

Nov. 21, 1933.

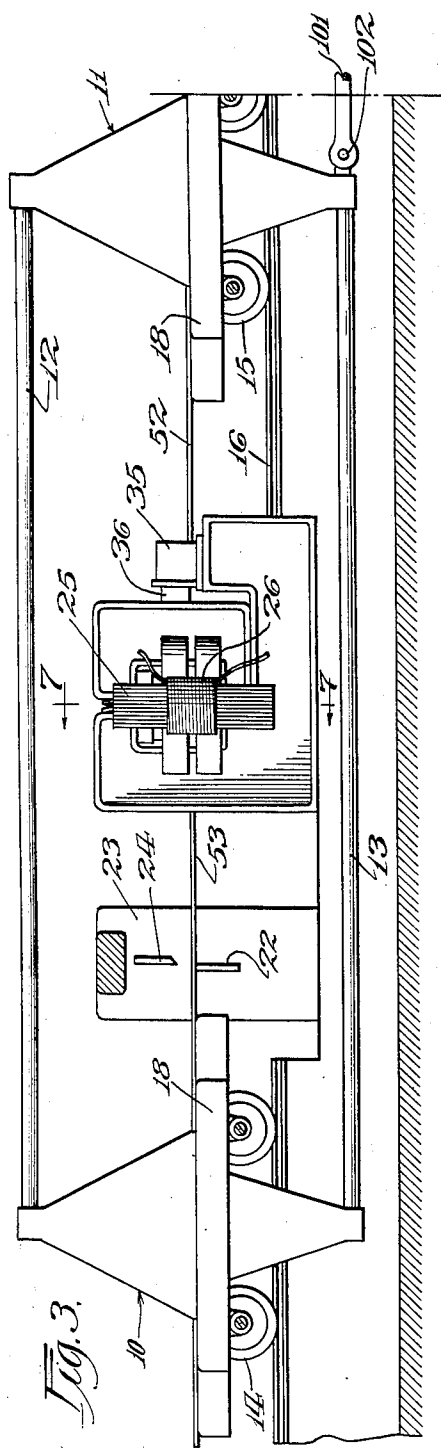
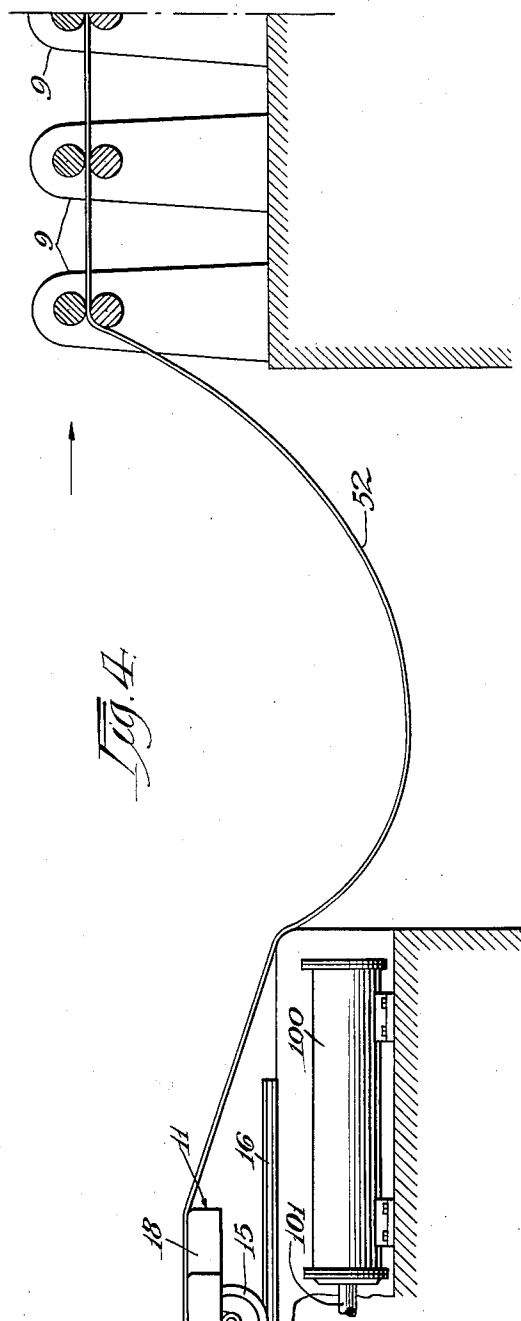
W. SYKES

1,936,314

APPARATUS FOR MANUFACTURING METAL STRIPS

Filed May 23, 1932

4 Sheets-Sheet 2



Inventor:
Wilfred Sykes
By Dycensforth, Lee, Christon & Wiles,
Attorneys.

Nov. 21, 1933.

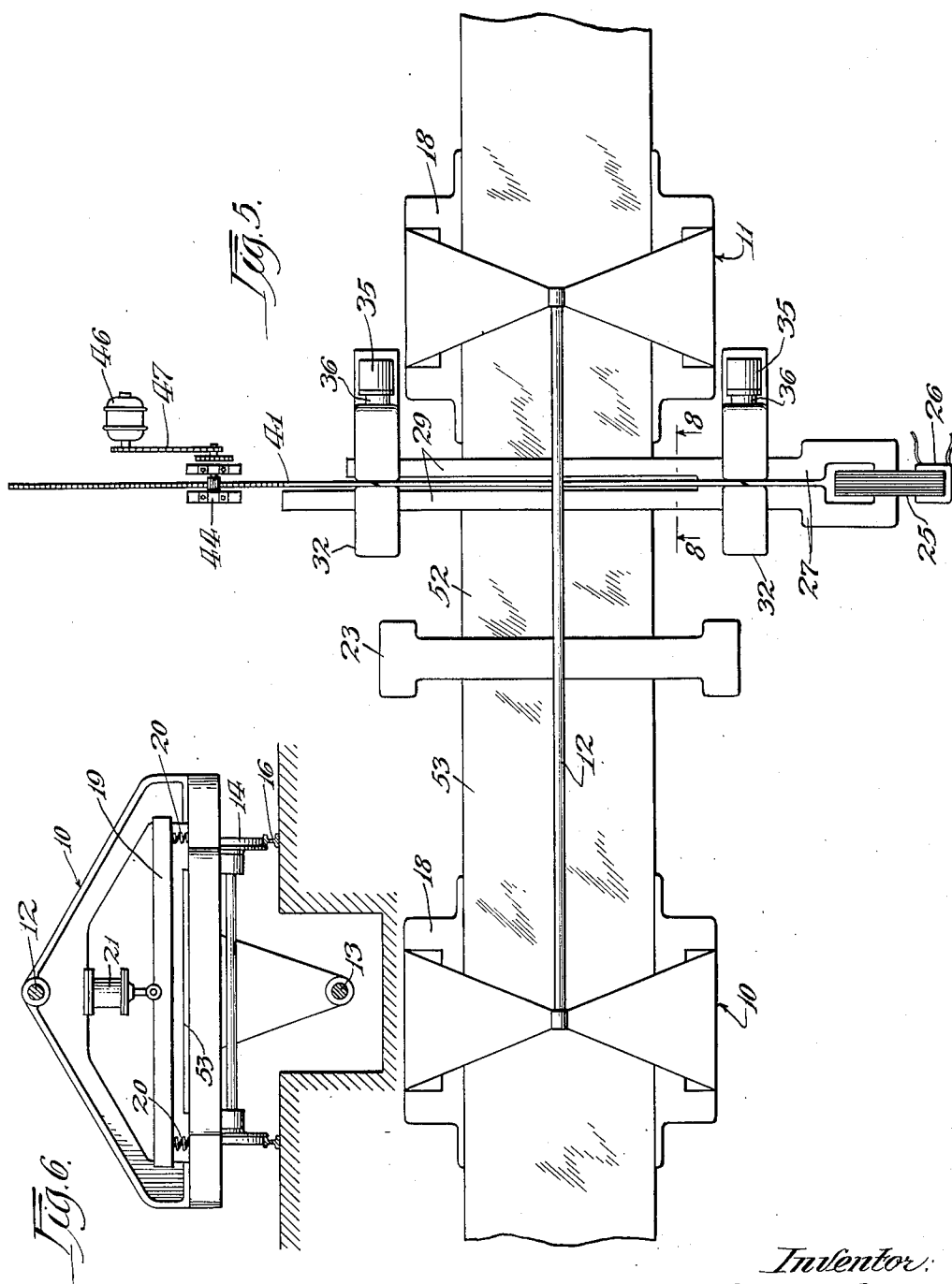
W. SYKES

1,936,314

APPARATUS FOR MANUFACTURING METAL STRIPS

Filed May 23, 1932

4 Sheets-Sheet 3



Inventor:
Wilfred Sykes,
By Dyrenforth, Lee, Critton & Wiles,
Attorneys.

Nov. 21, 1933.

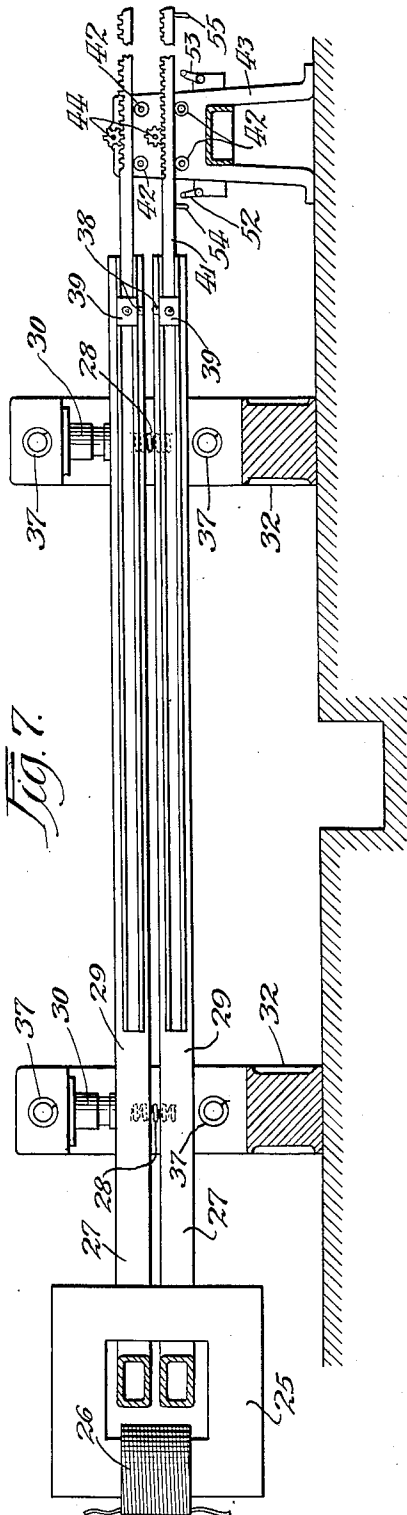
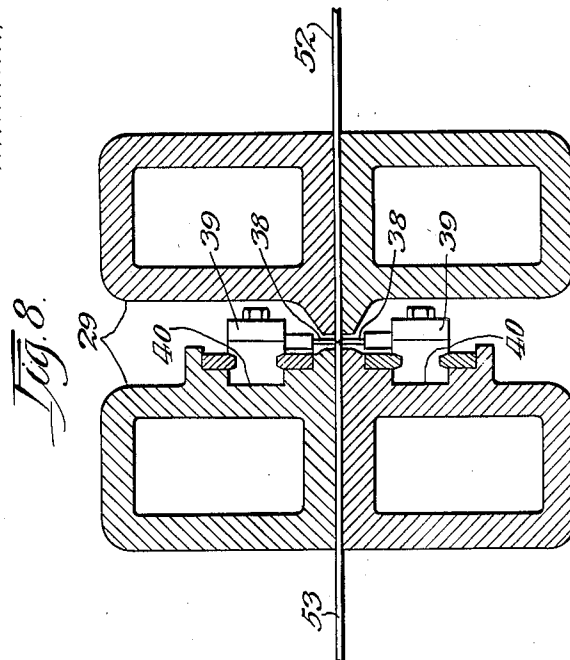
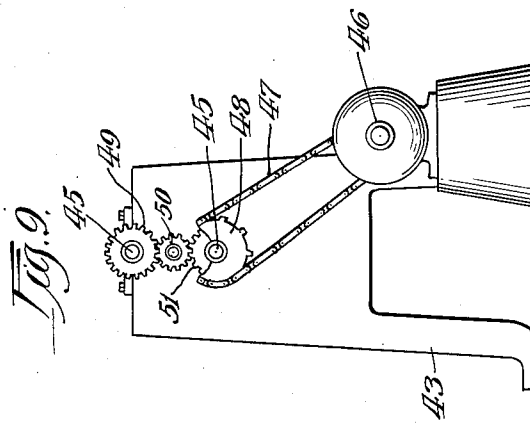
W. SYKES

1,936,314

APPARATUS FOR MANUFACTURING METAL STRIPS

Filed May 23, 1932

4 Sheets-Sheet 4



Inventor:
Wilfred Sykes,
By Dyrenforth, Lee, Critton & Wiles,
Attorneys.

UNITED STATES PATENT OFFICE

1,936,314

APPARATUS FOR MANUFACTURING METAL STRIPS

Wilfred Sykes, Chicago, Ill.

Application May 23, 1932. Serial No. 613,169

10 Claims. (Cl. 29—33)

My invention relates to machines for welding together the ends of strips and more particularly hot rolled strips preparatory to the cold rolling thereof to the desired gauge, this application being a division of my application for U. S. Letters Patent Serial No. 546,889, filed June 25, 1931.

In the practice of manufacturing cold rolled strip the strip is first rolled on a mill in heated condition producing a strip say of about one-sixteenth inch thickness and several hundred feet long forming what is commonly known as a coil. This hot-rolled strip is subsequently commonly processed, as by pickling, and then cold rolled to the final gauge, following which it may be annealed and further processed as well known in the art.

In accordance with common practice the coils are severally and in succession introduced into the cold rolling mill, thus necessitating the separate threading of each strip into the cold rolling mill involving considerable loss of time especially when the mill comprises a plurality of stands in tandem as is the common practice and through which the entering end of each strip is required to be threaded.

Furthermore, when the cold-rolling mill comprises a plurality of stands arranged in tandem it is necessary, in the rolling of the strip, that a certain tension be maintained on the strip between the different stands to insure the rolling of the strip throughout its length, to the desired uniform gauge, and as is obvious the end portion of each coil will not be rolled to the same thickness as the remaining portions but will be thicker and thus uniformity throughout the strip not be maintained and as this occurs with each strip when separately introduced into the stands, loss inevitably results.

In this connection one of my objects is to avoid the objections above noted and insure the rolling of the strip material to a uniform gauge throughout its length, and increase the production of useful product from the hot rolled strip.

Another object is to provide a machine whereby preferably without disturbing the continuity of the cold-rolling operation, the hot-rolled strips may be welded together suitably for rendering the feeding of the strip material through the stands as an unbroken strip of indefinite length as distinguished from the feeding of the hot-rolled strips separately and in succession into the cold rolling mill; and other objects as will be manifest from the following description.

Referring to the accompanying drawings:
Figure 1 is a view in side elevation, with cer-

tain parts sectioned, of a portion of equipment embodying my invention.

Figure 2 is a similar view of another portion of the equipment including a cold rolling mill, the structure of this figure being a continuation of the structure shown in Fig. 1, the parts shown in these figures being illustrated as in one of the positions assumed thereby in the operation of the equipment.

Figures 3 and 4 are views like Figs. 1 and 2 of the respective structures shown therein illustrating another position occupied by the parts in the operation of the equipment.

Figure 5 is a broken plan view of the structure shown in Figs. 1 and 3.

Figure 6 is a section taken at the line 6 on Fig. 1 and viewed in the direction of the arrow.

Figure 7 is a section taken at the line 7 on Fig. 3 and viewed in the direction of the arrows.

Figure 8 is an enlarged sectional view taken at the line 8—8 on Fig. 5 and viewed in the direction of the arrows; and

Figure 9, a view in side elevation of a portion of planing mechanism forming a part of the equipment.

The equipment shown comprises a cold-rolling mill formed of a plurality of roll-stands 9, certain ones only of which are shown, and arranged in tandem in accordance with common practice, and apparatus for butt-welding the hot rolled strips in end to end relation for delivery as a continuous strip to the stands.

The apparatus referred to comprises two carriages 10 and 11 rigidly connected together in spaced apart relation by rods 12 and 13 and supported at suitable wheels 14 and 15, respectively, on tracks 16 and 17, respectively, along which they are moved under the control of the operator as by means of piston and cylinder mechanism, the cylinder of which is stationary and represented at 100 and the stem of the piston thereof at 101, the stem being connected with the rod 13 at 102. The cylinder would be connected in any desirable way with a source of fluid pressure (not shown) for moving the structure comprising the carriages 10 and 11 along the tracks desired.

The carriages 10 and 11 are each provided with a clamping plate located above the solid platform portion 18 of the carriage and adapted to be forced downwardly, against the resistance of springs, into clamping engagement with the strip material extending across the platform, as by means of fluid pressure operated piston and cylinder mechanism, the clamping plate, springs

and cylinder and piston mechanism for the carriage 10 being represented at 19, 20 and 21, and the cylinder of the mechanism 21 in practice being connected in a manner not shown but as will be readily understood, by means of valve-controlled pipe connections with any suitable source of fluid pressure. It will thus be understood that the clamping plates for the carriages 10 and 11 are separately operable for the purpose hereinafter described.

Positioned between the carriages 10 and 11 is shear mechanism provided for shearing the rear end of the forward strip and the front end of the rearward strip in lapped relation as hereinafter described, this mechanism shown somewhat diagrammatically, comprising a lower blade 22 rigidly supported at its ends in the side members of a frame 23 and across which the strip material extends and a vertically slidable blade 24 operated in any desirable way and forwardly offset relative to the lower blade 22, these blades cooperating to effect the shearing of the strip material between them when the blade 24 is lowered. The purpose of the shear mechanism is to cut through the lapped ends of the strips whereby these ends are cut squarely and evenly and are thus perfectly matched permitting them to accurately fit in endwise contact during the welding operation hereinafter described.

Positioned between the carriages 10 and 11 and located forward of the shearing mechanism is apparatus for butt-welding the adjacent ends of the strips operated on by the shearing mechanism, this apparatus being shown as arranged as a transformer comprising a laminated core 25 of hollow rectangular shape provided with a primary winding 26 having a relatively large number of turns the terminals of which would be connected with any suitable source of electric current supply, and a pair of normally open secondary loops, or turns, 27 shown as formed of tubular metal construction and through which parallel currents flow. The secondary loops or turns 27 which are normally held vertically spaced by springs 28 interposed therebetween comprise relatively long extensions 29 adapted to receive the strip material between them, and clamp it at its opposite sides, the lower extensions 27 engaging the underside of the strip material and the upper extensions 27 being forced downwardly against the upper surface of the strip material to effect the clamping action, as by fluid pressure operated piston and cylinder mechanism 30, which would be supplied with operating pressure from any suitable source through valve controlled pipe connections.

One of the extensions 29 of the upper loop, or turn, 27 and the adjacent extension 29 of the lower loop, or turn, 27 extend into recesses 31 in stationary heads 32 arranged at opposite sides of the apparatus, and the other extensions 29 of these loops, or turns, extend into recesses 33 in slidably supported heads 34 (Fig. 1), the bottoms of the recesses 31 and 33 forming seats for the lower extensions 29 and against which they are pressed in the clamping operation above referred to.

The secondary turns, or loops, 27 being clamped against the strip material, the latter completes the circuit for each turn or loop and as the cross sectional area of the strip material is relatively small as compared with the cross-sectional area of the metallic parts of the loops, or turns, 27, it will be readily understood that a current of sufficient magnitude may be caused to flow

through the strip ends for fusing the abutting ends thereof.

In the operation of welding strips it is necessary to press them endwise together during the fusing operation and this is effected by forcing the heads 34 in a horizontal direction toward the heads 33 while maintaining the loop extensions 29 in clamped engagement with the strip ends. This is provided for in the particular construction shown by fluid pressure operated piston and cylinder mechanisms the cylinders 35 of which are rigidly connected with the heads 32 and the pistons 36 thereof with the movable heads 34, springs 37 interposed between the heads 32 and 34 operating to normally hold these heads in the spaced apart relation shown in Fig. 1.

In the operation of welding the strips burrs are formed on the upper and lower surfaces of the joints and as it is desirable that these be removed before the welded joints reach the rolling stands 9, means are provided for this purpose the means shown comprising planer knives 38 located above and below, respectively, the strip material in alinement with the plane in which the weld is effected, these knives, which are movable crosswise of the strip material and thus lengthwise of the joint, being supported in blocks 39 slidable in horizontal guides 40 on those of the extensions 29 which project into the recesses 31.

The blocks 39 are connected with rack bars 41 supported on rollers 42 on a stand 43 and meshing with pinions 44 fixed on shafts 45 driven in the same direction by a reversible motor 46 connected by a sprocket wheel 47 with a sprocket 48 on one of the shafts 45, the other shaft 45 being driven by a pinion 49 meshing with an idler pinion 50 in turn meshing with a pinion 51 on the lower shaft 45.

The motor 46 is equipped with limit switches 52 and 53 such as are commonly known in the art and alternately operated to stop the motor 46 at the ends of the desired movements of the bars 41 first in one direction and then in the other, by suitably located tappets 54 and 55 on the lower rack bar 41. In the operation of this mechanism the operator closes the circuit of the motor 46, and assuming the mechanism to be in the condition shown in Fig. 1, the bars 42 are moved to the left in this figure to carry the planer knives 38 beyond the left-hand edge of the strip material, the engagement of the tappet 55 with the limit switch 53 breaking the motor circuit. To reverse the movement of the bars 41 to plane off the burr referred to the operator closes the circuit for operating the motor in a reverse direction which moves the bars 41 to the right in Fig. 1, the motor continuing to thus operate until the tappet 54 engages the limit switch 52, the knives 38 having moved beyond the right-hand edge of the strip material whereupon the motor stops.

In the use of the apparatus, as the strip being rolled in the mill, comprising the stands 9, and represented at 52, nears the end of its movement therein, the next strip to be rolled and represented at 53 and which may be still hot from the hot rolling operation, is introduced at its forward end into the carriage 10 to extend in a position in which it laps the rear end of the strip 52, and the strips 52 and 53 then clamped to the carriages 10 and 11, respectively, by actuating the piston and cylinder mechanisms 21.

The carriages 10 and 11 are then advanced to the right in Fig. 1 by actuating the piston and cylinder mechanism 100 and 101 to a position

in which the lapped portions of the strips 52 and 53 aline with the shear mechanisms 23 which is then operated to shear these portions of the strips at right angles to the length thereof. The carriages 10 and 11 are then further advanced to the right in Fig. 1 to a position in which the adjacent ends of the strips 52 and 53 extend into the position shown in Fig. 8 relative to the secondary loops 27, and the upper extensions 29 of these loops then clamped down on the strips 52 and 53 as shown in Fig. 8, by actuating the piston and cylinder mechanisms 30.

The strips being positioned as stated current is supplied to the primary 26 of the welding mechanism, thereby inducing a current in the secondary comprising the loops, or turns 27, and when the strip ends reach the proper welding temperature, the strip 52 is forced endwise into continuing pressure contact therewith during the fusing of the metal to insure a proper weld, this being effected by actuating the piston and cylinder mechanisms 35 and 36 to force the heads 34, and therefore the extensions 29 clamping the strip 52, to the left in Fig. 1, the current being continued until the desired weld has been effected, it being understood that preliminary to the shifting of the strip 52 during the welding operation, as above set forth, the clamping means on the carriage 11 is released.

The burr thus formed at the top and underside of the welded joint between these strips is then removed while the strip ends are still hot, by actuating the planing mechanism above described to cause the strip material, comprising the united strips, to be of uniform thickness throughout.

Following the burr-removing operation the secondary loop clamping-portions 29 and the clamp of carriage 10, are released to free the strip material formed of the united strips, which continues to feed to the mill 9 as a continuous strip of uniform thickness. As the rear end of the strip nears the mill 9 another strip is welded thereto as above described, and the welding of successive strips continued, so that the mill 9 may be continued in uninterrupted operation, rolling the strip material to the uniform gage throughout.

It will be understood that inasmuch as the mill 9 by preference is operated without interruption, the rear end portion of the strip material being operated on by the mill 9 is manipulated by the operator at the portion thereof between the carriage 11 and the mill 9 prior to the introduction of the next strip into end-lapping relation thereto and the clamping of the strips to the carriages, into sufficiently slackened condition to permit of the operations of shearing and welding the strips and removing the burr without exerting objectionable tension on the portion of the strip material which is in the mill 9.

While I have illustrated and described a particular construction of apparatus embodying my invention, I do not wish to be understood as intending to limit it thereto as the same may be variously modified and altered without departing from the spirit of my invention.

I claim:

1. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip, and clamping means for clamping both of said strips movable toward and away from said mill

for positioning said strips relative to said welding means.

2. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip, and a carriage having clamping means for clamping both of said strips, and movable toward and away from said mill for positioning said strips relative to said welding means.

3. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip, and a carriage having a plurality of independently operable clamping means for clamping both of said strips and movable toward and away from said mill for positioning said strips relative to said welding means.

4. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip, and clamping means for clamping both of said strips and between which said welding means are located, said clamping means being movable toward and away from said mill for positioning said strips relative to said welding means.

5. Apparatus for cutting and welding strip material comprising cutting mechanism, welding mechanism, and means operative to clamp strips to be welded, in lapped position for cutting of said lapped portions by said cutting mechanism, said mechanisms and said means being relatively movable for presentation of said cut strips while clamped by said means, to said welding mechanism.

6. Apparatus for cutting and welding strip material comprising cutting mechanism, welding mechanism, means operative to clamp strips to be welded, in lapped position for cutting of said lapped portions by said cutting mechanism, said mechanisms and said means being relatively movable for presentation of said cut strips while clamped by said means, to said welding mechanism, and means whereby said strips are forced endwise toward each other during the welding thereof.

7. Apparatus for cutting and welding strip material comprising cutting mechanism, welding mechanism, and carriage mechanism having clamping means for clamping adjacent ends of lapped strips and operative to move said strips while clamped from said cutting mechanism to said welding mechanism.

8. Apparatus for cutting and welding strip material comprising cutting mechanism, welding mechanism, and carriage mechanism having a plurality of independently actuated clamping means for clamping adjacent ends, respectively, of lapped strips and operative to move said strips, while clamped, from said cutting mechanism to said welding mechanism, said welding mechanism having means for forcing said strips endwise toward each other during the welding thereof.

9. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip and comprising means whereby said strips are forced endwise toward each other during the welding thereof, and clamping means for clamping both of said strips movable toward and away

from said mill for positioning said strips relative to said welding means.

10. Apparatus for the purpose set forth comprising a rolling mill for strip material, welding means for welding the rear end of a strip while in said mill and the forward end of another strip and comprising means for clamping the strips

and means whereby said strips are forced endwise toward each other during the welding thereof, and clamping means for clamping both of said strips movable toward and away from said mill for positioning said strips relative to said welding means.

WILFRED SYKES.

10

85

15

90

20

95

25

100

30

105

35

110

40

115

45

120

50

125

55

130

60

135

65

140

70

145

150