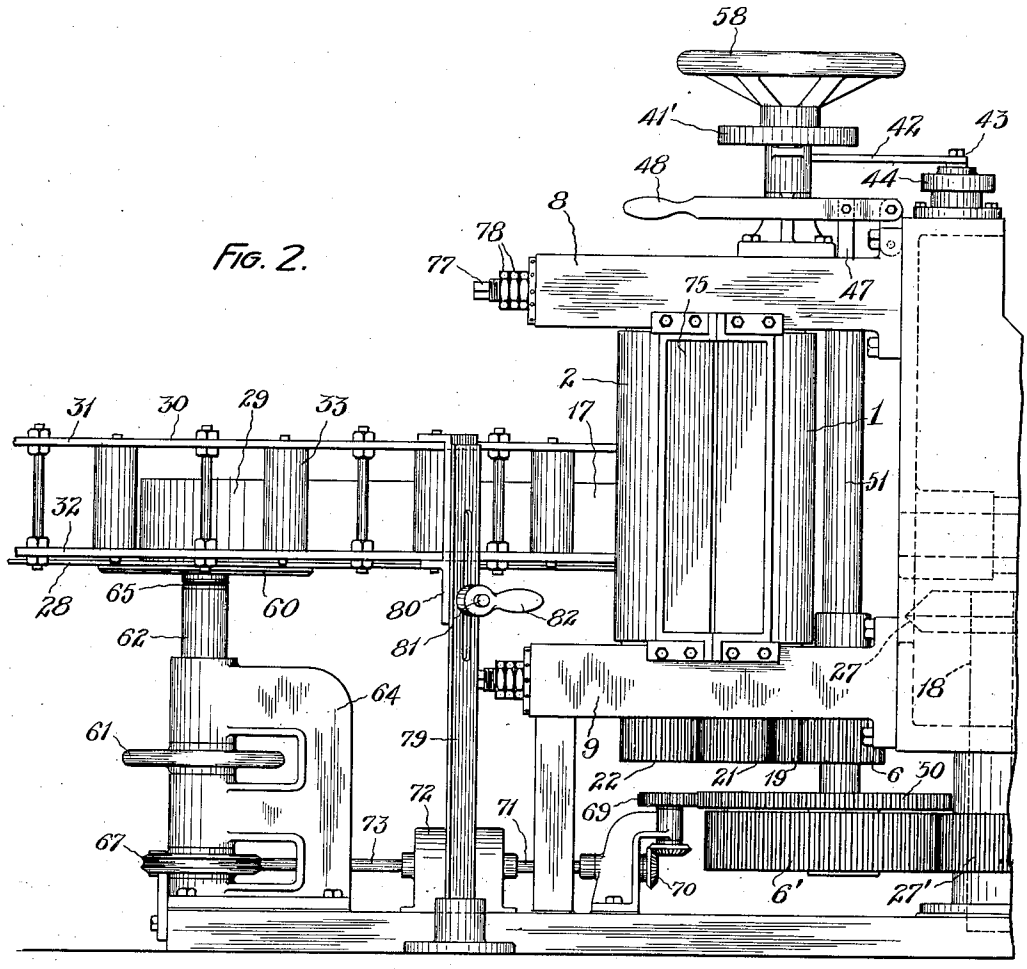
Feb. 21, 1928. **1,660,051**

J. A. SARGENT

COILING MECHANISM

Filed June 17, 1925 3 Sheets-Sheet 1

FIG. 2.



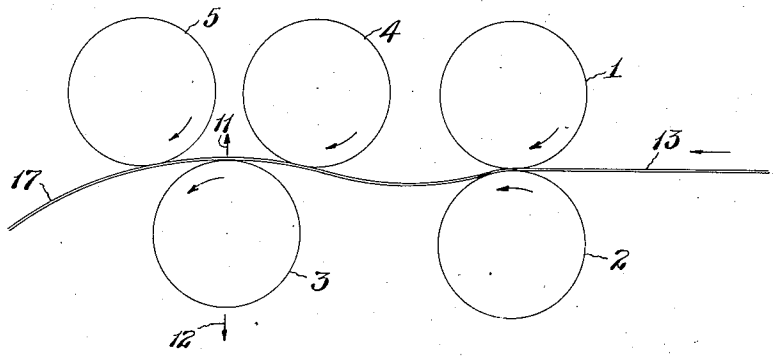


FIG. 1.

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COILING MECHANISM

Filed June 17, 1925 3 Sheets-Sheet 2

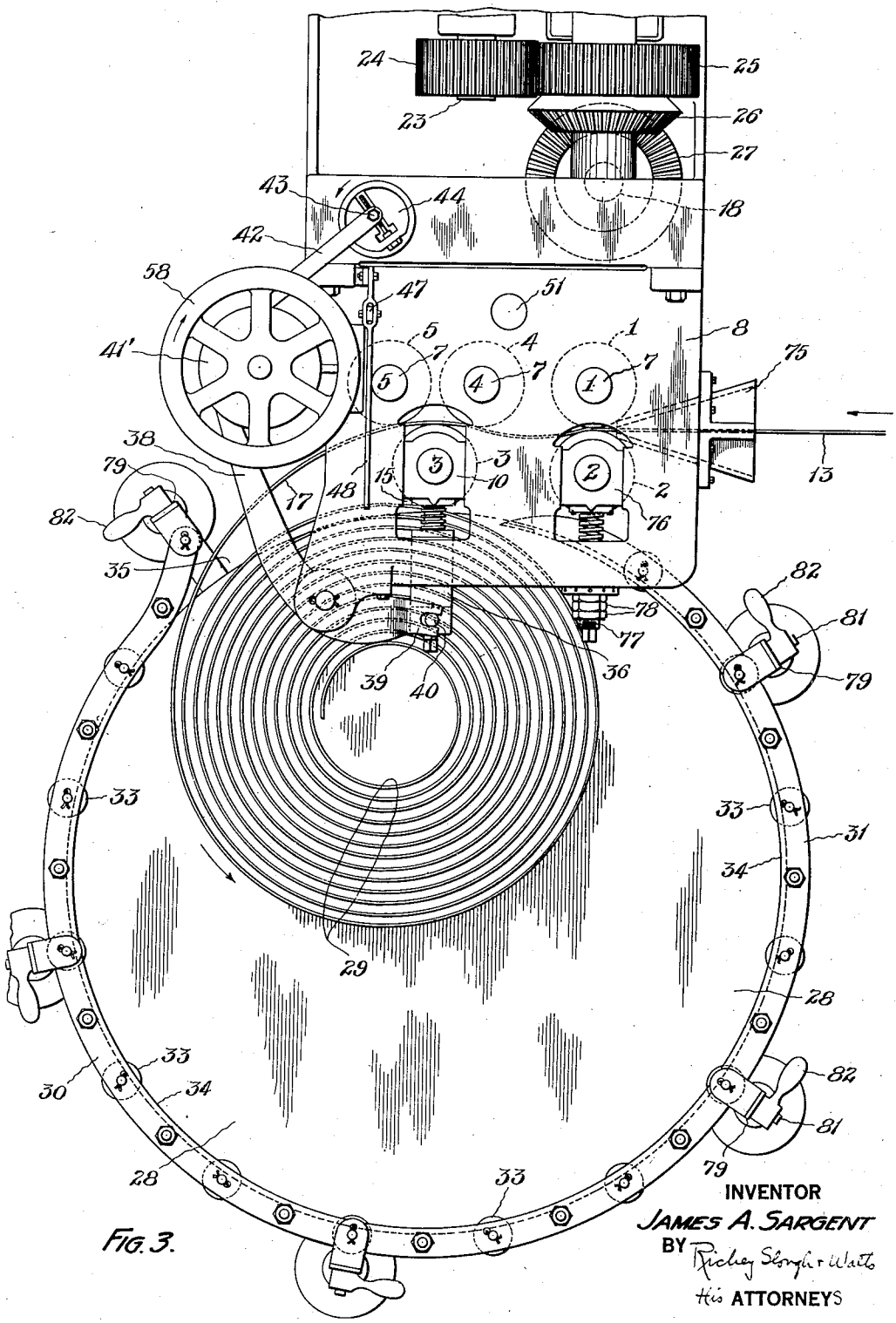


FIG. 3.

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COILING MECHANISM

Filed June 17, 1925 3 Sheets-Sheet 3

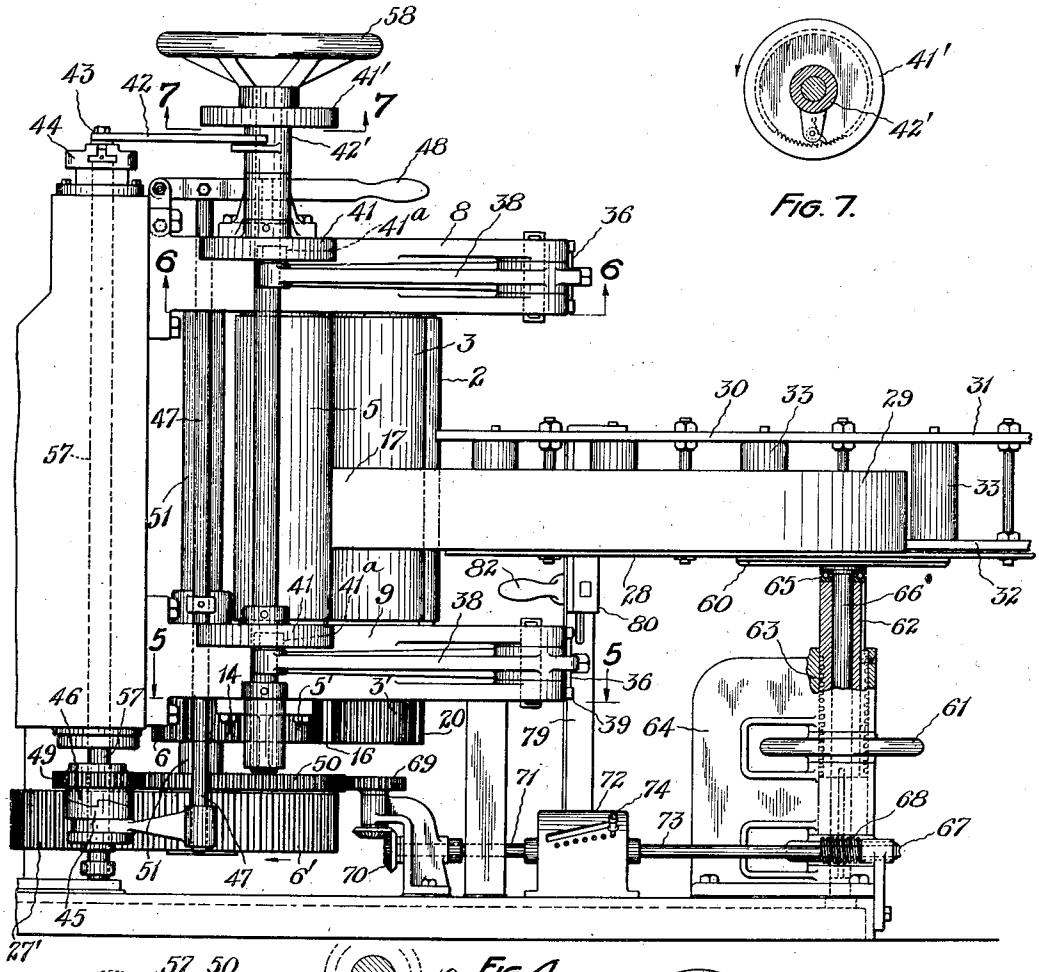


FIG. 4.

FIG. 7.

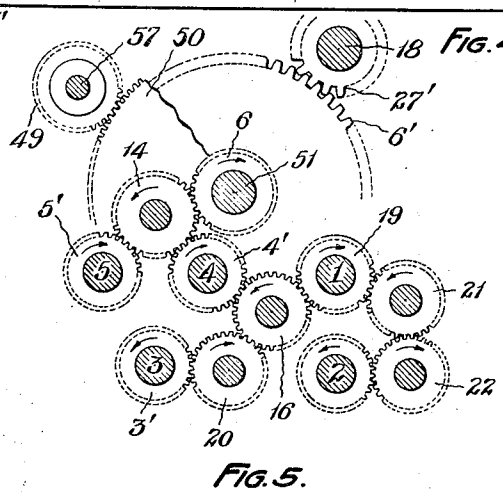


FIG. 5.

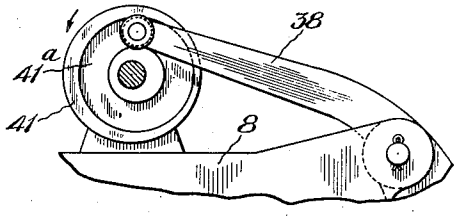


FIG. 6.

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Patented Feb. 21, 1928. 1,660,051

UNITED STATES PATENT OFFICE.

JAMES A. SARGENT, OF ELYRIA, OHIO, ASSIGNOR TO STEEL AND TUBES, INCORPORATED, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

COILING MECHANISM.

Application filed June 17, 1925. Serial No. 37,694.

My invention relates to coiling mechanism, and particularly to coiling mechanisms employed for the purpose of forming metal strip or sheet into a coiled spiral form of given approximate dimensions, such mechanism receiving the strip whether in a normally straight strip or variously formed, in coils or otherwise.

Strip steel especially as it comes from the mill commonly has an external scale or oxide adhering to its outer surfaces, and prior to the employment of such strip steel for fabricating steeel articles, or prior to administering such strips of steel to the reducing rolls to bring it to size where such operations are performed, it is first necessary to pickle the strip steel in a pickling bath where the scale is removed from the strip steel.

It is more convenient to handle such strips of steel or other metal in the form of spiral coils than otherwise since such coils may be placed on racks and supported thereon, lowered into the pickling vats for treatment therein and removed therefrom after such treatment has been consummated.

Heretofore in mechanisms for forming spiral coils of sheet metal, it has generally been the practice, so far as I am aware, to arrange the forming rolls so that their axes are in horizontal planes whereby the strip metal emerges from the mechanism to form a spiral coil projected upwardly from the rolls and supported in a stationary cage, with the convolutions of the spiral disposed in a vertical plane. Such arrangements have been unsatisfactory for a number of reasons among which are that the weight of metal carried in the spiral deforms the same, it is therefore difficult to produce a spiral of predetermined form, and also it is difficult to reproduce a spiral of any given form with any degree of accuracy.

An object of this invention therefore is to provide a mechanism whereby strip metal may be deformed to cause it to take a spiral coil shape, the convolutions of the spiral being on progressively larger radii as the coil is formed.

Another object is to provide a method of producing a coil in which the convolutions are normally out of contact with each other.

Another object of my invention is to provide apparatus wherein the coil may be supported upon a horizontal platform during the forming operation.

Another object of my invention is to rotate such a horizontal platform in a mechanism of the kind described during the forming operation.

Another object of my invention is to provide a mechanism of the type mentioned wherein strip steel may be fed to the rolls of the mechanism and thereby operated upon to form the coil of strip steel, the successive convolutions in the coil being susceptible to more precise predetermination.

Other objects of my invention and the invention itself will become apparent to those skilled in the art to which my invention appertains as the following description of an embodiment of my invention progresses and in which description reference will be had to the accompanying drawings forming a part of the specification.

Referring to the drawings—

Fig. 1 shows diagrammatically forming elements which may be employed in an embodiment of my invention, the view being taken as if from above the rolls of the mechanism;

Fig. 2 shows a side elevational view of a portion of a mechanism embodying my invention comprising rolls, a portion of the frame supporting the same, and a portion of the platform for receiving the coiled metal strip after it leaves the rolls;

Fig. 3 shows a top plan view of the apparatus illustrated in elevation in Fig. 2;

Fig. 4 is an opposite side elevation of the apparatus illustrated in Fig. 2;

Fig. 5 shows a sectional view on line 5—5 of Fig. 4 showing the driving chain of gears which drive the rolls;

Fig. 6 is a section on the line 6—6 of Fig. 4; and

Fig. 7 is a section on the line 7—7 of Fig. 4.

Referring now to the different figures of drawing and in all of which like parts are designated by like reference characters, at 1 and 2 I show a pair of receiving rolls for the mechanism disposed with their circumferential surfaces disposed closely adjacent each to the other, and between which a strip of sheet metal 13 may be advanced in the

direction of the arrow shown in Figs. 1 and 3, and at 4 and 5 I show a pair of adjacent forming rolls, these rolls being disposed preferably as shown with their axes in alignment with the axis of the roll 1.

At 3 I show a third forming roll which is capable of being reciprocated in the direction shown by either arrow 11 or 12, Fig. 1, as may be desired.

The method employed in coiling the sheet or strip 13 may be clearly seen from a consideration of Fig. 1. The sheet is received between rollers 1 and 2 and by these delivered to the triangularly arranged rollers 3, 4 and 5. If the roller 3 be moved toward the rollers 4 and 5, that is, in the direction of the arrow 11, it will be seen that the sheets will be given a greater curvature than that shown, due to the greater distance from alignment of the points of contact of the sheet with the three rollers 3, 4 and 5. Conversely if the roller 3 be moved away from the rollers 4 and 5, or in the direction of the arrow 12, the curvature will be decreased. I propose to start the strip 13 between rollers 3, 4 and 5 with the roller 3 moved relatively near to rollers 4 and 5, thus giving the first end of the strip a relatively high curvature, and, as the strip is fed between the rollers, to gradually retract the roller 3 at a rate which will reduce the curvature of the sheet at a rate slightly greater than would be the case if the sheet were wound in a spiral having successive convolutions in contact with each other. By so reducing the curvature I produce a spiral in which each convolution is spaced from those adjacent thereto, providing space for the pickling liquid to reach every part of the surface of the metal and for the removed scale to drop out from between the convolutions.

All of the rolls 1 to 5 inclusive have their axes disposed vertically in the machine and are journalled at their ends in the upper frame element 8 and in the lower frame element 9, either directly or by means of movable bearings below described.

The roll 3 is journalled within like adjustable blocks 10, which are slidably mounted for reciprocation within the slideways 15 in the upper and lower frame members respectively; this slidable mounting is provided for the purpose of moving the roll 3 toward and away from rollers 4 and 5 in the direction indicated by the arrow 11 or that indicated by the arrow 12 of Fig. 1, to vary the degree of curvature given the strip metal passing between the rolls 4 and 5 on the one side, and the roll 3 on the other side. The rolls are suitably rotated by motor driven mechanism later herein described, the effect of which is to draw the sheet metal first between the receiving rolls 1 and 2 which engage the two principal surfaces of the sheet, to propel it into forming engagement with the surfaces of the forming rolls 3, 4 and 5 which make rolling engagement with the metal, causing it to emerge as shown at 17, being then bent into a curved form; this curve is continuous and in the same direction and when caused to continuously vary in degree by continuous retraction of the roll 3 from the other rolls 4 and 5, a coil is formed from the metal strip as it leaves rolls 3 and 5. As the strip is curved and the coil formed by one pass through the rolls of the machine, it is not noticeably hardened but remains soft, a condition which is particularly desirable for later reducing operations, but which increases the possibility of deformation of the convolutions of the coil during the coiling or recoiling operation or at the receiving table.

The rolls 1 to 5 inclusive may be driven in any suitable way, such as by the chain of gears comprising gears affixed to the lower ends of the shafts carrying the rolls, and which shafts are numbered in some of the figures with the same numerals as the rolls themselves for simplicity in identification. Obviously all the rolls need not be power driven. For use with material having sufficient stiffness it would only be necessary to drive the feed rolls 1 and 2, or possibly only one of these, depending on the stiffness of the material and its friction with the other rolls for their rotation. Again, after the material has been started between rolls 3, 4 and 5 driving one or more of these might be sufficient to draw the sheet through the machine.

In Fig. 5 a main driving gear is shown at 6 and drives an intermediate gear 14 which meshes with both the gears 5′ and 4′ affixed to the ends of the rolls 5 and 4, respectively, to drive them in the same direction, and which, viewed from above in the embodiment illustrated, will be in a clockwise direction. The gear 4′ meshing with an intermediate gear 16 will drive it in a counter-clockwise direction, and the gear 16 meshing with the gears 19 and 20 will drive both of these in a clockwise direction. The gear 20 meshing with the gear 3′, affixed on the end of the roll carrying shaft 3, will drive it in a counter-clockwise direction. The gear 16 rotated counter-clockwise will rotate the rolls 1 and 2 in a clockwise and counter-clockwise direction, respectively, the direction of the roll 2 being reversed by means of a pair of intermediate gears 21 and 22 between the gears carried on the roll shafts 1 and 2.

The driving gear 6 for the chain of gears may be driven in any suitable way, the power being supplied from any source of power such as an electric motor or the like, and which may drive a shaft 23 as shown in Fig. 3, and through gears 24, 25, 26 and 27, shaft 18 and gears 27′ and 6′ may drive the gear 6 at a speed determined by the

speed of the motor and the size of the gears as is well known and which speed will be that which is best suitable for driving the rolls.

The platform 28 is provided to receive the sheet metal strip which may be coiled as shown at 29, Fig. 3, there being a guard 30 comprising upper and lower frame members 31 and 32 between which a plurality of rollers 33 are provided, these being of such size that they will preferably project beyond the inner edge 34 of the upper and lower frame members. An opening 35 is provided as an entrance to the space enclosed by the guard or cage for the reception of the coiling sheet metal 29 which emerges as shown at 17 from the forming rolls 3, 4 and 5. A plunger element 36 is mounted to reciprocate in the upper frame member 8 and in order to advance the roll 3 toward the rolls 4 and 5, or during the recoiling process to draw the roll 3 away from the rolls 4 and 5 to gradually decrease the degree of curvature imparted to the emerging sheet metal strip 17. Although the same is hidden from view in the figures, a like block 10 carrying the other end of the roll 3 is provided in the lower frame member 9, and is operated by the same mechanism now being described for the operation of the block 10, so that both ends of the rolls are like supported and like adjusted simultaneously by like mechanism.

Levers 38 are pivoted to the frame members 8 and 9 and have bifurcated ends 39 which embrace pins 40 carried by the plunger elements 36, and the levers 38 are, during the operation of the machine, gradually cammed by a cam groove 41^a in a rotatable disc 41 to withdraw the roll 3 gradually from the rolls 4 and 5.

Suitable mechanism is provided for slowly revolving the camming disc 41 having the eccentric groove 41^a, and which will not be described in detail, but comprises a reciprocating link 42 adapted to operate a ratchet mechanism comprising a pawl and ratchet teeth carried by the elements 42′ and 41′, the reciprocating driving link 42 being journalled at 43 to a rotating disc member 44, but disposed eccentrically of the said disc member.

The ratchet and pawl feeding mechanism as illustrated in Figs. 6 and 7, shows the camming groove 41^a in the element 41. A clutch 45—46 adapted to be controlled by a rod 47 to which is secured at its upper end an operating handle 48 is effective when operated to the position shown in Fig. 4 to rotate the eccentric element 44 fixedly secured to shaft 57 by clutching the clutch element 45 keyed on the shaft 57 to the clutch element 46 carried by the gear 49, and which gear in turn is driven by a large gear 50 which is carried on the same shaft 51 which carries the driving gear 6.

The gear 49 is only loosely journalled on the shaft 57. A hand wheel 58 is provided for the purpose of restoring the eccentrically grooved cam disc 41 to any desired position, as, for instance, between operations of the machine, and to reset the roll 3 to its initial position before a given operation of the machine. It will be observed, however, that with the arrangement illustrated the cams may be moved to any desired position by the hand wheel, irrespective of whether the parts of the apparatus are moving or stopped.

The platform upon which the coil is received may be of any desired construction. This operation, however, is much better if it be arranged to permit the coil to rotate freely or if it is assisted in rotating, thus preventing the strip being fed thereto from being subjected to high thrust forces, which might deform the same. In the embodiment illustrated, the platform consists of a horizontal disc 28 carried on a rotatable table 60 which may be elevated or lowered by means of a hand wheel 61 by virtue of the supporting hollow sleeve 62 having threads 63, and upon which threads the internally threaded hand wheel 61 is carried. The hand wheel 61 is carried between jaws of a frame 64 whereby rotation of the hand wheel will elevate or lower the turntable by raising or lowering the tube 62 supporting the table 60 upon thrust bearings 65. The shaft 66 carrying the platform 60 at its upper end carries a worm gear 67 at its lower end adapted to be driven by a worm 68 which in turn is driven from the large gear 50 through pinions 69 and 70, shaft 71 through the change gear set contained in the casing 72 and the shaft 73. It is desirable that the platform be adjustable vertically, as by such adjustment the wear upon the rolls may be distributed over their entire length, and their useful life thus greatly prolonged.

The change gear set has an operating handle 74 adapted to vary the relative speeds of shafts 71 and 73 whereby the platform 28 may be rotated at any desired speed. The turntable is so disposed and of such a size as to be capable of supporting rolls of the largest size which may be coiled by the machine, and the surface of the turntable 28 is preferably made very smooth and the floor is preferably metallic. The cage 30 is left open at its upper end for ready access to the formed rolls and to permit their ready removal. A guiding casing having inwardly extending walls is shown at 75 adapted to guide the steel or other metallic strip 13 entering the rolls 1 and 2 so as to facilitate ready insertion of the strip between the rolls.

Adjustable means comprising a slidable block 76 and a threaded rod 77 and nuts 78 is provided for the purpose of adjusting the

pressure exerted upon the roll 1 by the roll 2, block 76 and the adjusting means therefor being provided in duplicate at the lower end of the roll.

Suitable cage supporting means is provided and consists of a plurality of slotted standards 79 placed at intervals around the cage 30 to support the same in position about the platform 28. Suitable bracket members 80 are secured to the cage 30 adjacent the standards and are each provided with threaded members 81 adapted to project through the slots in the respective standards. Locking handles 82 are threaded to members 81 to lock the cage at the desired elevation.

Having thus described my invention in a particular embodiment, I am aware that the same may be practiced in embodiments differing widely from that herein illustrated and described, but comprehended within my invention.

I claim:—

1. In a coiling mechanism, the combination with a plurality of forming rolls between which sheet metal strip may be received and formed, one of said rolls being adjustable relative to the other rolls, the axes of the said rolls being disposed vertically, of a movable horizontal platform adapted to receive the formed metal strip without disturbing the spaced arrangement of the convolutions of the coiled strip.

2. In a coiling mechanism, the combination with a plurality of forming rolls between which sheet metal strip may be received and formed, one of said rolls being adjustable relative to the other rolls, the axes of the said rolls being disposed vertically, of a horizontal platform adapted to receive the formed metal strip, and means for rotating the horizontal platform.

3. In a coiling mechanism, the combination with a plurality of forming rolls between which sheet metal strip may be received and formed, one of said rolls being adjustable relative to the other rolls, the axes of the said rolls being disposed vertically, of a horizontal platform adapted to receive the formed metal strip, and a pair of receiving rolls for initially straightening the metal strip and passing it to the forming rolls.

4. In a coiling mechanism, the combination with a plurality of forming rolls between which sheet metal strip may be received and formed, one of said rolls being adjustable relative to the other rolls, the axes of the said rolls being disposed vertically, of a horizontal platform adapted to receive the formed metal strip, means for rotating the horizontal platform, and means to vary the speed of rotation of the platform.

5. In a coiling mechanism, the combination with a plurality of forming rolls between which sheet metal strip may be received and formed, one of said rolls being adjustable relative to the other rolls, the axes of the said rolls being disposed vertically, of a horizontal platform adapted to receive the formed metal strip, means for rotating the horizontal platform, and adjustable means to support said platform.

6. A coiling mechanism comprising two rolls rotatable about vertical axes and adapted to engage one side of a metal strip, a roll adapted to engage the other side of said strip between the points of contact with the two first mentioned rolls, and means for continuously and gradually moving said last mentioned roll toward or away from said first mentioned rolls.

7. A coiling mechanism comprising two rolls rotatable about vertical axes and adapted to engage one side of a metal strip, a roll adapted to engage the other side of said strip between the points of contact with the two first mentioned rolls, and automatic means for moving said last mentioned roll toward and away from said two first mentioned rolls, the amount of movement being in a predetermined ratio to the number of rotations of the rolls.

8. A coiling mechanism comprising a pair of oppositely rotating feed rolls, two bending rolls rotatable about vertical axes to engage the same side of metal strip at spaced points, a third rotatable bending roll to engage the opposite side of said strip intermediate said points and means for continuously moving said last mentioned roll toward or away from said two first mentioned bending rolls at a rate in predetermined ratio to the rate at which the strip is passed between the rolls.

9. A coiling mechanism comprising vertical bending rolls for imparting curvature to a strip of metal to form a spiral, a table upon which said spiral is received as it is formed, and means for adjusting the height of said table to permit different parts of the rolls to act upon the strip.

10. A coiling mechanism having a frame comprising vertically spaced substantially horizontal members, vertical rolls between two of said members for coiling metal strip, a support for receiving the coil as it is formed, and means for rotating the rolls and moving the support.

11. A coiling mechanism having a frame comprising vertically spaced substantially horizontal members, vertical rolls between said members for forming metal strip into a spiral, a support for receiving the spiral from the rolls as it is formed and means for simultaneously rotating the rolls and moving the support.

12. A coiling mechanism comprising bending rolls for forming a strip of metallic material into a spiral, feed rolls for delivering

the strip to the bending rolls, means for simultaneously rotating both the bending rolls and the feed rolls, means for gradually moving one of the bending rolls to change the curvature of the strip being formed, and means for adjusting said movable roll by which it may be quickly adjusted either while rotating or idle.

13. The process of coiling strip metal which comprises passing the metal on its edge in an upstanding position between a plurality of forming rolls and meanwhile gradually and continuously increasing the space between the forming rolls on opposite sides of the said metal, thereby progressively changing the curvature of the metal.

14. A coiling mechanism for strip metal comprising two outer, vertically disposed, forming rolls, an intermediate forming roll disposed parallel to the first said rolls and rotatable about an axis movable relative to and in parallelism with the axes of the first mentioned rolls, and positive means for automatically moving the last mentioned roll away from and back toward the first said rolls.

15. A coiling mechanism for strip metal comprising two outer forming rolls and an intermediate forming roll, the rolls having vertically disposed substantially parallel axes, and positive means for automatically increasing and decreasing the space between the intermediate roll and the two outer rolls coincident with rotation of the rolls.

16. In a coiling mechanism the combination of oppositely disposed vertical forming rolls for curving strip metal into a coil having convolutions thereof lying in one plane, means for feeding said metal through said forming rolls on edge, and means controlling said forming rolls to decrease the curvature of said metal in a predetermined ratio to the rate at which it is supplied thereto.

17. A coiling mechanism for coiling metal strips whose characteristics permit bending when cold comprising forming rolls having vertically disposed axes movable relatively to form the strip into a spiral having the convolutions lying in one plane, and horizontal means for supporting the spiral on end during its formation while maintaining its convolutions out of contact with each other.

18. A coiling mechanism comprising opposed forming rolls movable relative to each other for forming a strip metal into a spiral with convolutions of gradually decreasing curvature lying in one plane, and a support disposed horizontally to receive said spiral from said bending means and support it on end with its convolutions out of contact with each other.

19. A coiling mechanism comprising forming rolls having vertically disposed axes movable relative to each other for forming metal strip supported on edge into a spiral of gradually decreasing curvature with its convolutions in one plane, and a support disposed to receive said spiral from said bending means, said support being adapted to move the spiral during the coiling thereof in a manner to prevent contact of the convolutions with each other.

20. A coiling mechanism having a frame comprising vertically spaced horizontal members, vertical rolls maintained between two of said members for coiling strip metal into a spiral, a horizontal support for receiving the coiled strip on end, means for rotating the rolls, and means for moving the coil on the said horizontal support.

21. A coiling mechanism comprising vertically disposed forming rolls for bending strip metal with a gradually decreasing curvature, vertically disposed feeding rolls to move strip metal through the said bending rolls, and means for adjusting the position of the forming rolls with respect to each other for bending the strip metal into spiral form with any predetermined rate of change of curvature.

22. A coiling mechanism comprising three vertically disposed forming rolls between which strip metal may be passed on edge and bent to form a coil, and means for automatically moving the axis of one of the said rolls away from the other rolls to vary gradually the curvature of the strip metal as it is being bent and to return the axis of the said roll to its initial position.

23. A coiling mechanism comprising three vertically disposed forming rolls, two of the rolls being adapted to engage one side of strip metal positioned on edge and a third roll adapted to engage the said strip metal on its other side, the said rolls cooperating with each other to form the strip metal into a curve, and adjustable means for gradually increasing the space between the said rolls occupied by the strip metal to vary the curvature of the strip at a predetermined rate, and for decreasing the said space to its initial size after a piece of strip metal has passed therethrough.

24. A coiling mechanism comprising three parallel vertical forming rolls between which strip metal on edge may be passed, the said rolls being positioned to bend the strip metal and coil the same, adjustable means for moving the axis of one of the said rolls at a predetermined rate automatically and progressively with respect to the other rolls to gradually vary the curvature of the said strip metal, and means for restoring the said axis of the roll to its initial position, said means including a member manually operable at all times when the said adjustable means is operatively disengaged from the said roll.

25. In a metal coiling machine, a base, said

base supporting a pair of vertical stationary rolls, a third vertical roll spaced from said first-named rolls, and means for continuously moving said third roll away from said first-named rolls to cause the radius of curvature of a continuously moving strip of metal being passed through said rolls to be continuously increased.

26. In a metal coiling machine, a base, three spaced rolls supported on said base with their axes vertical, means for continuously moving one of said rolls away from the other two rolls to continuously increase the radius of curvature of a moving strip being passed through said rolls.

27. In a metal coiling machine, a base, three spaced rolls supported on said base with their axes vertical, means for continuously moving one of said rolls away from the other two rolls to continuously increase the radius of curvature of a moving strip being passed through said rolls, and means for automatically restoring said movable roll to its original position.

28. In a metal coiling machine, a base, three spaced rolls supported on said base with their axes vertical, bearings for said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a cam lever engaging the bearing of said movable roll, and a driven cam engaging said cam lever for causing said movable roll to gradually move outwardly and then suddenly move inwardly.

29. In a metal coiling machine, a base, three spaced rolls supported on said base with their axes vertical, bearings for said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a cam lever engaging the bearing of said movable roll, and a driven cam engaging said cam lever for causing said movable roll to gradually move outwardly.

30. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a bell-crank lever engaging the bearing of said movable roll, a cam engaging said lever for causing said roll to gradually move outwardly and then to suddenly move inwardly, and power-driven means for rotating said cam.

31. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a bell-crank lever engaging the bearing of said movable roll, a cam engaging said lever for causing said roll to gradually move outwardly and then to suddenly move inwardly, and power-driven means for intermittently rotating said cam.

32. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one said roll being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a bell-crank lever engaging the bearing of said movable roll, a cam engaging said lever for causing said roll to gradually move outwardly and then to suddenly move inwardly, and power-driven means for adjustably rotating said cam.

33. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a movable block engaging the bearing of said movable roll, a lever engaging said block, a cam engaging said lever, and means for gradually rotating said cam to cause said movable roll to slowly move outwardly.

34. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearing for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a lever adapted to control the movement of said movable roll and means engaging said lever to gradually move said movable roll outwardly.

35. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a lever adapted to control the movement of said movable roll, and means engaging said lever to gradually move said movable roll outwardly and then suddenly moving it inwardly.

36. In a metal coiling machine, a base, a pair of housings on said base, three spaced vertical rolls, bearing members for each end of said rolls, said bearing members being carried by said housings, one of said rolls being movable with respect to the other two rolls, and common means for driving said rolls and causing said movable roll to move slowly away from the other two rolls to continuously increase the radius of curvature of a metal strip passing therethrough.

37. In a metal coiling machine, a base, a pair of housings on said base, three spaced

vertical rolls, bearing members for each end of said rolls, said bearing members being carried by said housings, one of said rolls being movable with respect to the other two rolls, levers pivoted to said housings for controlling the movement of the bearings of said movable roll, cams for operating said levers, and means for slowly rotating said cams to gradually bring the movable roll to its outermost position so as to continuously increase the radius of curvature of a metal strip passing therethrough.

38. In a metal coiling machine, a base, a pair of housings on said base, three spaced vertical rolls, bearing members for each end of said rolls, said bearing members being carried by said housings, one of said rolls being movable with respect to the other two rolls, levers pivoted to said housings for controlling the movement of the bearing of said movable roll, cams for operating said lever, and means for slowly rotating said cams to gradually bring the movable roll to its outermost position and after a strip has been completely coiled to suddenly restore said movable roll to its innermost position.

39. In a metal coiling machine, a base, a pair of housings on said base, three spaced vertical rolls, bearing members for each end of said rolls, said bearing members being carried by said housings, one of said rolls being movable with respect to the other two rolls, levers pivoted to said housings for controlling the movement of the bearings of said movable roll, cams for operating said levers, and means for slowly rotating said cams to gradually bring the movable roll to its outermost position and after a strip has been completely coiled to suddenly restore said movable roll to its innermost position, and means for stopping the rotation of said cams immediately thereafter.

40. In a metal coiling machine, a base, a pair of stationary vertical rolls and a movable vertical roll mounted on said base, a pair of levers for controlling the movement of said movable roll, plate cams for operating said levers, means for slowly rotating said cams to permit said movable roll to move gradually outward to continuously increase the radius of curvature of a metal strip passing through said rolls, said cams being so shaped that the movable roll will be suddenly forced inwardly by said levers when the metal strip has been completely coiled up, and means for stopping the rotation of said cams immediately thereafter.

41. In a metal coiling machine, a base, a pair of stationary vertical rolls and a movable vertical roll mounted on said base, means for rotating said rolls, a lever for causing said movable roll to gradually move away from the stationary rolls, a cam for operating said lever, a one-way clutch mechanism for intermittently rotating said cam, a reciprocating rod for operating said clutch mechanism, and a power-driven eccentric for operating said rod.

42. In a metal coiling machine, a base, a pair of stationary vertical rolls and a movable vertical roll mounted on said base, and means for rotating said rolls, a lever for causing said movable roll to gradually move away from the stationary rolls, a cam for operating said lever, a one-way clutch mechanism for intermittently rotating said cam, a reciprocating rod for operating said clutch mechanism, a power-driven eccentric for operating said rod, and means for adjusting the eccentricity of said eccentric to vary the outward speed of said movable roll.

43. In a metal coiling machine, a base, three spaced vertical rolls supported on said base, bearings for each of said rolls, one of said rolls being movable with respect to the other two rolls to continuously increase the radius of curvature of a metal strip being passed through said rolls, a movable block engaging the bearing of said movable roll, a lever connected to said block and adapted to control the movement thereof, said block being adjustably mounted on said base, so as to control the starting position of said movable roll and thereby determine the inside diameter of the coil of metal being formed.

44. In a metal coiling machine, a base, a pair of housings on said base, a pair of stationary vertical rolls rigidly mounted in said housings, a movable vertical roll mounted in said housings adjacent said stationary rolls, slidable bearings for said movable roll, a pair of movable blocks threaded into said housing and engaging said slidable bearings, trunnions on said blocks, levers pivoted to said housings and having bifurcated arms engaging said trunnions, and power-driven cams engaging said levers for gradually moving said movable roll away from said stationary rolls.

45. In a metal coiling machine, a base, a pair of housings on said base, a pair of stationary vertical rolls rigidly mounted in said housings, a movable vertical roll mounted in said housings adjacent said stationary rolls, slidable bearings for said movable roll, a pair of movable blocks mounted in said housing and engaging said slidable bearings, trunnions on said blocks, levers pivoted to said housings and having bifurcated arms engaging said trunnions, and power-driven cams engaging said levers for gradually moving said movable roll away from said stationary rolls.

46. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent said stationary rolls and being automatically continuously movable with respect thereto so as to pro-

duce a spiral coil having its successive layers spaced from each other, a horizontal platform supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position.

47. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent to said stationary rolls and being automatically continuously movable with respect thereto so as to produce a spiral coil having its successive layers spaced from each other, a horizontal platform rotatably supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position.

48. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent said stationary rolls and being automatically continuously movable with respect thereto so as to produce a spiral coil having its successive layers spaced from each other, a horizontal platform rotatably and adjustably supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position.

49. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent said stationary rolls and being automatically continuously movable with respect thereto so as to produce a spiral coil having its successive layers spaced from each other, a horizontal platform supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position, a guiding frame surrounding said platform, said frame having a plurality of vertical rollers to confine the periphery of the coil as it is being formed.

50. In a metal coiling machine, a base, a pair of housings on said base, a pair of stationary vertical rolls rigidly mounted in said housings, a movable vertical roll mounted in said housings adjacent said stationary rolls, bearings for said movable roll, a pair of blocks threaded into said housing and engaging said bearings, trunnions on said blocks, levers pivoted to said housings and having bifurcated arms engaging said trunnions, and power-driven cam engaging said levers for gradually moving said movable roll away from said stationary rolls.

51. In a metal coiling machine, a base, a pair of housings on said base, a pair of stationary vertical rolls rigidly mounted in said housings, a movable vertical roll mounted in said housings adjacent said stationary rolls, bearings for said movable roll, a pair of blocks mounted in said housing and engaging said bearings, trunnions on said blocks, levers pivoted to said housings and having bifurcated arms engaging said trunnions, and power-driven cams engaging said levers for gradually moving said movable roll away from said stationary rolls.

52. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent to said stationary rolls and being automatically continuously movable with respect thereto so as to produce a spiral coil having its successive layers spaced from each other, a horizontal platform supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position.

53. In a metal coiling machine, a base, a pair of vertical feed rolls, a pair of stationary vertical coiling rolls and a movable vertical coiling roll mounted in said base, said movable roll being adjacent to said stationary rolls and being automatically continuously movable with respect thereto so as to produce a spiral coil having its successive layers spaced from each other, a horizontal platform adjustably supported on said base, the strip of metal being coiled lying on its edge as it passes through said rolls and being delivered to said platform in a horizontal position.

In testimony whereof I hereunto affix my signature this 11th day of June, 1925.

JAMES A. SARGENT.