June 10, 1930. A. F. CLARKE 1,763,092

FEEDING MECHANISM FOR METAL TREATING MACHINES

Filed Dec. 24, 1926 4 Sheets-Sheet 1

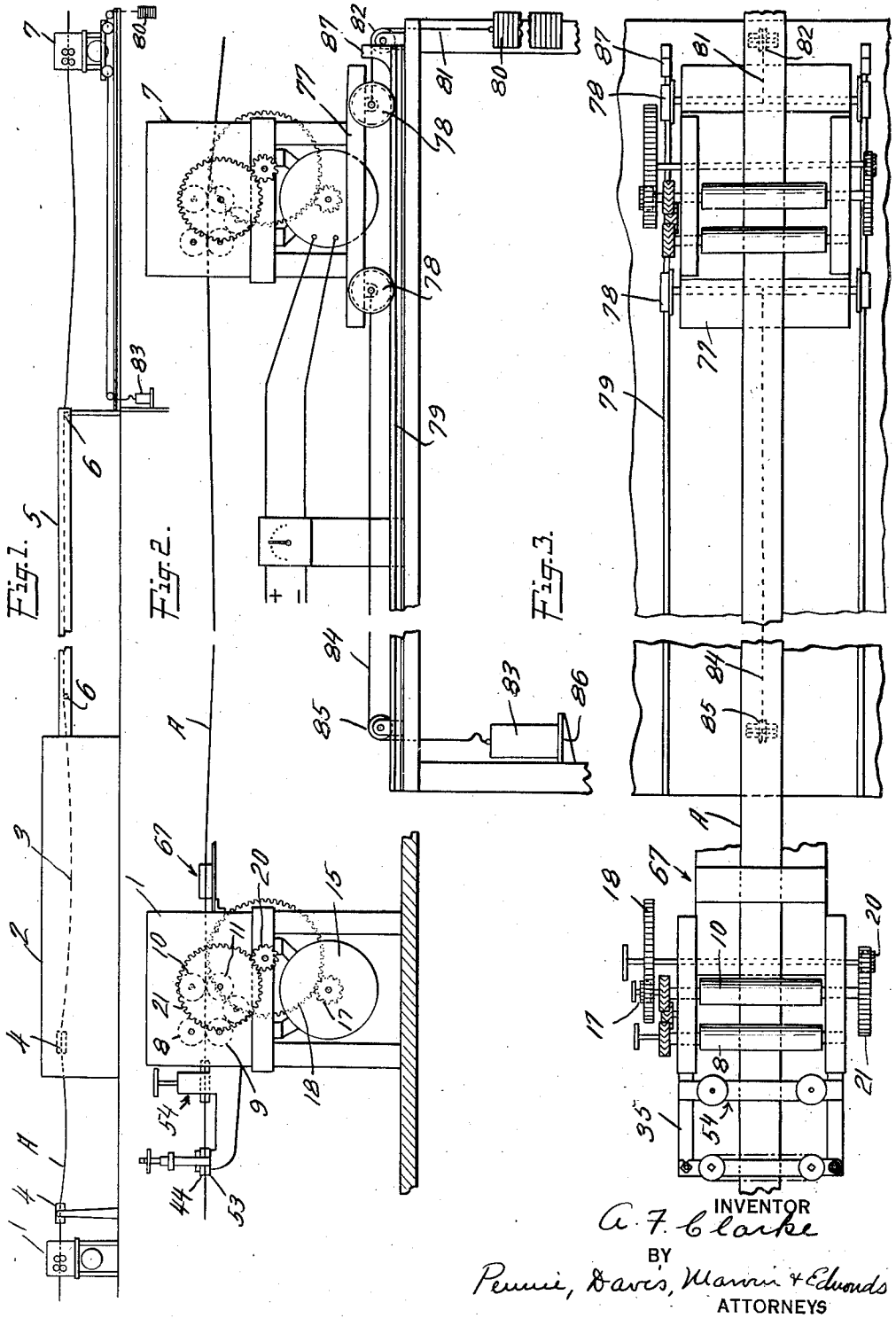


Fig. 1.

Fig. 2.

Fig. 3.

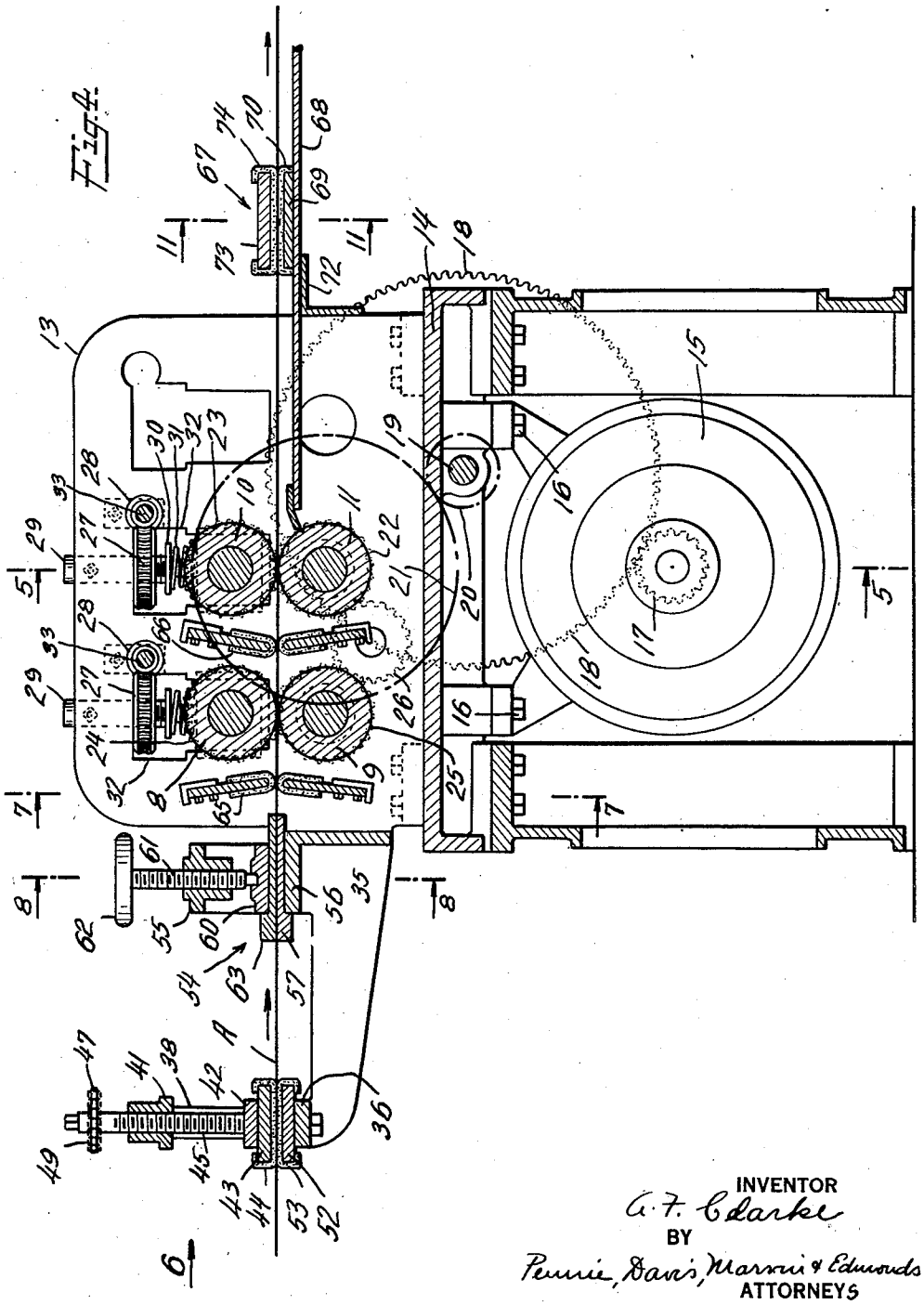
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Fig. 4.



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Fig. 5.

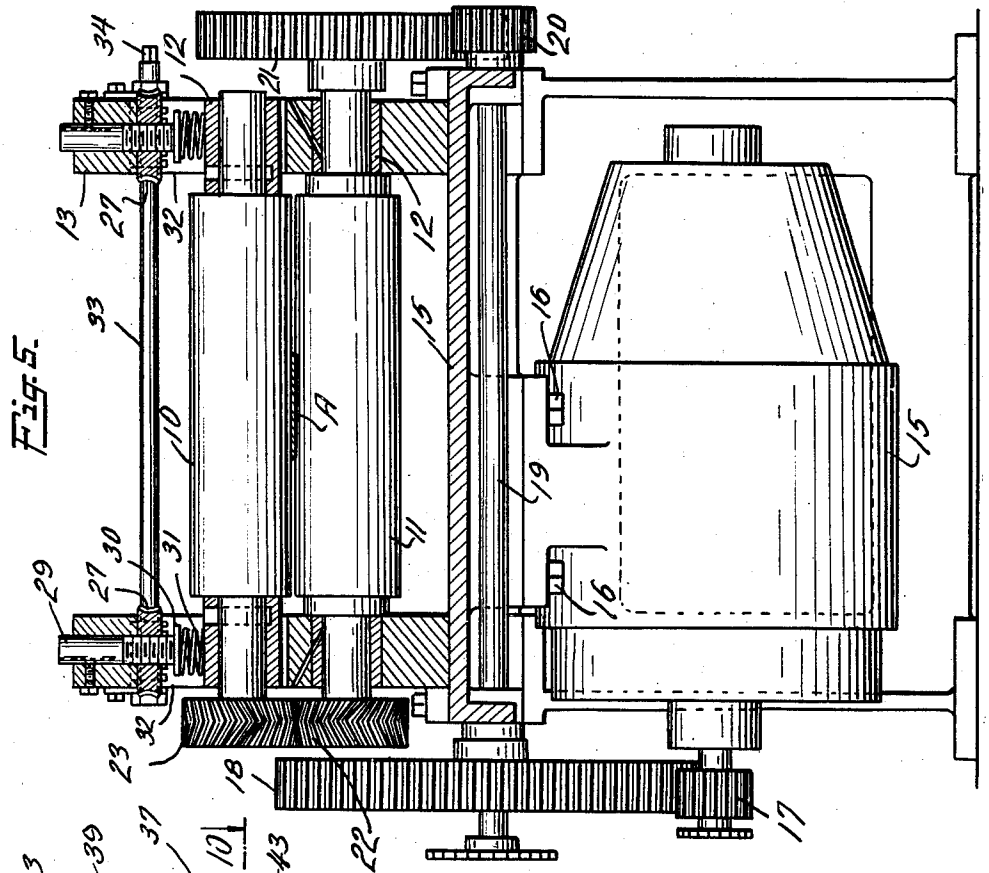
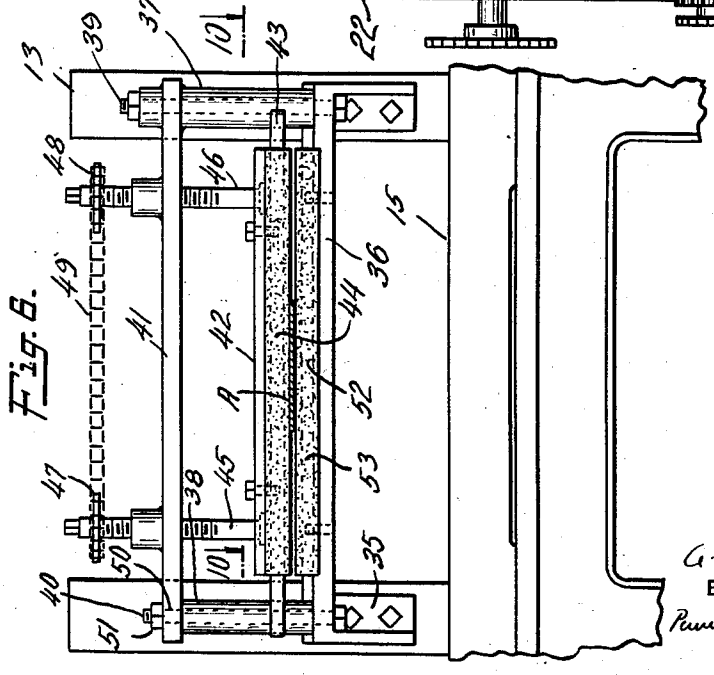


Fig. 6.



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FEEDING MECHANISM FOR METAL TREATING MACHINES

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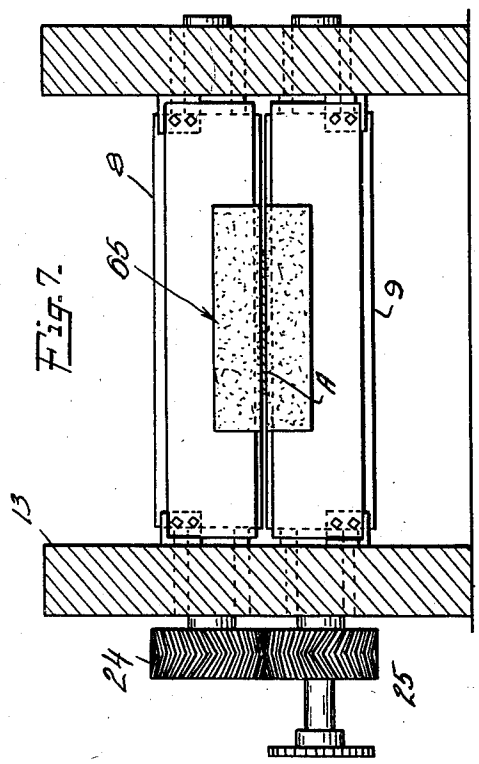


Fig. 7.

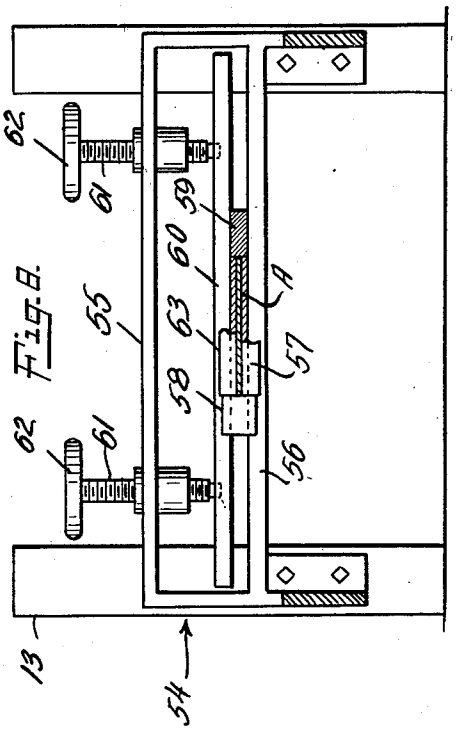


Fig. 8.

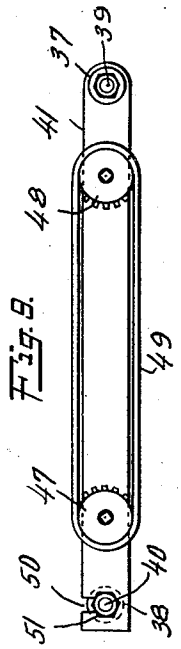


Fig. 9.

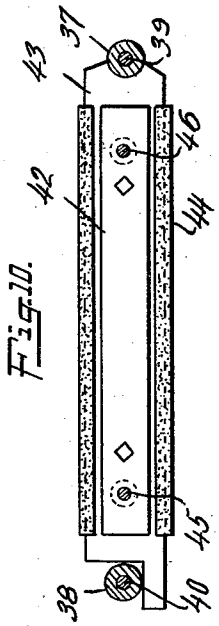


Fig. 10.

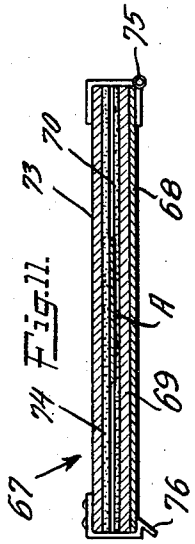


Fig. 11.

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UNITED STATES PATENT OFFICE

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FEEDING MECHANISM FOR METAL-TREATING MACHINES

Application filed December 24, 1926. Serial No. 156,976.

This invention relates to feed mechanism for metal treating systems and more particularly to feeding and pulling rolls for use in connection with the apparatus employed in the treatment of metal strips.

In a copending application of William E. Watkins, Serial Number 144,685 filed October 28, 1926, there is disclosed and claimed a process of treating metal strips in which the strips are fed longitudinally through a furnace in suspended form and subjected to heat.

In the present invention I provide feeding mechanism particularly adapted for use in such process, but capable of use in other systems in which metal strips are treated. The feeding mechanism forming the subject matter of the present invention consists of two parts, the feed rolls and the pulling rolls. The feed rolls are arranged on the inlet side of the furnace and consist of one or more pairs of rolls having suitable drive means and means for regulating the pressure exerted on the strip by the rolls.

The feeding mechanism also includes one or more cleaning devices by means of which any oil or other foreign substance is removed from the strip before the strip passes into the coating machine. Various forms of cleaning devices may be employed. Suitable guiding mechanism is also arranged in front of the rolls to guide the strip into them. It is advantageous to retain the strip in a straight line as it passes through the feed rolls and subsequent apparatus, as this reduces the tendency toward distortion when the strip is heated.

The pulling rolls are essentially similar to the construction of the feeding rolls but are mounted on a movable truck whereby the tension of the portion of the strip within the furnace may be automatically regulated by the movement of the truck. A suitable weight may be connected to the rear of the truck and suspended so that the tension of the strip will be automatically regulated by the weight. Suitable means are provided for limiting the movement of the truck.

This method of regulating the tension of the strip is an important feature of my invention, when the pulling rolls are employed in a system where a suspended strip is fed through a furnace as in the Watkins process referred to above, for in such systems it is important that the tension be carefully regulated. The pulling rolls may also be provided with a counter-weight which is normally inactive but which is brought into operation when the truck is moved rearwardly, a predetermined distance by the first mentioned weight.

In the drawings I have diagrammatically illustrated the arrangement of the feed rolls and pulling rolls in connection with a system in which a metal strip is fed through a furnace in suspended form and have also shown in detail the construction of the feed rolls and pulling rolls.

Fig. 1 is a diagrammatic side elevation showing a furnace and cooling chamber and showing the arrangement of the feeding rolls and pulling rolls with respect thereto;

Fig. 2 is a similar view of the feeding rolls and pulling rolls on an enlarged scale;

Fig. 3 is a plan view of the parts shown in Fig. 2;

Fig. 4 is a vertical sectional view of the feeding rolls;

Fig. 5 is a transverse vertical sectional view on line 5—5 of Fig. 4;

Fig. 6 is a detailed sectional view of one of the cleaning devices on line 6—6 of Fig. 4;

Fig. 7 is a transverse, sectional view on line 7—7 of Fig. 4;

Fig. 8 is viewed in elevation substantially on line 8—8 of Fig. 4, parts being shown in section;

Fig. 9 is a plan view of the parts shown in Fig. 6;

Fig. 10 is a detailed, sectional view on line 10—10 of Fig. 6, and,

Fig. 11 is a similar view on line 11—11 of Fig. 4.

Referring to Fig. 1 of the drawings, the reference numeral 1 designates generally the strip feeding mechanism to which a strip A, is delivered from any suitable source and thence fed through the system or apparatus

in which the strip is to be treated. A furnace, 2, is arranged so that the strip will be fed through it in a longitudinal path and is adapted to be suspended within the furnace as indicated in dotted lines at 3. Suitable guides, 4, may be arranged between the feeding mechanism and the furnace. These guides may be of the type described and claimed in the copending application of D. W. Blair, Serial Number 151,371, filed November 29, 1926.

A cooling chamber, 5, is arranged at the outlet end of the furnace and is provided with suitable rolls or supports, 6, over which the strip is adapted to pass. The strip may be cooled in this chamber in any suitable manner. The pulling rolls are arranged beyond the cooling chamber and are indicated generally by the reference numeral 7. It is, of course, understood that the illustration of a furnace and cooling chamber in connection with the feeding and pulling mechanism is merely illustrative and that the feeding and pulling mechanism may be employed in connection with any system for treating strip metal. The apparatus may thus include suitable coating machines such as that described and claimed in the Watkins Patent #1,295,820, which would be arranged on the inlet side of the furnace and may further include pickling and washing tanks between the cooling mechanism and the pulling rolls.

Referring to Fig. 4 of the drawings, the pulling mechanism consists of pairs of rolls between which the strip passes. One or more pairs of rolls may be employed. In this instance I have illustrated a pair of rolls, 8 and 9, and a second pair of similar rolls, 10 and 11. These rolls are mounted in bearings, 12, carried by a frame, 13, supported on a suitable base, 14. The feed rolls are driven by a motor, 15, which may be fastened to the base in any suitable manner as by bolts, 16. A spur gear, 17, is carried by the motor shaft and meshes with a gear, 18, on a power shaft, 19. A gear, 20, on the other end of the power shaft meshes with a gear, 21, connected to one end of the feed roll, 11. A gear, 22, is arranged on the opposite end of this feed roll and meshes with a gear, 23, carried by the upper feed roll, 10, of the second pair. The rolls, 8 and 9, are similarly interconnected by gears, 24 and 25, and power is supplied to these rolls by an intermediate gear, 26, meshing with the gear, 22, and the gear, 25, respectively. The strip of metal, A, passes between the feed rolls, 8 and 9, and then between the feed rolls, 10 and 11. The rolls, 8 and 10, may be adjusted with respect to the rolls, 9 and 11, by means of worm wheels, 27 and worms, 28. The worm wheels, 27, receive threaded rods, 29, the lower ends of which are enlarged as at 30 and are separated from the upper bearings, 12, by means of coil springs, 31. As shown, these bearings are mounted in openings, 32, in the side plates of the frame, 13. The worms, 28, are carried by transverse rods or shafts, 33, which are provided with squared ends, 34, for the reception of a wrench or other operating tool.

An extension, 35, is arranged at the front of the frame and this extension is adapted to support a cleaning device illustrated in detail in Figs. 6, 9 and 10 of the drawings. As shown, the cleaning device consists of a frame or support, 36, which is mounted on the extension, 35. A pair of sleeves, 37 and 38 are carried by this frame. A bolt or rod, 39, passes through the sleeve, 37, and a similar bolt or rod, 40, passes through the sleeve, 38. A horizontal cross bar, 41, is fixed with respect to the sleeve, 37, the arrangement being such that this bar is hinged to or pivots about the rod, 39. A second horizontal bar, 42, carries a shoe, 43, faced with a layer of felt cloth or similar material as indicated at 44. The bar, 42, is carried by screw threaded members, 45 and 46, having screw threaded engagement with the bar, 41. These members can be rotated to vary the position of the shoe, 43. Sprocket wheels, 47 and 48, are carried by these members and are interconnected by a chain, 49 (see Figs 6 and 9). The bar, 42, is free to slide vertically on the sleeves, 37 and 38, and the bar, 41, is provided with a notch, 50, adapted to receive the upper end of the bolt, 40. A nut, 51, arranged on the bolt, 40, serves as a means for clamping the bar, 41, against the upper end of the sleeve, 38. When this nut is loosened, the bars, 41 and 42, and the adjusting members, 45 and 46, can be swung as a unit about the rod, 39. The strip of metal, A, passes between the shoe, 44, and a corresponding shoe, 52, carried by the support, 36, and covered with a layer of felt, 53. The pivotal support of the upper shoe permits it to be swung to one side when threading a strip of metal through the apparatus.

After the strip of metal, A, passes between the felts 44 and 53, of the cleaning device, it passes to a guiding device, 54, the details of which are shown in Figs. 4 and 8. The guiding device consists of a frame having an upper horizontal member, 55, and a lower horizontal member, 56. A supporting plate, 57, over which the strip of metal passes is carried by the lower horizontal member. The lower horizontal member also carries end guiding members, 58 and 59, which are clamped against it by a movable cross bar, 60. This cross bar is carried by threaded rods, 61, which pass through the upper horizontal member, 55, of the frame and are provided with suitable hand wheels, 62, to permit operation of the threaded

rods to raise and lower the cross bar, 60. An upper guiding plate, 63, is arranged beneath the cross bar, 60, so that the strip of metal passes between the guiding plates, 57 and 63, lateral movement of the strip being prevented by the end guiding members, 58 and 59, which engage the edges of the strip.

Auxiliary cleaning devices, 65 and 66, may be arranged in front of each pair of pressure rolls. These auxiliary cleaning devices serve to remove any foreign substances not removed from the strip by the shoes, 44 and 53. An additional cleaning device, 67, (see Fig. 4) may be arranged beyond the last set of rolls. The details of this device are shown in Fig. 11 of the drawings. As shown, it consists of a lower supporting plate, 68, carrying a shoe, 69, covered with felt or other suitable material. The support, 68, is mounted on a bracket, 72, of the frame, 13. An upper shoe, 73, carrying a layer of felt, 74, is hinged to the lower shoe at one side as at 75. The opposite side of the upper shoe is provided with a detachable catch, 76, which serves to hold the shoes in operative position when desired. When the catch is released, the upper shoe can be swung on its pivot away from the lower shoe.

After the strip has passed through the furnace and cooling chamber, it is delivered to the pulling mechanism, 7. In the furnace the strip is heated to a temperature of from 1,600° to 2,200° F. and it is necessary that the tension of that portion of the strip within the furnace be carefully regulated. If the tension of the strip becomes excessive, the strip will become distorted and may even break within the furnace. The tension can be maintained at a suitable constant value by providing pulling mechanism by means of which the strip may always be subjected to a constant pull. The arrangement of the rolls and driving devices of the pulling mechanism is practically identical with the construction of the feed rolls heretofore described. The pulling mechanism, however, is mounted on a suitable truck, 77, having wheels, 78, adapted to travel on tracks, 79. An adjustable weight, 80, is connected to the rear end of the truck, 77, by a cord, 81, passing over a pulley, 82. This weight serves to counterbalance the tension of that portion of the strip within the furnace. If the pulling mechanism has a tendency to increase the tension of the strip beyond a desired limit, the condition of equilibrium is destroyed and the strip moves the truck, 77, forwardly on the tracks, 79. If there is too much slack in the strip, the weight, 80, moves the truck further away from the end of the cooling chamber, 5, thus automatically increasing the tension of the strip.

In order to prevent the weight, 80, from pulling the truck, 77, too far along the tracks, 79, I employ a counter-weight, 83, which is connected to the forward end of the truck by a cord, 84, passing over a pulley, 85. The weight is supported on a suitable shelf or bracket, 86, and there is normally sufficient slack in the cord, 84, to render the weight, 83, inoperative. When the weight, 80, pulls the truck close to the rear end of the track, the weight, 83, is lifted placing an additional pull on the truck in a forward direction and preventing further rearward movement. A stop, 87, may be arranged at the rear end of the track, 79, to bring the truck, 77, to a full stop if the weight, 83, is insufficient to overcome the weight, 80.

The apparatus thus provides means for feeding a continuous strip of metal through a furnace or other treating apparatus and maintains a constant tension on the strip. The feeding and pulling rolls are designed to be operated from an independent source of power in each instance, but it will be apparent that the power shaft, 19, of the feeding rolls and the corresponding power shaft of the pulling rolls can be driven from a single source through the use of suitable drive mechanism. The cleaning and guiding devices associated with the feeding rolls are designed to render the entire construction compact and readily accessible.

I claim:

1. In an apparatus for feeding metal strips, a pair of movably mounted pulling rolls and a weight attached to one end of said pulling rolls to regulate the tension of the strip.

2. In an apparatus for feeding metal strips, a movable truck, a pair of pulling rolls mounted on said truck and adapted to receive a continuous strip whereby a pull is exerted on said truck, and a weight connected to said truck and adapted to exert a pull on the truck in the opposite direction from the pull exerted by the strip.

3. In an apparatus for feeding metal strips, a movable truck, a pair of pulling rolls mounted on said truck and adapted to receive a continuous strip whereby a pull is exerted on said truck, and a weight connected to said truck, adapted to exert a pull on the truck in the opposite direction from the pull exerted by the strip, and a counter-weight connected to the other end of said truck.

4. The method of controlling the tension of metal strips in passing through apparatus for treating such strips consisting essentially of passing the strip through movably mounted pulling rolls and connecting a weight to the pulling rolls to counter-act the tension of the strip.

5. The method of controlling the tension

of metal strips in passing the strip through metal treating apparatus which comprises passing the strips through pulling rolls mounted on a movable support and maintaining a constant pull on the support in a direction opposite to the pull exerted by the tension of the strip.

6. In an apparatus for feeding metal strips, a pair of movably mounted pulling rolls and means for exerting a constant pull on the rolls in a direction opposite to the pull exerted by the tension of the strip.

In testimony whereof I affix my signature.

ALEXANDER FIELDER CLARKE.