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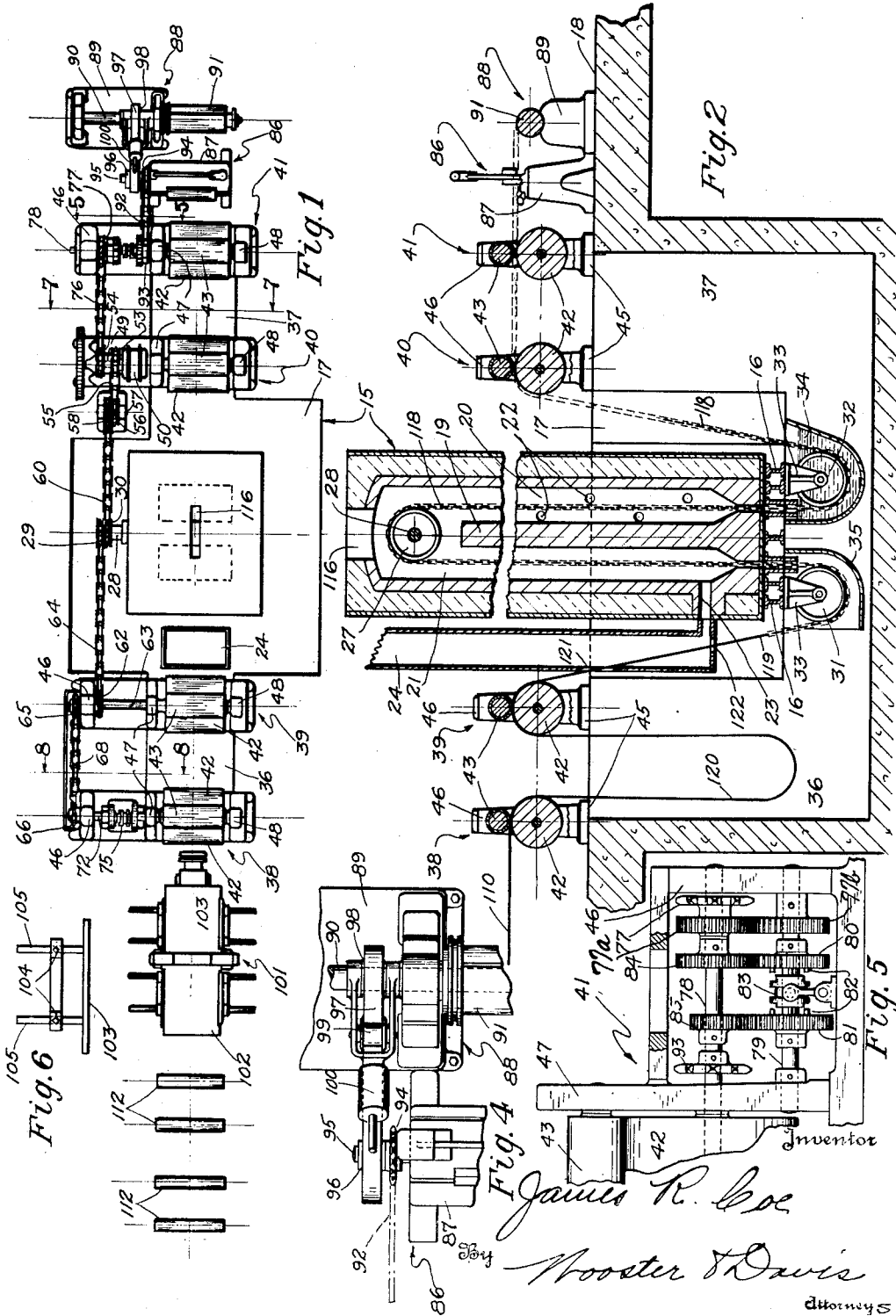
J. R. COE

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FURNACE FOR AND METHOD OF CONTINUOUSLY ANNEALING STRIP METAL

Filed Sept. 28, 1932

3 Sheets-Sheet 1



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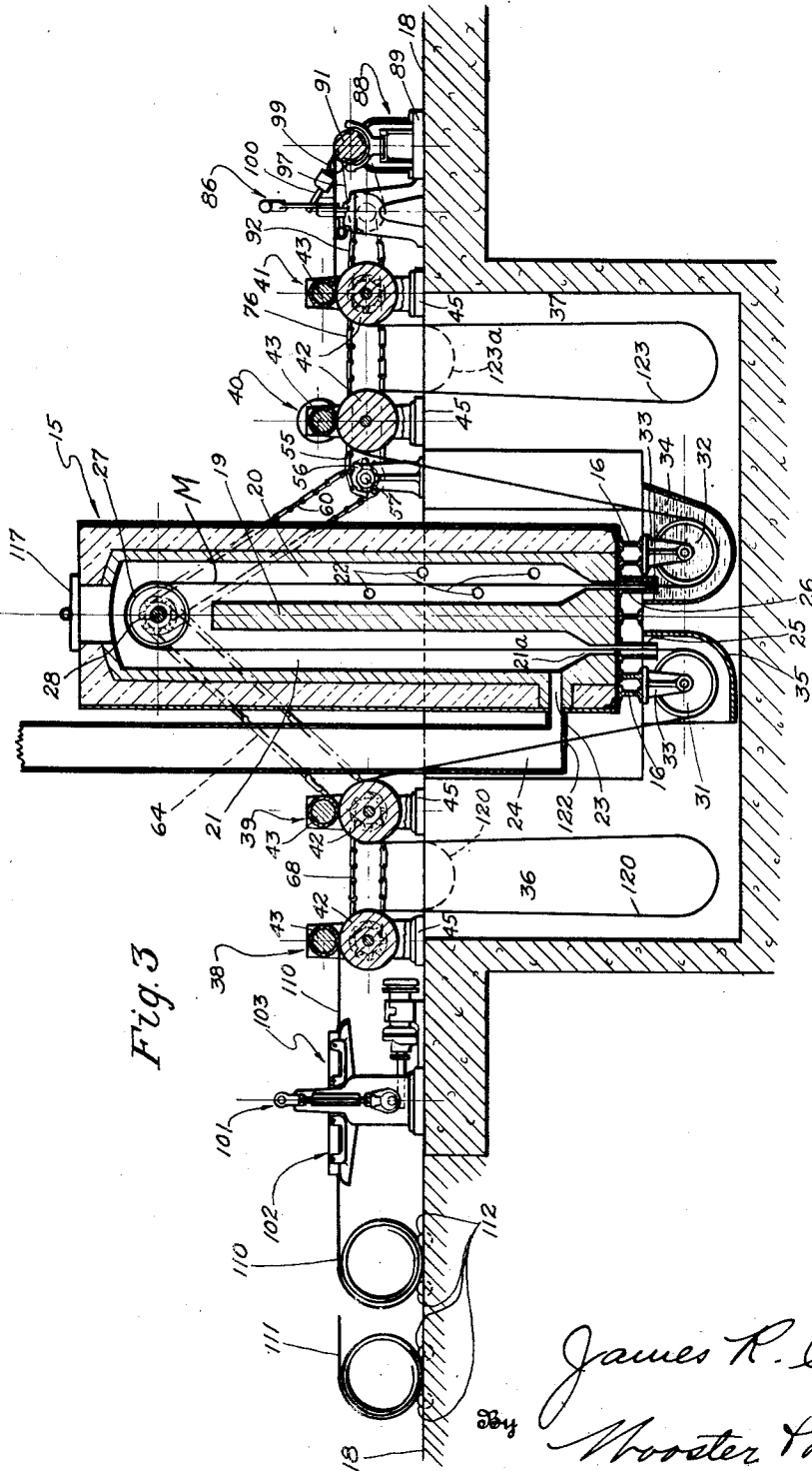
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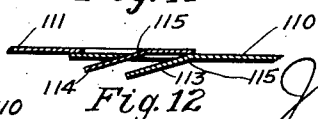
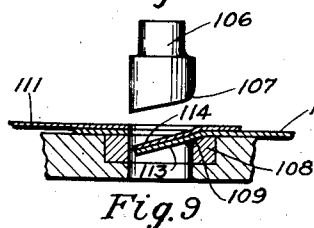
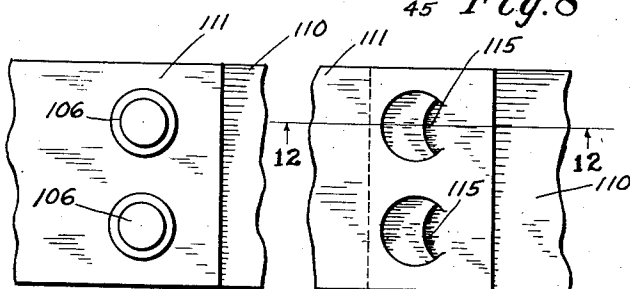
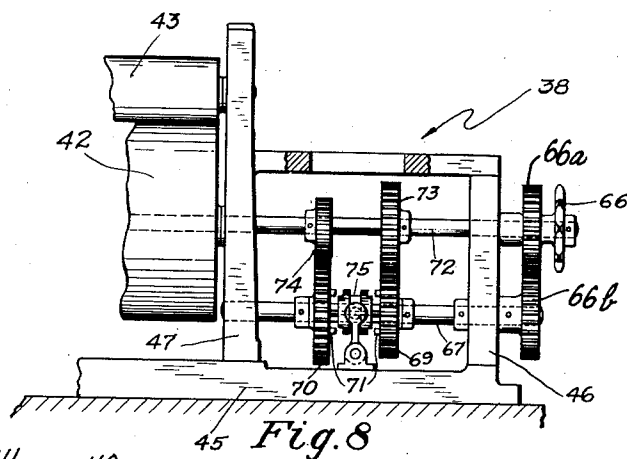
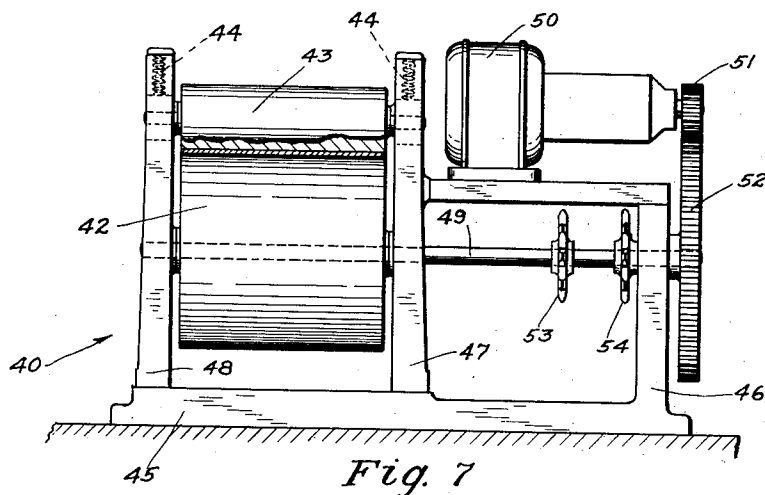
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FURNACE FOR AND METHOD OF CONTINUOUSLY ANNEALING STRIP METAL

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3 Sheets-Sheet 3



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FURNACE FOR AND METHOD OF CONTINUOUSLY ANNEALING STRIP METAL

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Application September 28, 1932
Serial No. 635,215

16 Claims. (Cl. 266—3)

This invention relates to new and useful improvements in annealing, and has particular relation to a means for and a method of continuously annealing strip metal.

6 An object of the invention is to provide a method and means whereby metal in strip form may be accurately and uniformly annealed.

Another object is to provide an apparatus for the purpose stated, and including means for joining or connecting the front end of one strip of metal to the tail end of the preceding strip, whereby the strips may be fed continuously to the furnace, and whereby each strip serves to thread the succeeding strip through the furnace.

15 A further object is to provide an annealing apparatus including means whereby metal strips may be readily connected end to end, a furnace, means for continuously feeding the connected strips through the furnace, and means for disconnecting or severing the annealed strips after they leave the furnace.

Another object is to provide an apparatus as stated and including an arrangement permitting the movement of metal to be stopped at the connecting and disconnecting means during the connecting and disconnecting operation, while at the same time a continuous feed of the metal through the furnace is maintained.

25 An additional object is to provide a method of annealing strip metal wherein the strips to be annealed are joined end to end, fed continuously through a furnace and then separated.

A further object is to provide an improved means and method of connecting the ends of lengths of strip metal stock.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings:

Fig. 1 is a top plan view of a complete apparatus in accordance with the present invention;

50 Fig. 2 is a vertical sectional view through a portion of the apparatus illustrating the initial loading or starting operation;

Fig. 3 is a vertical sectional view through the complete apparatus;

55 Fig. 4 is a top plan view on an enlarged scale,

illustrating the drive for the winding roll of the apparatus;

Fig. 5 is a detail sectional view showing a drive employed, the section being substantially on line 5—5 of Fig. 1;

Fig. 6 is a detail view on an enlarged scale illustrating a guide for the work;

Fig. 7 is a detail sectional view taken substantially along the line 7—7 of Fig. 1;

Fig. 8 is a somewhat similar view taken substantially along the lines 8—8 of Fig. 1;

Fig. 9 is a detail view partly in side elevation and partly in section illustrating a suggested and improved means for connecting the front end of one strip to the tail end of a preceding strip;

Fig. 10 is a top plan view of the means of Fig. 9;

Fig. 11 is a top plan view showing the end portions of two strips connected according to the present invention; and

Fig. 12 is a detail sectional view taken substantially along the line 12—12 of Fig. 11.

In the accompanying drawings, at 15 is indicated a furnace shown as comprising a vertically disposed brick lined box mounted on I-beams or other suitable supports 16 arranged within a pit 17 of the desired depth, and the top of the furnace may extend to any desired height above the floor level indicated at 18. A brick wall or the like 19 is arranged vertically in the furnace and divides the latter into a combustion or heating chamber 20 and a pre-heating chamber 21, the said chambers being in communication at the upper end of the furnace above the dividing wall 19.

Chamber 20 is shown as heated by oil or gas burners 22 projecting into apertures in the side walls of the furnace, and these burners are preferably arranged in a zig-zag or staggered relation whereby alternate burners supply heat to the same side of the metal strip M being treated. The heat generated by the burners passes upwardly to the top of the combustion chamber 20 and will then flow downwardly through the pre-heating chamber 21 and will pass outwardly through a flue aperture 23 to a stack 24 arranged vertically at one side of the furnace and extending to any desired or required height.

An entrance opening 21a is provided at the lower end of the pre-heating chamber 21 and about this opening there is disposed a guide box 25 which may be of the same construction as the guide box 26 disposed about the exit opening at the lower end of the combustion and heating chamber 20. Within the upper end of the furnace directly above the dividing wall 19 there

is mounted an alloy steel drum or pulley 27, the shaft 28 of which extends through bearings mounted in the side wall of the furnace, and at its outer end this shaft carries driving chain sprockets 29 and 30.

Mounted in the pit 17 below the furnace 15 are a pair of similar drums or pulleys 31 and 32 preferably mounted in anti-friction bearings carried in brackets 33 suspended from the I-beams 16 on which the furnace is supported. The pulley 31 is shown as exposed to the atmosphere, while the pulley 32 is disclosed as being submerged in water in a tank 34, and the water level in this tank is preferably kept at such height that the lower end of the guide box 26 is submerged and the heating and combustion chamber 20 thus sealed. Pulley 31 is partially enclosed by a sheet metal guide or guard means 35, and if desired, this means may be in the form of a tank adapted to receive water to seal the lower end of the guide box 25. Preferably, the pit 17 is of such size as to provide for access to the drums or pulleys 31 and 32, and the pit includes front and rear extensions 36 and 37 the purpose of which will later be fully described.

Mounted on the floor above the pit are four stands of feed rolls generally designated 38, 39, 40 and 41 respectively. Each stand includes a relatively large driven lower roll 42 and a small idle rubber covered upper roll 43 held in contact with the lower or bottom roll as by means of springs 44. (See Fig. 7). Additionally, each stand includes a base portion 45 carrying suitable uprights or housings 46, 47 and 48, and the upper and lower rolls 42 and 43 may be mounted between the housings 47 and 48.

The large or lower roll 42 of the stand 40 is mounted on a shaft 49 extending through and having bearing in each of the housings 46, 47 and 48. Mounted on the stand 40 is a variable speed motor 50 on the shaft of which is carried a relatively small gear 51 meshing with and driving a larger gear 52 (see Fig. 7) secured to the shaft 49 carrying the roll 42. It will now be apparent that the motor 50 is adapted to drive the shaft 49 and thus the roll 42 of stand 40.

Secured to the shaft 49 are a pair of sprocket wheels 53 and 54, the former of which operating through a sprocket chain 55 drives a sprocket 56 on a jack shaft 57 which shaft also carries a sprocket 58. Trained over the sprocket 58 and the sprocket 30 on the pulley shaft 28 is a sprocket chain 60 and through this sprocket chain sprocket 58 when driven is adapted to transmit motion to the shaft 28 and the drum or pulley 27 thereon. Trained over the sprocket 29 on shaft 28 and over a sprocket 62 on the shaft 63 of the roll stand 39 is a sprocket chain 64. The chain 64 operating through sprocket 62 drives the shaft 63 and it will be understood that said shaft mounts the large or bottom roll 42 of the stand 39. It will now be understood that while the motor 50 is operating the rolls 42 of the stands 39 and 40 and the pulley or drum 27 of the furnace are all driven at the same speed.

On the outer end of the shaft 63 a sprocket 65 is mounted and trained over this sprocket and a sprocket 66 loosely mounted on the outer end of a shaft 67 of the feed roll stand 38, is a sprocket chain 68. This arrangement serves to transmit motion from the shaft 63 to the shaft 67 through the spur gear 66a driven by sprocket 66 and the gear 66b secured to shaft 67 and of the same size as gear 66a. Shaft 67 extends through suitable

bearings on the frame, and turnable on said shaft is a relatively small gear 69 and a relatively large gear 70 each carrying portions 71 of a clutch. Parallel with and above the shaft 67 the stand carries a shaft 72 on which is secured a gear 73 meshing with and the same size as the gear 69 above mentioned, and a gear 74 of smaller diameter meshing with the above mentioned gear 70. The gears 73 and 74 are secured to the shaft 72 which carries a large roller 42 and splined to the shaft 67 between the gears 69 and 70 is a clutch element 75 operated by any suitable manually operated shifting means not shown.

As will be clear from Fig. 8, the clutch 75 may be shifted from a neutral position into a position to clutch either of the gears 69 and 70 to the shaft 67 whereby the clutched gear will be turned with the shaft. When the clutch element 75 connects gears 69 with the shaft 67 the said gear will drive gear 73 and thus the shaft 72 and the roll 42 will be driven at one speed which is the same as the speed of the sprocket 66 and the roll stand 39. When gear 70 is clutched to the shaft 67 the drive of shaft 72 will be through the gear 74 and owing to the different gear ratio will be at a greater speed. In the present instance the second speed is about twice the first or normal speed. From the foregoing it will be understood that the feeding roll of stand 38 may be driven at the same or greater speed than the rolls of the stands 39 and 40 or may be stopped while the latter two rolls continue in operation.

A sprocket chain 76 is trained over the sprocket 54 on shaft 49 and over a sprocket 77 loose on a shaft 78 (see Fig. 5) on the stand 41. This shaft 78 carries the feed roll 42 of stand 48 and below this shaft is a shaft 79. A spur gear 77a secured to sprocket 77 meshes with a gear 77b of the same diameter and secured to shaft 79. Turnable on the shaft 79 are a pair of gears 80 and 81 each carrying a clutch element 82 whereby the said gears may be selectively clutched to the shaft by means of a clutch element 83 splined on the shaft. The gear 80 meshes with a gear 84 of the same diameter secured to the shaft 78 while the gear 81 meshes with a gear 85 of smaller diameter also secured to said shaft. Clutch element 83 may occupy a neutral position or it may be shifted by suitable manual means (not shown) to have the shaft 78 and its roll 42 driven at the same or a greater speed than the rolls 42 of the stands 39 and 40. Preferably the gears 81 and 85 are so proportioned as to drive the roll 42 at twice the normal feeding speed.

Beyond the roll stand 41 there is arranged a shear 86 of any standard construction including a support 87, and beyond the shear 86 there is arranged a winder or coiler 88 which likewise may be of a standard construction. Winder 88 includes a support 89 mounting a shaft 90 carrying a winding drum 91. A sprocket chain 92 is trained over a sprocket 93 on the shaft 78 and over a sprocket 94 (Fig. 4) on a shaft 95 supported by the shear frame 87. Also, on the shaft 95 is a pulley 96 over which is trained a belt 97 serving to transmit power from pulley 96 to a pulley 98 on the shaft 90 of the winder. An idler 99 carried by a counter-weight means 100 serves to regulate the tension of the belt 97. It will now be understood that the winder is driven only when the roll of stand 41 is driven and at substantially the same speed as said roll. This results from the fact that the winder is driven by the sprocket 93 on the shaft 78 of said roller.

Arranged forwardly of the feed roll stand 38

is a punch press 101 of any standard type and guide tables 102 and 103 are arranged one at each side of said press and extend a considerable distance in the front and rear of the press.

Each guide table carries a pair of adjustable guides 103 adapted to be secured in adjusted position by set screws or the like 104 arranged to clamp the arms 105 of the guides. The guides are, of course, adjustable toward and from one another and their function is to properly guide metal strips to insure that the edges of said strips will be in alignment.

The punch press 101 is equipped with a row of punching or lancing tools 106 preferably spaced approximately three inches apart and extending for the length of the die bed and press gate. Each of these tools comprise a circular shearing punch from which a certain portion of the cutting edge is omitted or removed by filing as indicated at 107 in Fig. 9. The lower surface of each punch is inclined as shown and these punches are adapted to co-operate with circular shearing dies 108 from which a certain portion of the cutting edge has been omitted or removed as at 109.

The complete operation of the machine will later be given but here it is thought that the function of the punch press should be set forth. This press is used to connect the forward or front end portion of one strip of metal, to be annealed, with the rear or tail end portion of the immediately preceding strip, whereby said preceding strip will feed or guide the second strip through the furnace. The metal to be annealed will be delivered to the furnace in coils of comparatively short length. Two strips of metal in the form of coils are indicated at 110 and 111 in Fig. 3, and these coils are mounted on suitable supporting rolls 112. As the end of the strip 110 is reached or when the end of this strip is reached the forward end of strip 111 is disposed on the tail end of the strip 110 as shown in Fig. 10 and the punch press is operated to partially lance and press downwardly a portion 113 of the strip 110 and a portion 114 of the strip 111.

Since the tools are cut away as at 107 and 109 the depressed portions will remain connected with the strips from which they are pressed as by neck portions 115. After the strips have been treated as described the strip 110 will be fed forwardly and the downwardly depressed portion 114 of strip 111 will be disposed through an opening in the strip 110 and the two strips connected. That is, the strips will be connected since as strip 110 moves forwardly relative to strip 111 the neck portion 115 securing the depressed portion 114 to strip 111 will be engaged. It will be understood that the desired number of these punchings may be made and the number will, of course, vary with the width of the stock being treated.

In its upper end the furnace is provided with a slot 116 normally closed as by a cover 117 and in the regular operation of the apparatus after the furnace has been brought to the desired temperature a light alloy steel chain 118 (Fig. 2) is dropped through the slot 116 in such a manner that one end of the chain passes downwardly through the heating chamber 20 into the water tank 34 and this end of the chain is connected with the winder 88. The other end of the chain is dropped through the pre-heating chamber 21 into the guide 35 and is connected with the front

end of the strip 110 in any suitable manner as at 119, Fig. 2.

It will be noted that the chain has been passed about the pulleys 28, 31 and 32 and through the feed rolls of the stands 40 and 41 to the winding device. The strip 110 has been threaded through the feed rolls of the stands 38 and 39 and has had a loop 120 formed in it, the said loop being disposed in the pit extension 36 above which the stands 38 and 39 are located. Also, the strip has been threaded through a portion of the stack 24 entering the same as at an opening 121 and leaving as through an opening 122. When the device is threaded up as described the motor 50 may be started and the chain will be drawn through the furnace and may be wound on the device 88 and then put away until it is again necessary to thread the machine. During its movement the chain will draw the strip 110 and the said strip will be threaded through the furnace and formed into a coil by the winding device 88.

The loop 120 having been formed, when the end of strip 110 is reached the clutch element 75 is shifted into neutral position so that there is no further feeding of the strip by the rolls of the stand 38. The clutch 75 is shifted when the tail end of the strip is in the punch press 101 and the forward end of strip 111 is then disposed on the tail end of strip 110 and the punch press operated to join these over-lapping ends as above described. Although the feeding movement of the tail end of strip 110 is arrested during this joining or connecting operation the feed of the strip through the furnace continues as the slack represented by the loop 120 continues to supply metal to the furnace.

After the ends of a pair of strips have been connected as described the clutch element 75 is shifted to engage gear 70 so as to have the rolls of stand 38 operated at greater than their normal speed to replenish the loop 120, preferably at about twice the normal speed. When the loop is replenished the clutch element is again shifted to engage gear 69 so as to have the rolls of stand 38 driven at their normal speed which speed is the same as that of the other feeding means of the machine.

The progress of the strip through the furnace will it is believed be apparent. The strip passes about the drum 31 and through the guide box 25 into and upwardly through the pre-heating chamber 21. Passing around the drum or pulley 27 the strip moves downwardly through the heating and combustion chamber 20 passing between the staggered burners 22. At the lower end of chamber 20 the strip passes outwardly through the guide box 26 and about the drum 32, being submerged in the water of tank 34, and is then carried upwardly and through the feed rolls of stand 40 from which it passes to the rolls of stand 41 and thence through the shearing means 86 to the winding means 88.

When a joint between two strips reaches the shearing device 86 the clutch element 83 is shifted into its neutral position stopping the feed through the rolls of stand 41. This action also results in stoppage of the winding device. While the feed is thus stopped the shearing device is operated to cut the first strip immediately forwardly of the joint and the second strip immediately in the rear of the joint. Owing to this arrangement the annealed strips may be taken from the machine in coils of the same length or substantially the same length as those originally presented to the

machine. While the strips are being cut the feed rolls 41 and winding drum 91 are stopped, but as the metal strip continues to be fed through the furnace it is formed into a storage loop 123. During normal operation with the rolls 41 and drum 91 operating at normal speed this loop is reduced to the dotted line position 123a.

After the joint is cut out the feed is started by shifting the clutch element 83 and the forward end of the second strip is connected with the winding roll. In the re-starting of the feed through the rolls of stand 41 clutch element 83 is shifted to engage gear 81 to have the stand 41 feed at increased speed, say for example double the normal speed, whereby to take up the loop 123 which is formed in the pit extension 37 between the stands 40 and 41 during the time that the feed through stand 41 was discontinued to permit the severing operation. When the loop is taken up to the dotted line position 123a element 83 may be again shifted to engage gear 80 to have the feed at stand 41 be at normal speed.

From the foregoing description it will be understood that the strips to be annealed are brought to the apparatus in the form of coils and that they are taken from the apparatus in the same form. Each time an end of a new strip is attached to a preceding strip the feeding means 38 is operated at an increased or double speed so as to build up the loop 120, and during the time that said feeding means is not operating the furnace continues to function the metal being fed therethrough at the usual speed and being taken from the loop 120. Therefore, it is not necessary to disturb the feed through the furnace during the time that an end of a strip is being connected with the tail end of the immediately preceding strip.

Since the loop 120 is formed in the pit extension 36 the metal of said loop does not come into contact with any element which might injure its surface and this same is true of the loop 123 which is formed in the pit extension 37 when the feeding device 41 is stopped to permit of the shearing operation above described. At the end of each shearing operation when the first strip has been removed from the winding roll 91 and the forward end of the second strip connected with said roll the feeding device 41 is operated at an increased or double speed so as to take up the loop 123. However, during each of these operations the metal is being continuously fed through the furnace and with the furnace temperature properly regulated, and the speed of the feed also properly regulated strip stock is rapidly and continuously annealed uniformly and accurately. The apparatus is of course adapted to take care of strips of various widths although if desired separate machines might be provided for strips varying substantially in width. After the loop 120 has been created the feeding device 38 is again operated at normal speed and this same is true of the feeding device 41 after the loop 123 has been taken up. The function of the slip belt 97 is to insure proper speed of the winder as the coil builds up and increases in diameter.

Having thus set forth the nature of my invention, what I claim is:

1. In an annealing apparatus, a furnace, a connecting station adjacent said furnace, means at said station to connect the forward end of a metal strip with the rear end of a preceding metal strip, a disconnecting station adjacent the furnace, means at the disconnecting station for separating the annealed strips received from the furnace, means for feeding the connected strips

from the connecting station through the furnace and to the disconnecting station, means for stopping the feed through said stations during the connecting and separating operations, and means whereby the feed through the furnace may be continued during the connecting and separating operations.

2. In an annealing apparatus, a furnace, a continuously operating means for feeding a metal strip through the furnace whereby the strip will be annealed, means for connecting an end of a second metal strip to the tail end of a metal strip being fed whereby the strip being fed will thread the second strip through the furnace, and means to form a storage loop in the first strip to supply the furnace while the strips are being connected.

3. In an annealing apparatus, a furnace, a connecting station adjacent said furnace, means at said station to connect the forward end of a strip to the tail end of a second strip, a separating station adjacent the furnace, means at the separating station for separating annealed strips received from the furnace, a feed roll between the connecting station and the furnace, a feed roll between the furnace and the separating station, means driving said feed rolls, means for feeding the metal strips from the first feed roll through the furnace to the second feed roll, means whereby the first feed roll may be speeded up to form a loop in the strip and then stopped to permit operation of the connecting means without interrupting the feed through the furnace, and means whereby the second feed roll may be stopped to permit operation of the separating means and then speeded up to take up the loop formed in the strip while the second feed roll was stopped.

4. In an annealing apparatus, a furnace, a connecting station adjacent said furnace, means at said station to connect an end of a metal strip to an end of a preceding metal strip, a feed roll between the connecting station and the furnace, means for driving said feed roll, means for feeding the metal strips received from the feed roll through the furnace, and means whereby the feed roll may be speeded up to form a loop in the strip between the feed roll and the furnace and then stopped to permit operation of the connecting means without interrupting the feed of the strip through the furnace.

5. In an annealing apparatus, a furnace, a connecting station adjacent said furnace, means at said station to connect an end of a metal strip to an end of a preceding metal strip, a separating station adjacent the furnace, means at the separating station for separating annealed strips received from the furnace, a feed roll between the furnace and the separating station, means driving said feed roll, means for feeding the metal strip from the connecting station through the furnace to said feed roll, and means whereby said feed roll may be stopped to permit operation of the separating means and then speeded up to take up the loop formed by the feeding of the strip through the furnace while the feed roll was stopped.

6. In an annealing apparatus, a furnace, a connecting station adjacent said furnace, means at said station to connect an end of a metal strip to an end of a preceding metal strip, a separating station adjacent the furnace, means at the separating station for separating annealed strips received from the furnace, a feed roll between the connecting station and the furnace, a feed roll between the furnace and the separating station, means for feeding the metal strips from the first

feed roll through the furnace to the second feed roll, a motor, means whereby all said feed are driven by said motor, means whereby the first feed roll may be speeded up to form a loop in the strip and then stopped to permit operation of the connecting means without interrupting the feed through the furnace, and means whereby the second feed roll may be stopped to permit operation of the separating means and then speeded up to take up the loop formed in the strip between the furnace and the second feed roll during the time the second feed roll was stopped.

7. The method of annealing strip metal comprising threading an end of a strip through a furnace, feeding said strip through the furnace, feeding the rear end portion of said strip toward the furnace at a faster rate than the strip is fed through the furnace whereby a loop is formed, stopping said second feed when the rear end of the strip is approached, securing the forward end of a second strip to the rear end of said first strip while said second feed is stopped and while the furnace feed continues using the metal forming the loop, starting said second feed to again build up a loop and then reducing the speed of said second feed to correspond with that of the furnace feed, feeding forwardly the annealed strip as received from the furnace, winding said received strip into a coil, stopping the feed of said received strip when the connected ends of a pair of strips are reached, separating said connected ends of the strips, again starting the feed of the received strip and running said feed at an increased speed to take up the loop formed in the strip while said feed was stopped, reducing said feed to normal speed when said loop is taken up, and then winding the next received strip into a coil.

8. The method of annealing strip metal stock comprising passing a metal strip downwardly through a furnace stack in contact with the waste gases therein, then passing said strip upwardly through a pre-heating chamber in communication with the stack, and then passing said strip downwardly through a heating chamber in communication with the preheating chamber and out through a water seal.

9. The method of annealing strip metal stock comprising passing a metal strip downwardly through a furnace stack in contact with the waste gases therein, then passing said strip upwardly through a pre-heating chamber discharging its gases into the stack, and then passing said strip downwardly through a heating chamber discharging its gases into the preheating chamber and out through an exit.

10. The method of annealing strip metal comprising threading an end of a strip through a furnace, feeding said strip through the furnace, feeding the rear end portion of said strip toward the furnace at a faster rate than the strip is fed through the furnace whereby a loop is formed, stopping said second feed when the rear end of the strip is approached, securing the forward end of a second strip to the rear end of the first strip while said second feed is stopped and while the furnace feed continues using the metal forming the loop, starting said second feed to again build up a loop, and then reducing the speed of said second feed to correspond with that of the furnace feed.

11. The method of annealing strip metal comprising threading an end of a strip through a furnace, feeding said strip through the furnace, securing the forward end of a second strip to the rear end of the first strip before said end of the first strip reaches the furnace, feeding forwardly the annealed strip as received from the furnace, stopping the feed of said received strip when the connected ends of a pair of strips are reached, separating said connected ends of the strips, again starting the feed of the received strip and running said feed at an increased speed to take up the loop formed in the strip while said feed was stopped, and then reducing the feed to normal speed when said loop has been taken up.

12. The method of threading a metal strip to be annealed through an annealing furnace, the same consisting in disposing a chain in said furnace along the line to be traveled through the furnace by the strip, securing one end of said chain to an end of the strip, and feeding the chain through the furnace to draw the strip into and through the furnace.

13. In an annealing apparatus, a furnace, a continuously operating means for feeding a metal strip through the furnace whereby the strip will be annealed, means for connecting an end of a second metal strip to the tail end of a metal strip being fed whereby the strip being fed will thread the second strip through the furnace, means for separating the strips at the outlet side of the furnace, and means to form a storage loop in the second strip to receive the metal as it comes from the furnace while the strips are being separated.

14. In an annealing apparatus, a furnace, a continuously operating means for feeding a metal strip through the furnace whereby the strip will be annealed, means for connecting an end of a second metal strip to the tail end of a metal strip being fed whereby the strip being fed will thread the second strip through the furnace, means to form a storage loop in the first strip to supply the furnace while the strips are being connected, means for separating the strips at the outlet side of the furnace, and means to form a storage loop in the second strip to receive the metal as it comes from the furnace while the strips are being separated.

15. In an annealing apparatus, a furnace, a continuously operating means for feeding a metal strip through the furnace whereby the strip will be annealed, means for connecting an end of a second metal strip to the tail end of a metal strip being fed whereby the strip being fed will thread the second strip through the furnace, and means to stop movement of the tail end portion of the first strip while connecting the second strip thereto and while the main portion of the first strip continues to move through the furnace.

16. In an annealing apparatus, a furnace, a continuously operating means for feeding connected metal strips through the furnace whereby the strips will be annealed, means for separating the strips at the outlet side of the furnace, and means to form a storage loop in a strip between the severing means and the furnace to receive the metal from the furnace while the strips are being separated.

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