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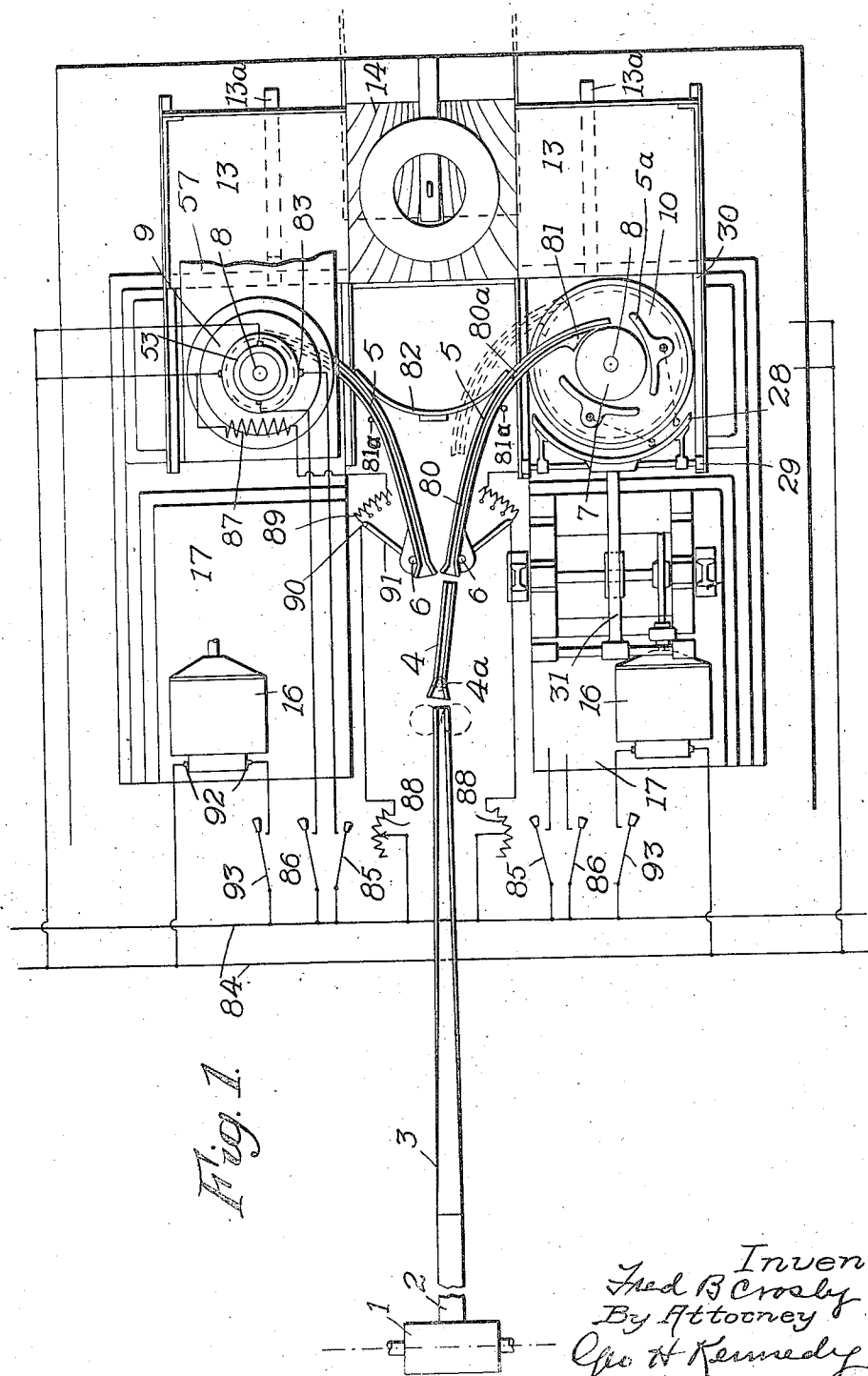
1,474,319

F. B. CROSBY

METHOD OF HANDLING HOT METAL STRIP AND APPARATUS THEREFOR

Filed Dec. 29, 1919

4 Sheets-Sheet 1



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Nov. 13, 1923.

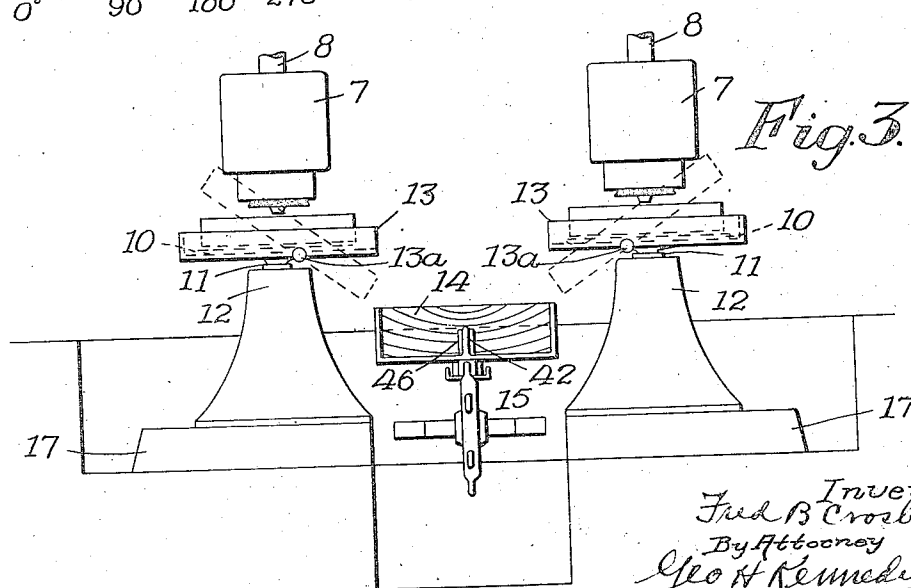
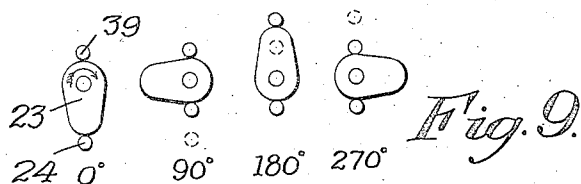
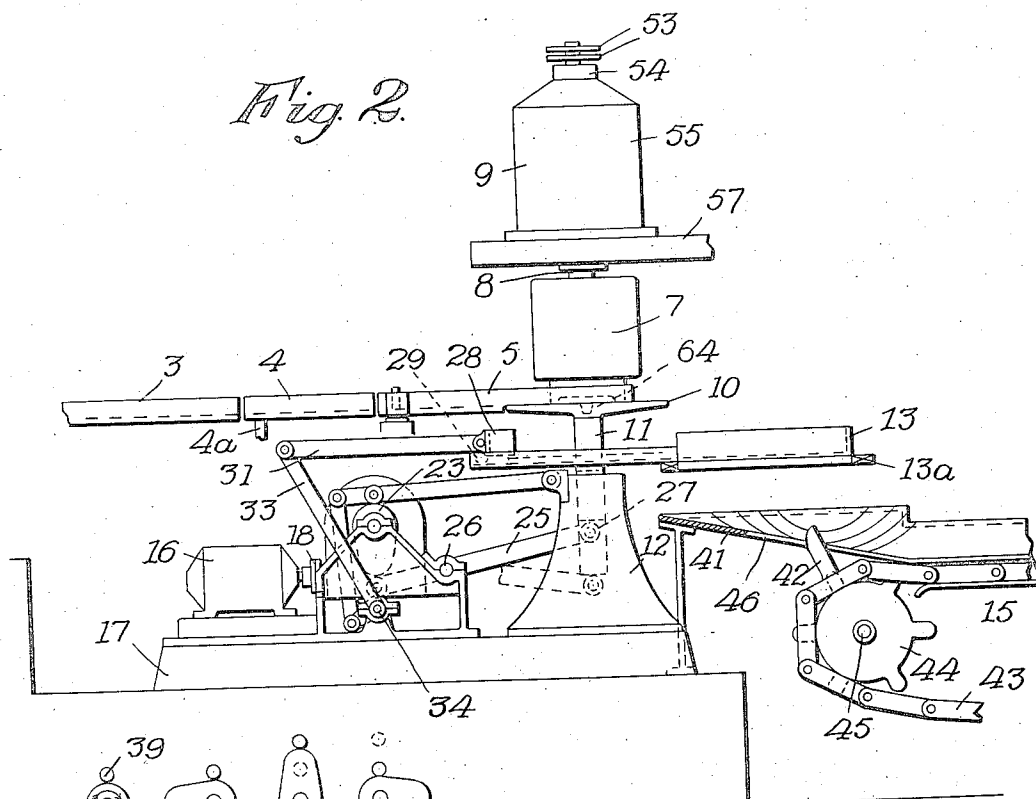
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4 Sheets-Sheet 2



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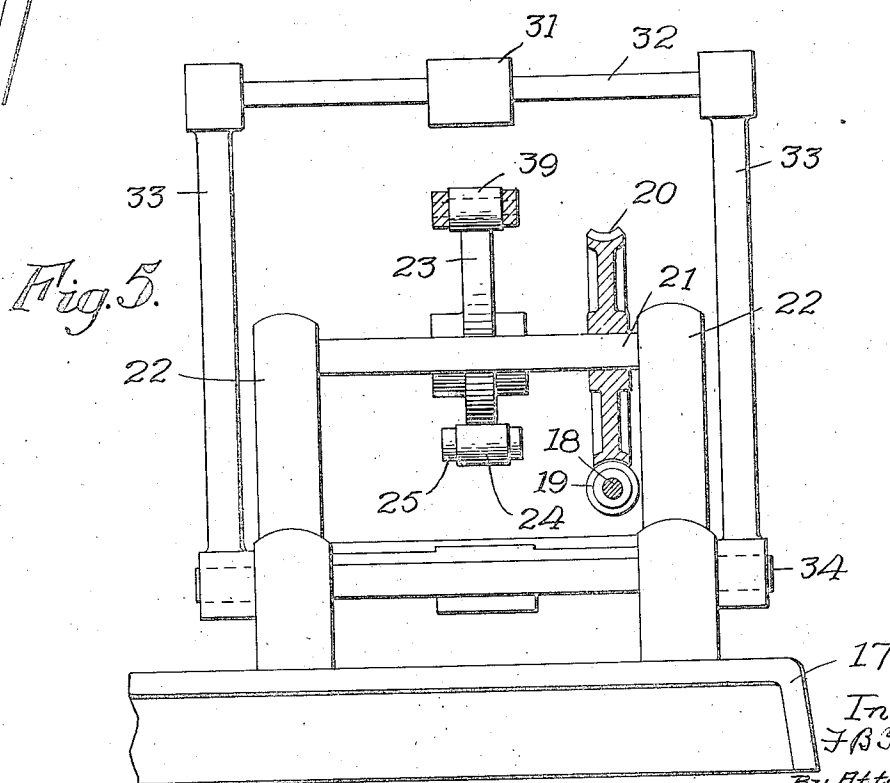
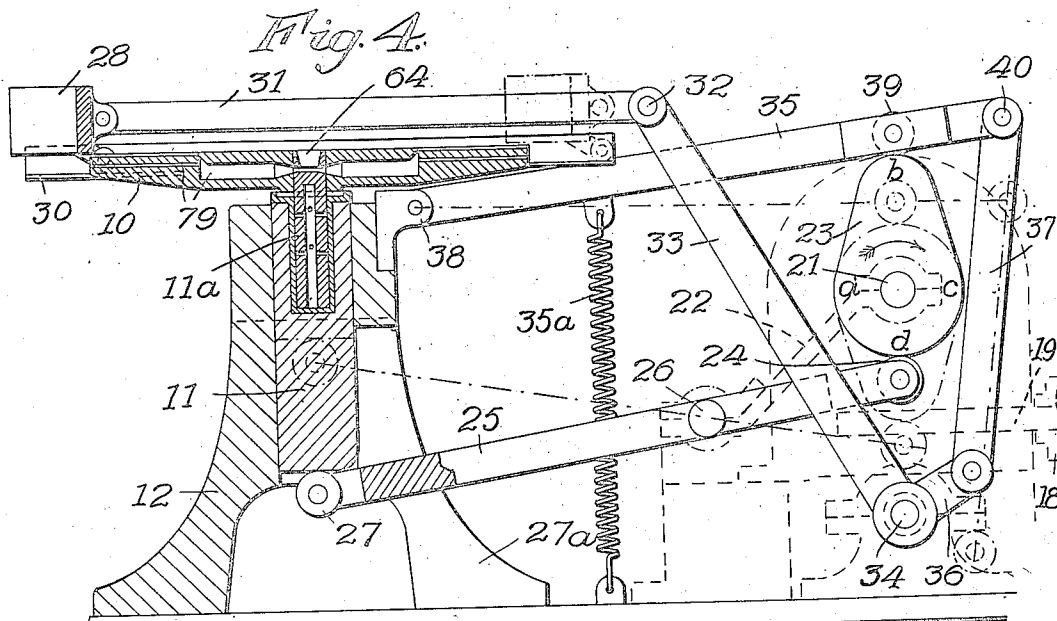
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4 Sheets-Sheet 3



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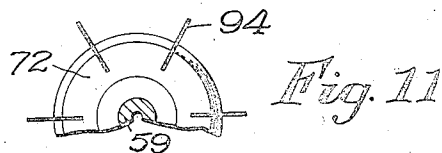
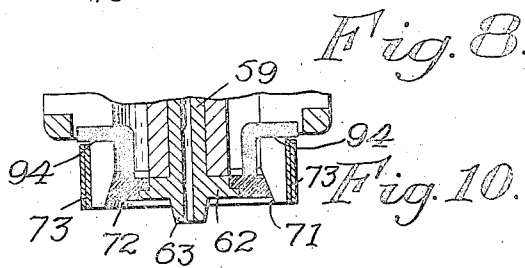
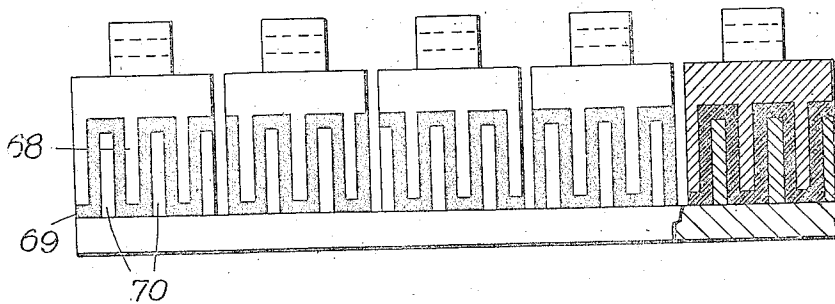
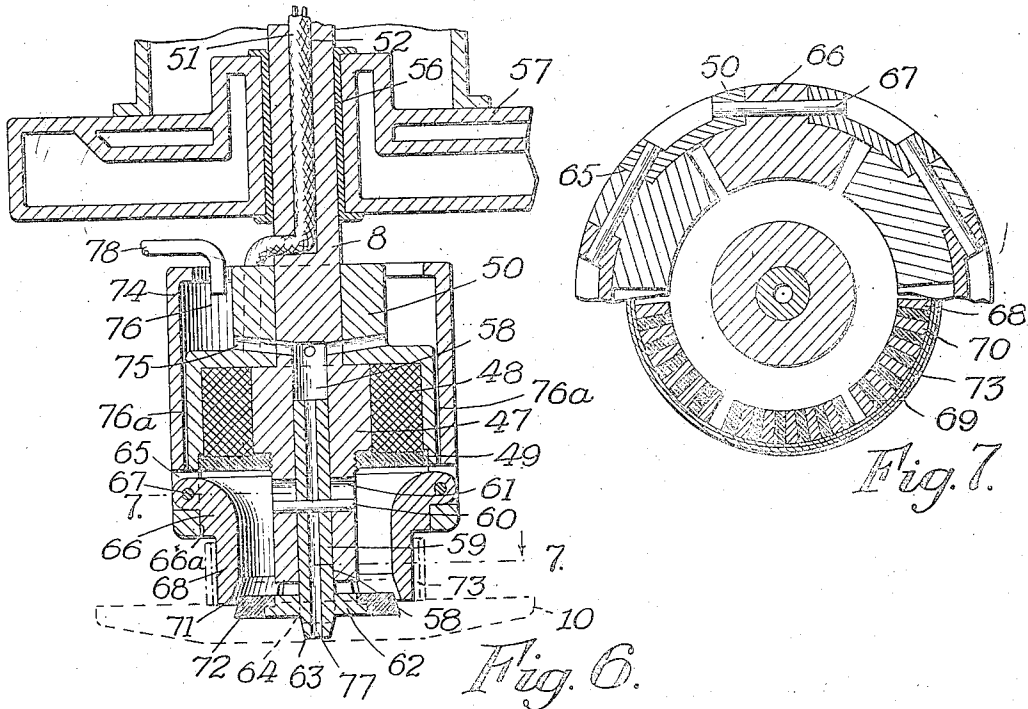
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METHOD OF HANDLING HOT METAL STRIP AND APPARATUS THEREFOR

Filed Dec. 29 1919

4 Sheets-Sheet 4



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Patented Nov. 13, 1923.

1,474,319

UNITED STATES PATENT OFFICE.

FRED B. CROSBY, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO MORGAN CONSTRUCTION COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

METHOD OF HANDLING HOT METAL STRIP AND APPARATUS THEREFOR.

Application filed December 29, 1919. Serial No. 348,149.

To all whom it may concern:

Be it known that I, FRED B. CROSBY, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in a Method of Handling Hot Metal Strip and Apparatus Therefor, of which the following, together with the accompanying drawings, is a specification.

My invention relates to rolling mills and has for its object to provide a novel method and apparatus for handling relatively long and thin metal strip, or the like, immediately after hot rolling.

Difficulties in handling the product of hot strip mills have heretofore resulted from the accumulation of the strip on the cooling beds usually placed between the finishing rolls and the traction reels. This occurs whenever the rate of rolling is greater than the rate of reeling and it is obvious that the accumulation of strip on the cooling beds tends to materially decrease the output of the mill.

By my invention, I provide a method and apparatus for handling the strip, by which the strip is coiled immediately after hot rolling by automatic magnetic reels, the speed of which always closely approximates the speed of delivery of the strip. My method further provides for the handling of the completed coils in such a manner that they may be conveyed away from the mill in a direction substantially coinciding with the center line of the mill, or at any desired angle thereto.

These and other novel features of my invention are fully set forth in the accompanying description and drawings, in which Figure 1 is a plan view of the automatic reeling mechanism embodying my invention.

Figure 2 is a view in side elevation of the mechanism shown in Fig. 1.

Figure 3 is an end view of the mechanism shown in Fig. 1.

Figure 4 is a detail view in side elevation of the coiling table.

Figure 5 is an end view of the parts shown in Fig. 4.

Figure 6 is a sectional view of a magnetic reel.

Figure 7 is a sectional view along the line 7-7, Fig. 6.

Figure 8 is a diagrammatic view showing the development of the magnetic segments of the reel, shown in Fig. 6.

Figure 9 is a diagrammatic view showing the different positions occupied by the operating cam of the push-off mechanism.

Figure 10 is a detail view of the coil stripping means.

Figure 11 is a plan view of the parts shown in Fig. 10.

Similar reference characters refer to similar parts in the different figures.

Referring to Figs. 1, 2 and 3 of the drawings, the mechanism generally comprises a pair of finishing rolls 1 that are adapted to deliver strip to a run-out trough 2, from which the strip passes through a twist guide 3. The twist guide 3 delivers the strip edge-wise to a switch 4 that is pivotally mounted, as shown at 4^a. A pair of reel guides 5 are arranged so as to receive the strip from the switch 4 and are mounted for pivotal movement on shafts 6. The reel guides 5 are respectively adapted to deliver the strip to reels 7 that are supported on vertical shafts 8 driven by electric motors 9. Coiling tables 10 located immediately below the reels 7 are adapted for vertical movement on plungers 11 slidably supported in pedestals 12. The tables 10 are rotatably mounted on the plungers 11 by shafts 11^a, as shown in Fig. 4. Inspection tables 13 are arranged adjacent to the lower position occupied by the coiling tables 10 and a receiving platform 14 is located between the tables 13. A conveyor mechanism 15 is provided to remove the coils from the receiving platform 14. In the general operation of the mill, the strip is adapted to be formed in ribbon coils by the reels 7 after which it is immediately delivered to the conveyor mechanism by a push-off and delivery mechanism which will now be described.

Referring now to Figs. 2, 4, and 5, electric motors 16 are mounted on bases 17 which also support the pedestals 12. The electric motors 16 are respectively provided with a shaft 18 on the end of which is mounted a worm 19. The worm 19 is in mesh with a worm wheel 20 that is mounted on a shaft 21. The shaft 21 is rotatably supported at its end in bearing brackets 22 extending upwardly from the base 17. A cam 23 is mounted on the shaft 21 between the brack-

ets 22 and is adapted to be engaged by a roller 24 rotatably mounted on one end of a lever arm 25. The arm 25 is pivotally mounted at 26 and is provided at its other end with a roller 27 that extends through a slot 27^a in the pedestal 12 and is in engagement with the base of the plunger 11 of the coiling table 10. Rotation of the cam 23 imparts oscillatory movement to the arm 25 which in turn causes an up and down movement of the plunger 11 and the coiling table 10. The table 10 is shown in its upper position in Fig. 2 and in its lower position in Fig. 4, these positions being occupied by the table once during each revolution of the cam 23.

Referring to Figs. 1, 2 and 4, the push-off mechanism comprises a push-off 28 having substantially the same radius of curvature as the coiling table 10. The push-off 28 is mounted on rollers 29 that are supported in guides 30 extending in parallel relation on opposite sides of the coiling table 10. A push-off arm 31 is pivotally connected at its ends to the push-off 28 and to a push-off bar 32. As best shown in Fig. 5, the bar 32 is connected at its ends to a rocker shaft 34, by links 33, the push-off arm 31 being mounted on the bar 32 between the links 33. The shaft 34 is connected to a rocker arm 35 by means of a crank 36 and a connecting link 37. The rocker arm 35 is pivotally mounted at one end on the pedestal 12, as shown at 38, and is provided with a roller 39 held in engagement with the upper surface of the cam 23 by a spring 35^a. The connecting link 37 is connected to the rocker arm 35 at a point 40 beyond the roller 39. Rotation of the cam 23 imparts an oscillatory movement to the rocker arm 35 which is transmitted to the rocker shaft 34 by means of the link 37 and the crank 36. The oscillatory movement of the rocker shaft 34 is transformed into reciprocating movement of the push-off 28 through the links 33 and the push-off bar 32. The push-off 28 is thereby adapted to move back and forth over the coiling table 10, when in its lower position, the guides 30 serving to support the push-off in its movement. The push-off 28 is shown in its extreme positions in Figs. 2 and 4, respectively, the push-off 28 being adapted to move back and forth over the table 10 once for each revolution of the cam 23.

As best shown in Fig. 4, the cam 23 is provided with a surface *adc* which has the same radius of curvature and represents 180 angular degrees, so that when either of the cam rollers 24 or 39 is passing over this surface there will be no displacement of the arms upon which the cam rollers are mounted. The cam surface *abc* is so designed that either of the rollers 24 or 39

in engagement therewith will move from one extreme position to the other extreme position while passing from *a* to *b* or from *b* to *c*. Thus the cam roller 24 will not be moved while passing over the cam surface *dc*, while the cam roller 39 will move from its upper to its lower position, as shown in dotted lines, while passing over the cam surface *ba*.

Referring now to Fig. 9, the positions of the cam 23 and its rollers 24 and 39, is indicated diagrammatically for each 90 degrees of angular movement. At the start, the coiling table 10 is in its upper position below the reel 7 and the push-off 28 is withdrawn all the way. When the cam is turned 90° clockwise, the rollers occupy the positions indicated. This movement of the cam 23 causes the table 10 to move to its lower position while the push-off 28 remains withdrawn. When the cam 23 has turned through 180°, the rollers occupy the positions shown, and the movement of the cam and its rollers causes the push-off 28 to move forward to its extreme position over the table 10, while the table 10 remains stationary. When the cam 23 is turned 270°, the rollers occupy the positions shown and this movement of the cam causes the push-off 28 to return to its original position across the table 10, while the table 10 remains stationary. When the cam 23 is turned through 360°, the rollers again occupy the position shown for 0° in Fig. 9, this movement of the cam causing the table 10 to move upward to its former position in contact with the reel 7, while the push-off remains stationary.

When the rolling mill is operating, the above described cycle of operation with respect to the movement of the cam 23, causes a completed coil to be removed from the table 10, and to be delivered to the inspection table 13 by the movement of the push-off 28. The tables 13 are respectively provided with a pivot 13^a, about which the tilting table may be turned and the completed coil delivered to the receiving platform 14. As best shown in Fig. 3 the receiving platform 14 is provided with a generally concave warped surface, the configuration of which is such as to center the coil thereon. The conveyor mechanism 15 comprises a plurality of dogs 42 provided on the links of a chain 43 which passes over a sprocket wheel 44 mounted on a shaft 45. As the chain 43 is moved by the sprocket wheel 44, the dogs 42 enter a slot 46 provided in the bottom of platform 14 and are adapted to engage the central openings in the completed coils. A completed coil may then immediately enter a muffle conveyor where it will be surrounded by an inert or non-oxidizing atmosphere, so that the exposure of the coil to the out-

side atmosphere will be reduced to a minimum. It is obvious that the inspection tables 13 may be held stationary while the coils are delivered to the platform 14 by any suitable means.

The disposition of the reeling mechanisms on opposite sides of the line of delivery of the strip provides a compact and symmetrical arrangement utilizing the floor space most effectively. In addition, any mishap in the operation of one reel can be corrected with great facility and without danger to the operator, due to the location of the reels on opposite sides of the moving strip.

Referring now to Figs. 6, 7, and 8, the shaft 8 of the reel 7 is provided with an enlarged portion 47 that is surrounded by a winding 48. The winding 48 is supported upon the portion 47 by a plate 49 of nonmagnetic material, such as brass. The winding 48 is surrounded by a cylindrical spider 50 that is supported upon the shaft 8 by the enlarged portion 47. A twin conductor electric cable 51 extends from the terminals of the winding 48, through the hub of the spider 50 and from thence through a hole 52 provided in the shaft 8. The shaft 8 carries the rotor of the electric motor 9 and is provided with a plurality of collector rings 53 that are respectively connected to the conductors of the cable 51, as shown in Fig. 2. The shaft 8 is supported at its upper end in a suitable thrust bearing 54 carried by the casing 55 of the motor 9 and a sleeve bearing 56 is provided where the shaft 8 passes through the support 57 of the motor 9. The lower portion of the shaft 8 is provided with a central opening 58 within which a plunger 59 is adapted to move. The plunger 59 is prevented from sliding out of the opening 58 by means of a pin 60, the ends of which are in engagement with a slot 61 provided in shaft 8 below the portion 47. The plunger 59 is provided at its lower end with a plate 62 that is provided with a projection 63 adapted to be received in a centrally located opening 64 in the coiling table 10, as shown in Fig. 4.

The spider 50 is provided near its lower edge with a plurality of spaced openings 65, within which are mounted a plurality of magnetic segments 66 on pivot pins 67 secured within the openings 65. As best shown in Figs. 7 and 8, each segment 66 comprises interlacing magnetic fingers 68 and 70 separated by a continuous grid of nonmagnetic material 69. The fingers 68 form an integral part of each segment while the fingers 70 are completely embedded in the nonmagnetic material 69, except at their lower ends which are adapted to engage the top of table 10 when in its upper position. The lower edges of the magnetic fingers 68 and 70 are slightly bevelled, as shown at 71,

and a nonmagnetic ring 72 surrounding the plate 62 is correspondingly bevelled. When the reel table 10 moves to its upper position, as shown in dotted lines, it engages the plate 62 and forces the bevelled ring 72 upwardly into engagement with the segments 66 thus mechanically locking the segments 66 in their expanded position. With the winding 48 energized and the table 10 in its upper position, the magnetic circuit is from the enlarged portion 47 of the shaft 8 downwardly through the plate 62, and the table 10 and then to the fingers 70. The magnetic flux then flows across the equivalent air gap formed by the nonmagnetic material 69 to the fingers 68 and from thence back to the shaft 8 through the spider 50.

With the coil 48 energized, the nonmagnetic plate 49 prevents passage of magnetic flux from the shaft 8 to the spider 50, at this point, and directs it downwardly to the plate 62 where the nonmagnetic ring 72 forces the flux to pass through the table 10 and into the fingers 70. The shaft 8, the table 10, plate 62, and the segments 66 are thus magnetically locked together and the passage of flux from the segments 66 to the spider 50 magnetically locks these members together at the surfaces 66^a, thus holding the segments in their expanded position. The arrangement of interlacing magnetic fingers 68 and 70 distorts the flow of flux from a generally vertical direction into a generally horizontal direction, so that the flux readily flows into the advancing end of the strip 73 which is delivered to the outer periphery of the segments 66 by the guide 5. The strip 73, in contact with table 10, serves to bridge the gap between the fingers 68 and 70 by reducing the reluctance therebetween and will be held magnetically both to the table 10 and to the segments 66. The strip 73 will thus be wound in a compact coil upon the segments 66. The segments 66 are prevented from moving inwardly on their pivot pins 67 while a strip is being coiled by the wedging action between the segments and the ring 72 and by the magnetic locking at the surfaces 66^a. The table 10 is held closely to the reel while a strip is being coiled, so that the bearing of the shaft 11^a is relieved from the weight of the table 10 and of the strip being coiled. It is obvious that as soon as the winding 48 is de-energized, the completed coil may be removed therefrom by the lowering of table 10, for the segments 66 are then free to move inwardly and will exert no binding effect on the completed coil.

The spider 50 is partially surrounded by a hollow cylindrical water jacket 74. Radial passages 75 connect the opening 58 in the shaft 8 with a space 76 between the water jacket 74 and the spider 50. The plunger 59 is provided with a longitudinal passage 77 which connects with the opening 64 in the

table 10. Cooling water enters the water jacket 74 through a pipe 78 and passes from the space 76 through the shaft 8 to the table 10, from whence it is discharged through radial passages 79, as shown in Fig. 4. The water also passes downwardly from space 76 through passage 76^a in the spider 50, thus cooling the winding 48, the segments 66 and the strip 73.

Referring now to Fig. 1, each guide 5 is provided with a slot 80 of substantially the same depth as the width of the strip 73 which is being coiled. The bottom of slot 80 is cut away near the table 10, as shown at 80^a, and the side walls of the slot are flush with the top of the table 10 when the latter is in its elevated position. The side wall of the guide nearest the reel 7 is flanged to provide a brake shoe 81 having substantially the same radius of curvature as the reel segments 66, the shoe 81 being preferably composed of magnetic material. The brake shoes 81 are held in close proximity to the reels 7 before coiling by magnetic attraction and also by a resilient member 82, which is supported between the guides 5 and holds them against the stops 81^a. Each guide 5 is thus adapted to deliver the strip 73 to the table 10 and to the reel 7 in such a manner that it may be readily seized by the magnetic segments 66 and coiled thereon. The shoe 81 exerts pressure upon the strip as it is being coiled and ensures that the strip will be tightly wound. While the reel 7 is energized, the shoe 81 is attracted to the face of the reel and thereby tends to engage the strip more closely as it is being coiled. The shoe 81 will also exert a magnetic braking effect and serve to bring the reel to rest after the reel motor is disconnected. Additional guides 5^a are provided to swing outwardly as the coil increases in size.

The armature terminals 83 of the motors 9 are connected across electrical supply mains 84 through disconnecting switches 85. The collector rings 53 leading to the terminals of the windings 48 of the reels are also connected across the mains 84 through disconnecting switches 86. Each motor 9 is further provided with a field winding 87, one terminal of which is connected to one supply main 84 and the other terminal of which is connected to the other supply main 84 through an adjustable rheostat 88 and a regulating rheostat 89. The regulating rheostat 89 is provided with a plurality of taps 90 that are adapted to be engaged by a contact arm 91 mounted upon the reel guide 5 near its shaft 6. The contact arm 91 moves across the taps 90 as the guide 5 is moved outwardly by the formation of a coil upon the reel, and the resistance in the circuit of the field winding 87 will be decreased, resulting in a decrease in the speed of the motor 9. The speed of the motor 9 is thus

adapted to be initially adjusted by means of the rheostat 88 to correspond with the delivery speed of the rolls 1 and is adapted to be automatically decreased as the diameter of the coil thereon increases, by the action of the regulating rheostat 89. In this way, the peripheral speed at the point of coiling will always be substantially the same as the delivery speed of the strip 73. The armature terminals 92 of the push off motors 16 are connected across the supply mains 84 through disconnecting switches 93.

Having thus described the various parts entering into my invention, the operation thereof is as follows:—The reel switch 4 is first moved into alinement with one of the guides 5, and the switches 85 and 86 of the corresponding reel 7 are closed, thereby starting the reel motor and energizing the reel winding 48. The finishing rolls 1 then deliver the strip to the switch 4 and the guide 5 delivers the strip to the periphery of the reel where it is seized by the magnetic segments 66 and the table 10.

It is well known that metal strip is usually rolled at a temperature above the point of recalescence, at which the magnetic properties of the metal are lost. In passing between the rolls 1 and the reel 7, the strip is allowed to cool to a temperature below the point of recalescence, at which the magnetic properties of the strip will be sufficiently regained so that it can be seized by the magnetic reel. The cooling of the strip forms no part of my invention and may be accomplished in any suitable way, such for example, as that disclosed in the copending application of Victor E. Edwards, Serial No. 324,772, filed Sept. 19, 1919, in which specific means for cooling the strip between the rolls and the magnetic reel is fully shown and described.

As soon as the strip 73 is seized by the reel 7, it is coiled thereon and as the diameter of the coil increases, the speed of the reel motor 9 is automatically decreased, so that the peripheral speed at the point of coiling is always approximately the same as the delivery speed of the strip. This automatic adjustment of the speed of the reel motor 9 prevents the strip from stretching or snarling in the guides between the rolls 1 and the reel 7. As soon as a coil has been completed, the disconnecting switch 85 is opened, thus deenergizing the reel motor 9. The reel is then brought to rest by dynamic braking of the motor and the braking effect of the shoe 81, the winding 48 still being energized in order that the brake shoe 81 may exercise a magnetic braking effect in addition to that caused by the pressure of the resilient member 82. As soon as the reel has been brought to rest, the disconnecting switch 86 is opened, thereby de-energizing the winding 48. The switch 93 of the push-off motor circuit is

then closed and the cam 23 is allowed to turn through one revolution.

The coiling table 10 immediately starts to move downward and as the reel is no longer energized, the magnetic segments 66 are free to move inwardly about their pivots 67, so that the coil may easily be stripped off the segments 66, as the table 10 is lowered. Figures 10 and 11 show specific means for stripping the coil from the reel, after de-energization. The non-magnetic ring 72 is provided with a plurality of fingers 94 which extend upwardly between the segments 66 and are provided with projections 95 for engaging the upper edge of the coil, shown in dotted lines. When the table 10 is in its upper position, the projections 95 clear the strip 73 while the coil is being formed. As soon as the table 10 is lowered, the plunger 59 with the plate 62 and the ring 72 moves downwardly under the influence of gravity, whereupon the projections 95 of the fingers 94 engage the inner layers of the completed coil and strip it from the collapsed segments 66.

As soon as the table 10 reaches its lower position the push-off 28 moves the coil from the table 10 to the inspection table 13. The push-off 28 then returns to its former position and the table 10 is again raised into contact with the reel. All of the above movements occur during one revolution of the cam 23, as fully described with reference to Fig. 9. The completed coil is then removed from the table 13 by tilting the same, or in any other manner, and is delivered to the receiving platform 14. The configuration of the platform 14 is such as to cause the completed coil to be centered thereon so that a dog 42 of the conveyor mechanism can remove the coil from the platform 14 and convey it into a non-oxidizing atmosphere, if desired.

As soon as a coil has been completed on one reel 7 and its motor shut off, the switch 4 is moved into alignment with the other guide 5 and the strip is then delivered to the other reel 7 and coiled thereon. The disconnecting switches 85, 86 and 93 of the other reel and push-off are then manipulated, as described above, and another completed coil is delivered to the receiving platform 14. In this way, coils are almost continuously formed and delivered to the receiving platform 14, with substantially no interruption in the rolling.

From the foregoing, it is apparent that by the use of my method and apparatus it is possible to form relatively long and thin metal strips into coils immediately after hot rolling, the reels being adapted to automatically operate at approximately the same speed as that of the strip. In this way there is no chance for the strip to jam between the finishing rolls 1 and the reels 7. The

arrangement of the coiling and push-off mechanisms on opposite sides of the receiving platform 14 allows the completed coils to be conveyed away from the mill along a line substantially coinciding with the center line of the mill, as a whole. In this way the whole arrangement of apparatus may be housed in a relatively long and narrow building with complete utilization of the space occupied by the building.

While I have shown my method as being carried out by a specific arrangement of apparatus, it is apparent that it may as readily be carried out by other forms of apparatus accomplishing the same results, and I desire therefore, that only such limitation be imposed thereon as come within the scope of the appended claims.

I claim,

1. In a strip rolling mill, the combination with rolling and guiding means, and a reel for forming the strip into ribbon coils, of means coacting with said reel for removing a completed coil therefrom and delivering it to a conveying mechanism.

2. In a strip rolling mill, the combination with rolling and guiding means, and a reel for forming the strip into ribbon coils, of a coiling table for supporting the strip while it is being coiled, and for removing a completed coil from said reel.

3. In a strip rolling mill, the combination with rolling and guiding means, and a reel for forming the strip into ribbon coils, of a movable coiling table for supporting the strip while it is being coiled and for removing a completed coil from said reel, and means for removing the coil from said table and delivering it to a conveying mechanism.

4. In a strip rolling mill, the combination with rolling and guiding means, and a reel for forming the strip into ribbon coils, of a vertically movable coiling table adapted, in its upper position, to support the strip while it is being coiled and adapted, in its lower position, to remove a completed coil from the reel.

5. In a strip rolling mill, the combination with rolling and guiding means, and a reel for forming the strip into ribbon coils, of a vertically movable coiling table adapted, in its upper position, to support the strip while it is being coiled and adapted, in its lower position, to remove a completed coil from the reel, and mechanism for removing the coil from the table when the latter is in its lower position.

6. In a mechanism of the class described, a magnetic reel comprising coiling segments and a relatively movable coiling table adapted to be magnetically locked in engagement therewith upon the energization of said reel.

7. In a mechanism of the class described, a magnetic reel comprising a plurality of

pivotally mounted segments adapted to be mechanically locked in their expanded position when the reel is energized for coiling.

8. In a mechanism of the class described, 5
a magnetic reel comprising a plurality of pivotally mounted segments adapted to be magnetically and mechanically locked in their expanded position when the reel is energized for coiling, the said segments 10
being free to move inwardly when the reel is de-energized, and is mechanically unlocked for the removal of a coil.

9. In a mechanism of the class described, a magnetic reel comprising coiling segments 15
and a vertically movable coiling table adapted to be mechanically and magnetically locked in engagement therewith when in its upper position and upon the energization of said reel.

10. In a mechanism of the class described, a magnetic reel comprising a plurality of pivotally mounted segments adapted to be magnetically locked in their expanded position by a coiling table when the reel is 20
energized for coiling, whereby the strip being coiled is magnetically locked to the segments and to the table.

11. In a mechanism of the class described, a magnetic reel comprising a rotatably 30
mounted coiling table adapted to be magnetically locked to the reel upon its energization, whereby the bearing of said coiling table is relieved from the weight of the coil being formed on the reel.

12. In a mechanism of the class described, the combination with a magnetic reel, and a coiling table co-acting therewith, of means 35
for providing for the circulation of a cooling medium through said reel to said coiling table.

13. In a mechanism of the class described, the combination with a magnetic reel provided with an energizing winding and a

plurality of magnetic coiling segments and a coiling table co-acting therewith, of means 45
for providing for the passage of a cooling medium around said winding and between said segments and through said reel to said table.

14. In a mechanism of the class described, 50
the combination with a magnetic reel for forming a ribbon coil, of means for exerting a magnetic drag on the periphery of the coil being formed.

15. In a mechanism of the class described, 55
the combination with a magnetic reel for forming a ribbon coil, of means for exerting a magnetic drag on the circumference of the coil being formed to produce a compact coil. 60

16. In a mechanism of the class described, the combination with a magnetic reel for forming a ribbon coil, of a guide for delivering a strip to said reel for coiling and for exerting a magnetic breaking effect on the 65
periphery of the coil as it is being formed thereon.

17. In a mechanism of the class described, a magnetic reel comprising a movable member provided with projections for stripping 70
a completed coil from the reel.

18. In a mechanism of the class described, a magnetic reel comprising a movable member provided with projections held clear of 75
the coil being formed, with the member in its upper position and adapted to strip the coil from the reel when the member moves to its lower position.

19. In a mechanism of the class described, a magnetic reel comprising a movable member provided with projections held clear of 80
the coil being formed, while the reel is energized and adapted to strip the coil when the reel is deenergized.

Dated this 26th day of December, 1919.

FRED B. CROSBY.