding said cutting oxygen jet row directing means stationary during the severing operation.

9. Apparatus as claimed in claim 7 in which said jet directing means comprise a double nozzle provided with respective rows of passages in planes converging at the preheat band on the strip.

10. Apparatus as claimed in claim 7, in which said jet directing means comprise a double nozzle provided with respective rows of passages, and a cooling chamber is provided between said rows of passages.

11. Apparatus for thermochemically severing thin flat metal strip, which comprises supports for holding said strip stationary during the severing operation, means for directing against one surface of the strip a row of oxy-fuel gas jets sufficiently closely spaced to project a sheet of preheat flame extending the full width of the strip in a plane transverse to the strip to heat a narrow transverse band of the metal to oxygen ignition temperature, means for thereafter directing against said band a row of cutting oxygen jets similarly spaced to project a sheet of cutting oxygen in a plane transverse to said strip but inclined thereto at an acute angle in a longitudinal plane and intersecting the plane of the preheating flame at said band to pierce through the metal and sever the strip and supports for holding said cutting oxygen jet row directing means stationary during the severing operation.

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