May 17, 1949. B. S. BURRELL 2,470,235

COILING MACHINE FOR STRIP MATERIAL

Filed Aug. 31, 1944 4 Sheets-Sheet 1

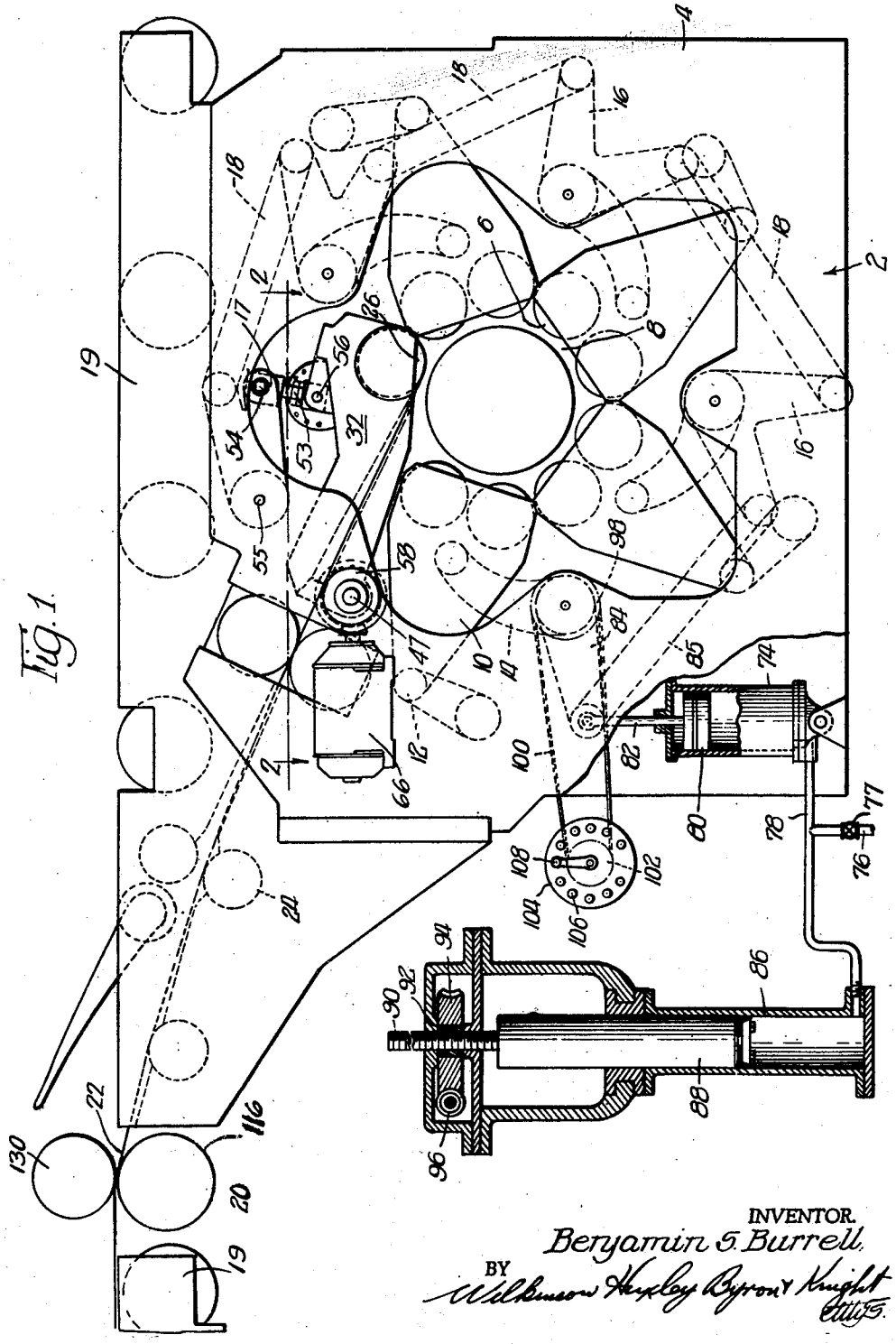


Fig. 1.

INVENTOR.
Benjamin S. Burrell,
BY
Wilkinson Huxley Byron & Knight
Attys.

May 17, 1949. B. S. BURRELL 2,470,235

COILING MACHINE FOR STRIP MATERIAL

Filed Aug. 31, 1944 4 Sheets-Sheet 2

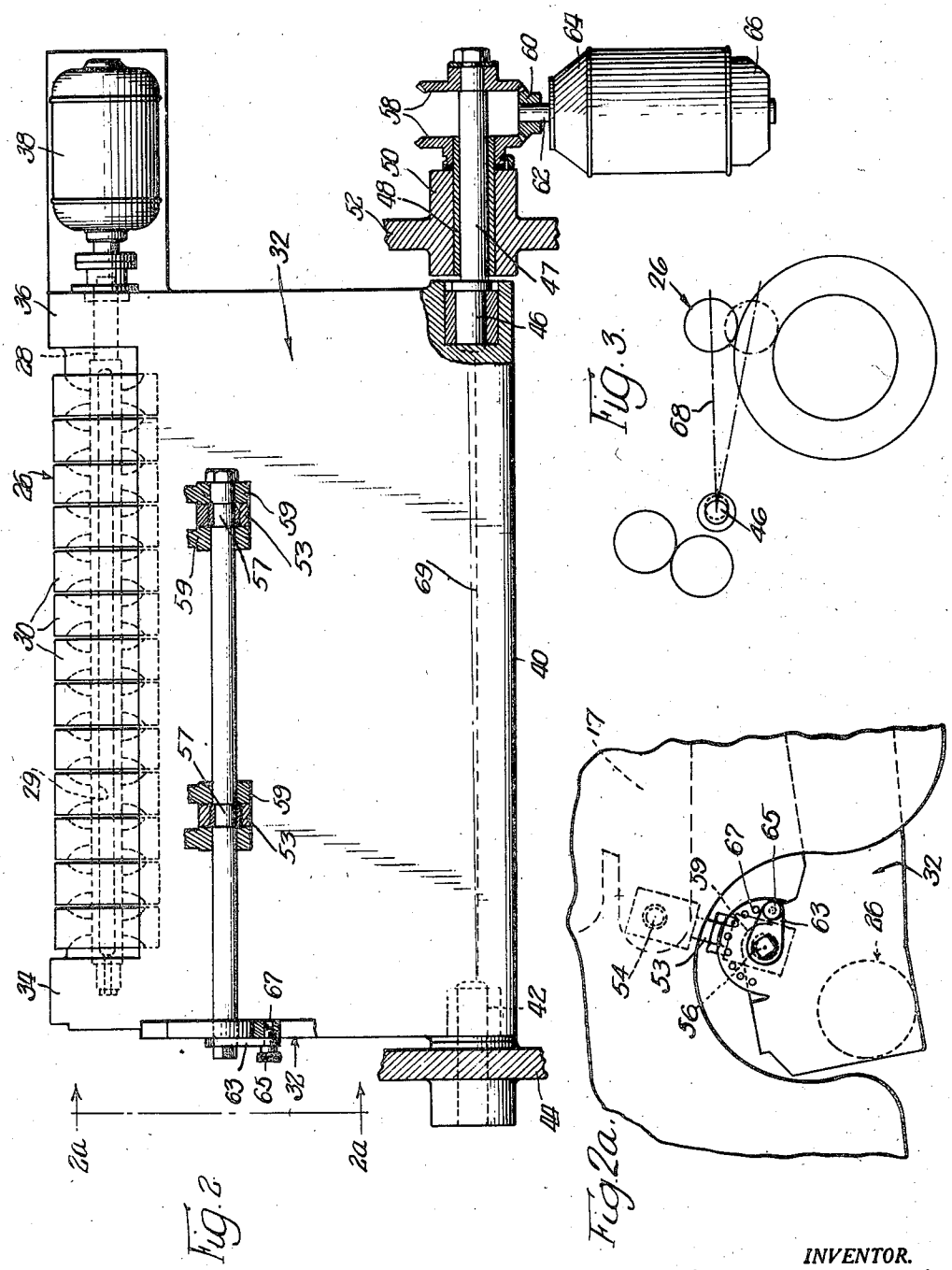



Fig. 2.




Fig. 3.




Fig. 2a.

INVENTOR.
Benjamin S. Burrell,
BY
Wilkinson Huxley Byron & Knight
Attys.

May 17, 1949. B. S. BURRELL 2,470,235

COILING MACHINE FOR STRIP MATERIAL

Filed Aug. 31, 1944 4 Sheets-Sheet 3

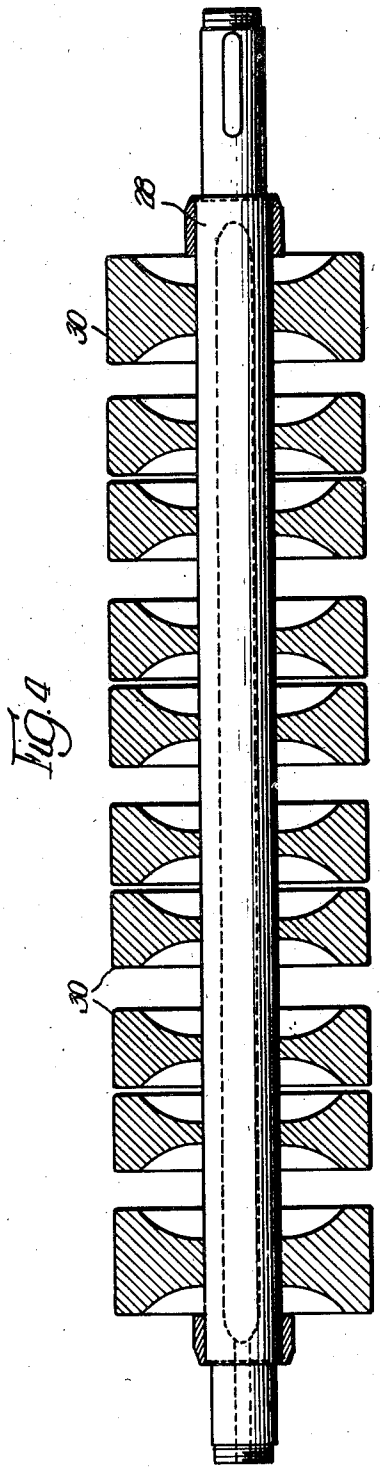



Fig. 4

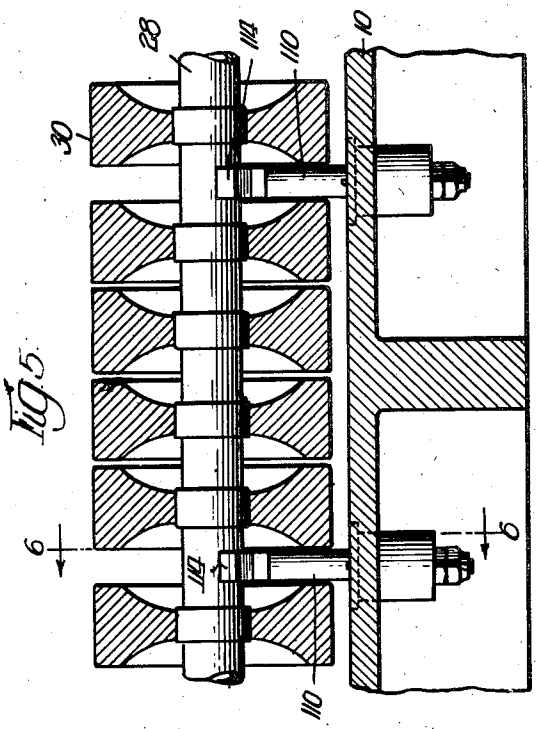



Fig. 5

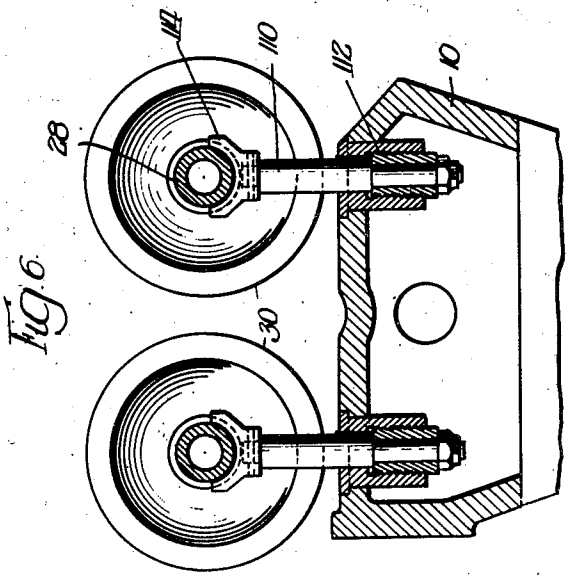



Fig. 6

INVENTOR.
Benjamin S. Burrell.
BY
Wilkinson Huxley Byron & Knight
Attys

May 17, 1949. B. S. BURRELL 2,470,235

COILING MACHINE FOR STRIP MATERIAL

Filed Aug. 31, 1944 4 Sheets-Sheet 4

Fig. 7

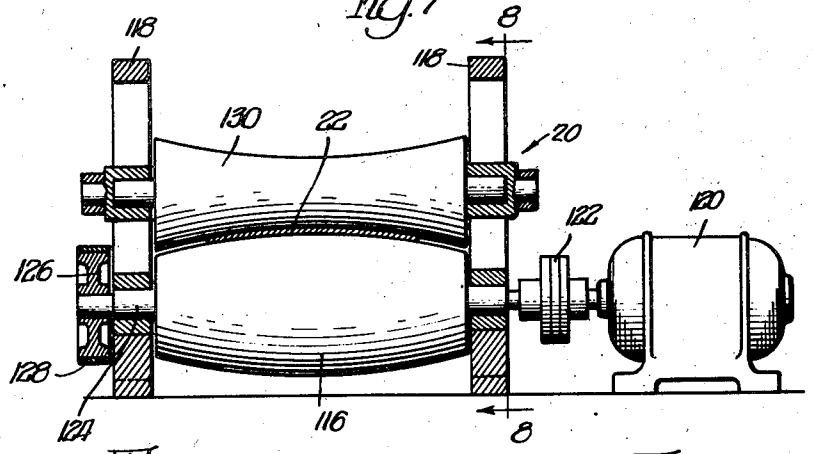



Fig. 8.

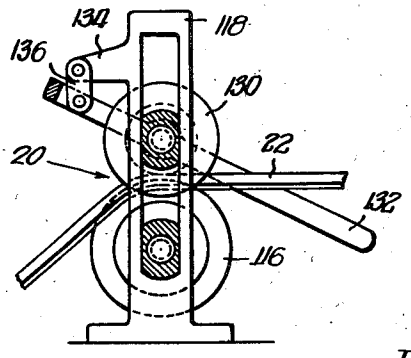



Fig. 9.

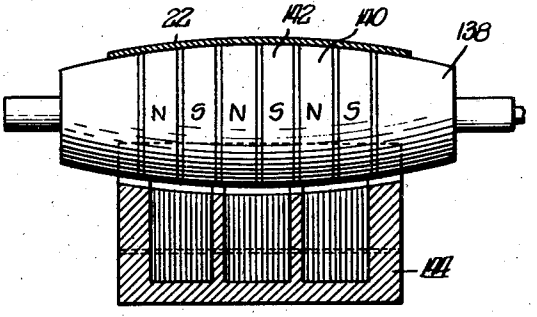
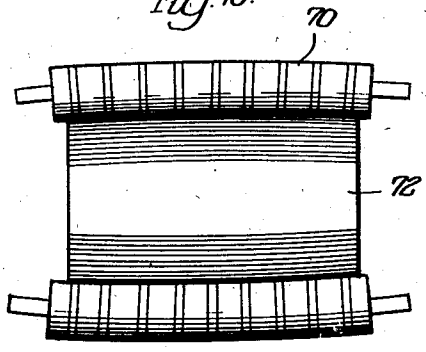



Fig. 10.




INVENTOR.
Benjamin S. Burrell
BY
Wilkinson Huxley Byron & Knight
Attys.

Patented May 17, 1949 2,470,235

# UNITED STATES PATENT OFFICE

2,470,235

## COILING MACHINE FOR STRIP MATERIAL

Benjamin S. Burrell, East Chicago, Ind.

Application August 31, 1944, Serial No. 552,192

12 Claims. (Cl. 242—78)

1

The present invention relates to hot strip mills, and more particularly to improvements in the reel or coiler for said mills.

Among the objects of the present invention is to provide novel guiding mechanism for controlling the coiling of strip material received from the mill into the reel or coil forming mechanism.

In accordance with conventional practices at the present time, coiling mechanism is provided in association with rolling mills producing strips which receive the said strips and form the same into coils having a series of super-imposed convolutions. Certain of these conventional reels or coiling mechanisms are formed generally with a plurality of power driven coil forming elements disposed to provide a substantially enclosed circular unobstructed coiling space adapted to receive and cooperate with a strip fed thereto to form the roll of a series of super-imposed convolutions, such coil forming elements being adjustable outwardly under the action of the material being coiled as the coil becomes larger and larger. Such strip mills are operated to deliver strips to the coiling machine at speeds of from approximately 500 to 3,000 feet per minute and it is highly important to so form these coils that the marginal edges of the convolutions are in alignment and no telescoping of the coil takes place during its formation.

In the operation of hot strip mills, the material being coiled is often slightly thicker in the center than at the edges thereof so that in coiling such material in coils often having as many as 100 convolutions to make up a complete coil the outside or periphery at the center is greater than at the edges, thus forming an exterior surface which is convex in shape across its width which becomes greater as the diameter of the coil increases. Furthermore, when the coil is being formed, it is hotter by approximately 500 degrees Farenheit in the center than at the edges so that there are two factors involved which cause the coil to be convex at its outer surface—one being the thicker strip in the center than at the edges, and the other being the greater temperature at the center than at the edges while in hot coil form due to the slower heat transfer to the air and to the cooling water. All hot rolled strip steel while being coiled hot (in coil form) is convex on the outer surface due to variation of heat transfer, regardless of whether the coil is thicker in the center or of uniform thickness across its entire width.

Due to the increased thickness of the strip at the center and its cambered condition from

2

the mill, it has been impossible heretofore to coil these strips without considerable telescoping of the coil. This is a distinct disadvantage for the reason that these coils are handled by crane magnets and roller and chain conveyors which cause considerable damage to the ends of the coils when the same are in telescoped condition, thus leading to a large amount of waste and considerable expense in the preparation of the coiled strips into the finished product.

Various means have been used in the past for guiding the traveling strip from the conveying table into the coil forming mechanism, such, for example, as disclosed in the Paul Patent No. 2,111,-054, and which have to a certain degree been successful in handling material of certain thicknesses. However, such guide means do not function properly where the strip material is of the order of .060 inch thickness or thinner, inasmuch as the material is too flexible or limber due to weakness to remain flat and stiff and be governed in travel by said edge guides. Accordingly, in accordance with present practices, it has been impossible to prevent telescoping of the coiled strips so that a large amount of waste and considerable expense has been involved in the particular operations under discussion.

It is, accordingly, an object of this invention to provide novel improvements in guiding mechanism for the reels and to provide improvements to coiling mechanism for such rolling mills adapted to eliminate telescoping of the coils and to assure alignment of the marginal edges of the convolutions forming the coil of strip material.

More particularly, the present invention comprehends incorporating novel mechanism in reels formed with a plurality of coil forming elements providing a substantially enclosed circular unobstructed coiling space which is adjustable under varying conditions to wind tightly and to prevent telescoping of the coils of strip material formed within the confines thereof.

Another object of the present invention is to provide a reel as immediately hereinabove described in which one or more of the coil forming elements is adjustable independently of the remaining coil forming elements to produce coils free from any telescoping effect when strip steel is delivered to it in a reasonably straight and uniform condition.

The present invention has as a further object the idea of providing a novel guide means for use in reels of the types hereinabove set forth which is adjustably mounted for displacement axially

with respect to other coil forming elements of the reel.

Still a further object of the present invention is to provide novel guide means for strip material which is adjustable in substantially a straight line within the range of its adjustability and which is adapted to cooperate with the coil of strip material to prevent telescoping of the coil and to assure proper marginal alignment of the series of superimposed convolutions forming the coil.

The present invention further contemplates a novel coil forming mechanism in which all of the coil forming elements are of flexible construction adapted to embrace and conform to the convex shape of the coil being formed so as to prevent a lateral displacement thereof in the coil forming mechanism with the attendant telescopic effect which is characteristic of coils of strip material which are formed at the present time.

Still a further object of the present invention is to provide novel guide mechanism adapted to be incorporated between the table conveyor and the coil forming mechanism for equipment of the type herein disclosed which is adapted to assure proper entry of the traveling strip into the coil forming mechanism.

Another object of the present invention is to provide an improvement in coiling mechanism characterized as including novel means for controlling the pressure applied by the power operated coiling elements to the coil during the formation of the same.

A still further object of the present invention is to provide a coil forming element which is of flexible construction to allow the same to flex and assume the contour of a coil being formed to prevent lateral displacement of the same and to assure that no telescoping of the coil will take place.

The present invention also contemplates adjustable limiting means for one or more flexible coil forming elements which may constitute in part the coil forming mechanism so as to limit the flexure of the coil forming elements during the operation of the machine.

Still a further object of the present invention is to provide guide means interposed between the table conveyor and the coil forming mechanism of hot strip mills and the like, which guide mechanism may be used in conjunction with the novel improvements in the coiling forming mechanism as above described for properly introducing the strip material into the coil forming mechanism. Such guide mechanism is more particularly characterized as involving a convex guide roller having suitable means associated therewith for creating a frictional drag between the strip and the roller to maintain the strip taut between the coiling mechanism and the mill for directing the strip into the coil forming mechanism.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings—

Figure 1 is a view in end elevation of a reel for a strip mill which embodies improvements made in accordance with the present invention;

Figure 2 is an enlarged detached view taken substantially along line 2—2 of Figure 1 and showing guide mechanism for the reel embodying the teachings of the present invention, the said view showing certain of the parts thereof in section to disclose the structure more in detail;

Figure 2*a* is a view in end elevation taken in the plane represented by the line 2*a*—2*a* of Figure 2 of the drawings;



Figure 3 is a diagrammatic view of the guide mechanism shown in Figure 2 of the drawings showing the line of movement of the guide roller therefor;

Figure 4 is a view in cross section of a guide or coil forming roller constituting a part of the coil forming mechanism of the reel;

Figure 5 is a fragmentary view in section of the guide or coil forming roller having associated therewith novel limiting means for determining the extent of flexure of the said roller;

Figure 6 is a fragmentary view in cross section taken in the plane represented by line 6—6 of Figure 5 of the drawings;

Figure 7 is a view partly in section and partly in elevation of a novel guide mechanism adapted to be used in a strip mill between the table conveyor and coiler therefor for guiding the strip material to the entry for the coiler;

Figure 8 is a view in end elevation taken in the plane represented by line 8—8 of Figure 7 of the drawings;

Figure 9 is a view in cross section of an alternative form of construction for guide mechanism interposed between the table conveyor and the coiler of a strip mill; and

Figure 10 is an enlarged diagrammatic disclosure of the cooperative relation between the flexible coil forming elements and the coil of strip material formed thereby.

Referring now more in detail to the drawings, Figure 1 discloses generally a reel or coiling mechanism of conventional design disposed at the end of a table conveyor of a strip mill and known in the field as of the down-coiler type. This type of coiler or reel is shown in various patents, as, for example, in the Biggert Patent No. 1,850,312, as well as the Johnson Patent No. 1,654,651, and only so much of the machine is herein disclosed as is thought necessary to set forth the improvements which have been made thereto in accordance with the present invention.

The reel or coiler 2 is provided with suitable housing structure 4 within which is provided a plurality of power driven strip forming elements or rollers 6 disposed to form a substantially enclosed circular unobstructed coiling space 8 into which is fed strip material to be coiled by said rollers 6. The rollers 6, as shown in the specific illustration of the invention, are mounted in pairs upon movable frames or housing elements 10 which are pivoted, for example, as at 12 and which are moved outwardly under the action of the strip material being coiled within the space 8. Such movement is under control of certain resistant mechanism operating through a plurality of levers 14 connected to each of the supporting structures 10 and which are interconnected through levers and links, such as 16 and 18, to maintain said rollers 6 in position for engagement with the coil of strip material being formed within the space 8. A lever 17 has movement with levers 16 through connection with links 18, as later described.

The reel or coiler 2 of the present illustrative embodiment of the invention is incorporated into the strip forming machine or mill at the end thereof and is adapted to receive the strip material from the table conveyor generally designated by numeral 19 and located to the left of the coil-forming apparatus as shown in Figure 1, said table conveyor delivering said strip material to a guide mechanism conventionally shown at 20

but which is of improved construction, as will be hereinafter more fully set forth. The strip material generally shown at 22 passes from the guide mechanism 20 into the coil forming space 8 and is guided intermediate the guide mechanism 20 and the coiling space 8 by a plurality of guide rolls 24. In general, the coiler 2 may embody in its structure any suitable ejector (not disclosed herein) which is adapted to engage the end of the coils after their formation to move the same longitudinally of the opening 8 and to discharge the coils as formed from the machine.

According to present practices, the strip material formed in the strip mill has a transverse camber or barrel or convex shape surface due to the impossibility of maintaining exact alignment of the strip forming rolls or because of differential rate of cooling of the strip, as above explained. This camber or barrel shape of the strip material becomes pronounced when the strip material is coiled within the reel of the coiling machine due to the large number of convolutions which go to make up such coils. Because of the increased thickness of the coils adjacent the center portion thereof, much difficulty has been experienced in coiling the strip material so as to have the ends thereof in proper alignment. In accordance with prior practices, the ends of the coils are telescoped which leads to considerable damage to the coils through handling operations with the result that considerable material is wasted and greater costs are involved in further finishing operations to produce the completed product.

The present invention in one of its aspects is directed to novel means for preventing the telescoping of the ends of the coils of strip material and to assure proper alignment of the marginal edges of the superimposed convolutions. In order to accomplish this result, the coiler may incorporate in its construction a guide roller 26 which constitutes the top or entry coil forming element of the down-coiling machine, as shown in the drawing, and which, together with the remaining coil forming elements 6, defines the substantially circular unobstructed coiling space 8. As more particularly shown in Figure 4 of the drawings, this roller 26 comprises a shaft 28 which is hollow as at 29 and upon which hollow shaft 28 is mounted a plurality of adjacently disposed roller elements 30 of disc-like formation and which are adapted to conform to the contour or outer surface of the coil of strip material as the shaft is flexed.

The roller 26, through the medium of the shaft 28, is journalled in the guide frame 32 at the respective ends of said shaft, namely, at 34 and 36, it being understood that self adjusting bearings, not shown, are employed for mounting the ends of the shaft 28, thereby permitting flexing of the shaft in accordance with the invention. Roller 26 is power driven by means of the motor 38 supported by the frame and operatively coupled to shaft 28. Said guide frame 32 at its end opposite roller 26 is pivotally supported on a horizontal axis extending through trunnion 40 provided therefor. The stud shaft 42 projects inwardly of frame 44 to pivot one side of the guide frame 32 and the eccentric pin 46 projects inwardly of frame 52 to pivot the other side of said guide frame. The eccentric pin 46 is part of shaft 47 mounted in the eccentric bushing 48 journalled in the hub 50 of the frame member 52.

Whereas, the trunnion end 40 of the guide frame 32 is pivotally supported on the horizontal axis



42—46, the end adjacent roller 26, as shown in Figure 1, is adjustably suspended by the turnbuckles 53 pivoted at 54 to lever 17 adapted to turn on axis 55 and which has movement with levers 16, being connected thereto by the links 18. It is understood that lever 17 has movement in an upward direction, that is, counterclockwise, as the coil increases in diameter so that roller 26 automatically moves outwardly to accommodate the increase in size of the coil. This bodily movement of the roller is possible since guide frame 32 has pivotal movement on its trunnion axis indicated by 42—46.

The turnbuckles 53 are connected to the guide frame by shaft 56 journalled in spaced lugs 59 provided by said frame, the eccentric cranks 57 of said shaft being disposed between said lugs and which connect with the eyes of the turnbuckles 53. Mounted upon a projecting end of shaft 56 is a crank 63, Figure 2a, adapted to carry the spring pressed plunger 65 for engaging any one of a plurality of openings 67 formed in the quadrant secured to frame 32. Through crank 63 the shaft 56 may be conveniently rotated by the operator and said rotation moves the eccentric cranks 57 to vary the distance between 54 and 56 which must be varied to adjust the position of roller 26 either toward or from the coil. This adjustment of the flexible roller is provided so as to secure the proper pressure relation thereof on the coil of strip material as the same is being formed.

Shaft 47, providing the eccentric pin 46, extends beyond hub 50 of frame 52 and is rotated through the bevel gears 58 which mesh with the bevelled pinion 60 attached to shaft 62 of a reduction gear box 64 driven by a motor indicated by 66. Motor 66 is of the reversible type and operation of the same will simultaneously rotate the eccentric pin 46 and eccentric bushing 48 to give minute adjustment to the frame 32 about its horizontal pivot axis 42—46. The roller 26 is accordingly adjusted laterally of the coil as is desired to properly guide the strip material for coiling within space 8.

Figure 3 of the drawings illustrates the eccentricity of the trunnion end 40 of the frame, the line of adjustment being indicated by 68. In Figure 2 the eccentric adjustment of one end of the trunnion axis 42—46 is further indicated by numeral 69.

While the drawings disclose the roll 26 as being of the flexible type comprising a plurality of elements 30, nevertheless the invention is not limited to such form of construction inasmuch as it has been found that satisfactory results can be secured by the use of a solid or non-flexible roller which will conform to a straight or flat surfaced coil, that is, one that is exactly correct in thickness across its width and is made cold by water cooling between the mill and coiling machine if the top or first entry roller of the group of rollers is adjustable in and out of axial alignment with the other rollers.

Furthermore, while the embodiment herein selected to illustrate the invention discloses a single eccentric means for moving one end of the roller so as to angularly displace the longitudinal axis thereof with respect to the other rollers forming the opening 8, nevertheless eccentric operating means may be provided at each side of the trunnion axis 42—46 for adjusting the roller in the manner herein described.

By use of the mechanism hereinabove set forth, it is possible to coil reasonably straight strip ma-

terial taken from the strip mills so that no telescoping of the ends takes place and the marginal edges of the superimposed or successive convolutions of the coil are in proper alignment. With such a coil, damage to the coils is eliminated, thus resulting in a great saving in material as well as cost in the further processing of this material to produce the finished product.

The present invention is not herein limited to the use of a flexible first entry coil forming element in the coiler, but comprehends a coiler in which all of the coil forming elements or rollers 6 may be of flexible construction. Such an assembly provides a flexible roller formation about the coil being built up whereby the coil is held firmly in a constant central position by the gripping of the flexed rollers so as to provide greater traction between the coiling roller mechanism and the coil being made, thus eliminating slippage which will provide a closer synchronized speed between the coiling machine and the mill delivery speed of the strip material. This is of particular advantage in preventing marks or defects to the surface of the strip material formed by coiling machines in accordance with present practices where it is usual to operate the coiling mechanism from 300 to 500 feet a minute faster than the mill delivery speed whereby a considerable amount of slippage takes place in the coiling machine in order to keep the strip taut between the coiler and the mill.

Figure 10 of the present drawings is representative of a coiler in which the rollers 70 conform to the rollers 6 shown in Figure 1 of the drawings and are made of flexible construction in accordance with the roller shown in Figure 4 of the drawings so as to conform to the convex or barrel shape of the coil 72 formed therebetween to prevent its lateral displacement and to guard against the possibility of the telescoping effect heretofore inherent in coiling operations.

The present invention also contemplates novel means for controlling the pressure applied to the coil of strip material by the coil forming elements as the coil is being built up. As is well known, the coils of strip material of a 44 inch mill are usually produced in widths varying from 9 inches to 42 inches and of a diameter of from 30 to 45 inches and range in weight from about 1,000 to 8,000 pounds. It will, therefore, be readily apparent that the coiling rollers will require a variable pressure to properly flex or bow the rollers to conform to the convexed outside surface of the coil which is continuously getting greater as the coil builds up. For instance, a resisting pressure of 80 pounds per square inch may be needed at the start of a coil and a continuous build-up of pressure to, say, 125 pounds per square inch when the coil has reached its completion, each width of material, size and weight of coil requiring a varying resistance.

Such means as contemplated by the present invention for control of this pressure is shown in Figure 1 of the drawings as embodying an air cylinder 74 connected to a compressed air feed or charging line 76 through the medium of a conduit 78. The valve 77 in the charging line is closed when the system has been supplied with air under pressure. In other words, the charging line 76 supplies initial loading pressure to the system. Operating within the cylinder 74 is a piston 80 to which a rod 82 is connected and which rod is in turn connected to the lever 84 of the mechanism for controlling the movement of the rollers 6. Communicating with the conduit 78 is an air receiver or cylinder 86 having a plunger 88 operable therein and which is provided with a screw 90 threadedly engaged by a nut 92 mounted within the worm gear 94 and which gear is operative through the worm 96. Mounted for movement in accordance with the movement of lever 84 is a sprocket 98 adapted to operate a sprocket chain 100 and which in turn passes around a sprocket wheel 102 of a rheostat 104. The rheostat 104 electrically controls the operation of a motor (not disclosed) operatively connected to the worm 96 for adjusting the plunger 88 and, accordingly, the pressure applied to the coil of strip material by the rollers 6 through the link and lever mechanism 16 and 18, it being noted that lever 84 as well as the associated link 85 of such mechanism are connected to the rod 82 of the pressure control means.



As will be apparent from the above description, outward movement of the rollers 6 causes movement of the piston 80 and compression of fluid within the cylinder 74 and receiver 86. As the rollers 6 move outwardly under the action of the coil of strip material, the sprocket 98 is rotated to operate the rheostat 104 which periodically, through the contacts 106 and 108, causes energization of the motor for operation of the worm 96 and adjustment of the plunger 88. By virtue of this arrangement, a variable controlled resistance to movement of the rollers 6 is applied as the coil strip material is built up. It is understood that the provision of a variable sized receiver chamber is easily and readily controlled for definitely setting the pressure rise as needed for flexing of the rollers of the coiler so that the same will flex or bow to conform to the convex or barrel shape of the coil under all conditions and to assure proper alignment of the convolutions of said coil.

The present invention also has within its purview the provision of means for limiting the bowing or flexing of the rollers of the coil forming mechanism. As clearly shown in Figures 5 and 6 of the drawings, such means may consist of the rods 110 adjustably mounted as at 112 in the housing or frame structure 10 and which rods are provided with saddles 114 adapted to embrace the shaft 28 of the rollers and to limit their movement upon flexing. Any desired adjustment may be had to give the degree of flexing necessary to properly grip the coil of strip material in accordance with the disclosure herein. These rods are preferably located at either side of the center line of the rollers, as clearly shown in Figure 5 of the drawings.

As hereinbefore set forth, the present invention also contemplates the provision of guide mechanism which has been diagrammatically shown in Figure 1 of the drawings at 20 for guiding the strip material from the table conveyor into the coiling mechanism. One form of such guide mechanism is shown in Figures 7 and 8 of the drawings as being constituted by a convex roller 116 journalled in the frame structure 118 and being power driven by a motor 120 through a free wheeling coupling or clutch 122 and which convex roller 116 in a down-coiler is adapted to have the strip 22 pass over the top thereof and into the coiling space 8 over the guide rollers 24. Mounted upon the shaft 124 of the roller 116 is a brake drum 126 embraced by a band 128 adjustable by any means desired for effecting a frictional drag on said convex roller. Cooperating with the strip 22 is a concave idler roller 130 adapted to grip the same and to maintain the

strip in operative position with respect to the convex roller.

In order to provide a taut strip between the rollers 116 and 130 and the coiling mechanism, the convex roller 116 is driven by the motor at a speed slower than the speed of the strip material as the same is received from the table conveyor so that a friction drag is provided between the strip and the roller 116.

As shown in Figure 8 of the drawings, the idler roller 130 is adjustably mounted in the frame 118 and is moved with respect to the roller 116 by levers 132 fulcrumed on brackets 134 through connecting links 136.

The strip material may be firmly held down on a convex guide roller by magnetizing the convex roller itself. Accordingly, Figure 9 discloses an alternative form of construction for a satisfactory guide roller, the same comprising a convex roller 138 adapted to be mounted in a frame structure such as 118 and to be driven by a motor such as 120 controlled by dynamic braking. This convex roller is formed to provide revolving poles such as 140 and 142 and is in close association with stationary coil 144 for magnetizing the same. As in the embodiment shown in Figure 7 of the drawings, the strip material 22 passes over the top of the convex roller in a down-coiling machine as disclosed in Figure 1 of the drawings and into the coil forming space 8. The roller 138 is driven at a slower surface speed than the speed of strip 22, thus providing a friction drag between these two elements for holding the strip in taut relation between the convex roller and coiling mechanism.

While the guide mechanisms of Figures 7, 8 and 9 have been disclosed in connection with certain other improvements in the coiler and which may be advantageously used in combination therewith, nevertheless it is to be understood that on certain material non-telescoping effects can be secured by the coilers hereinabove described irrespective of whether or not such guiding mechanism is used in conjunction therewith.

In the present disclosure, the various embodiments have been described in connection with a down-coiler for a strip mill, but such improvements are equally effective for use in connection with up-coilers and vertical coilers. In each instance, the novel results accomplished by such improvements and as hereinabove set forth are secured.

While I have herein described and upon the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit of the invention.

What is claimed is:

1. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a first entry forming element, a guide frame journalling said first entry forming element, and means supporting said guide frame for adjustment laterally to guide said strip and align marginal edges of successive convolutions, whereby to prevent telescoping of the coil.

2. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a flexible first entry roller, a guide frame journalling said flexible roller at one end of the frame, means pivotally supporting the other end of the frame to position the flexible roller adjacent the coil forming space and with its axis substantially parallel with that of the coil, said supporting means including an eccentric pivot shaft for lateral adjustment of the flexible roller to guide said strip and align marginal edges of successive convolutions, whereby to prevent telescoping of the coil.

3. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a flexible first entry roller, a guide frame journalling said flexible roller at one end of the frame, means pivotally supporting the other end of the frame to position the flexible roller adjacent the coil forming space and with its axis substantially parallel with that of the coil, said supporting means including an eccentric pivot shaft for lateral adjustment of the flexible roller to guide said strip and align marginal edges of successive convolutions, and other eccentrically adjustable means connecting with the guide frame at the first mentioned end for adjusting the position of the flexible roller toward or from the coil forming space, whereby to secure the proper pressure relation thereof on the coil as the same is being formed.

4. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a flexible first entry roller comprising a hollow shaft and a plurality of roller elements mounted thereon, a guide frame journalling said hollow shaft at one end of the frame, means pivotally supporting the other end of the guide frame including an eccentric pivot shaft for lateral adjustment of the flexible roller to guide said strip and align marginal edges of successive convolutions, and other means for adjusting the position of the flexible roller toward or from the coil forming space independently of the other coil forming elements.

5. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a flexible first entry roller, a guide frame journalling said flexible roller, supporting means connecting with the frame at its ends respectively, one of said means pivotally supporting the frame and providing for lateral adjustment of the flexible roller, the other supporting means for the frame supporting the roller for adjustment toward or from the coil forming space independently of the other coil forming elements, a table conveyor for delivering said strip material to the coiling machine, and a convex-surface roller disposed between said conveyor and the coiling space for feeding and guiding said material.

6. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coil forming space and including a first entry roller, a guide frame journalling said roller at one end of the frame, means pivotally supporting the other end of the frame and providing for lateral adjustment of the roll-

er, other supporting means connecting with the roller end of the frame for adjustably positioning said roller toward or from the coil forming space, a conveyor for delivering said metal strip to the coiling machine, guide mechanism for the strip between the roller and conveyor including a convex-surface guide roller, means for driving said guide roller, and other means for creating a frictional drag between said guide roller and said strip.

7. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements defining a coil forming space and including a first entry roller, means for adjusting said first entry roller independently of and out of parallel relation with the other elements to angularly displace the longitudinal axis of the first entry roller with respect to said other elements for guiding said strip to align the marginal edges of successive convolutions and thus prevent telescoping of the same, a conveyor for delivering said metal strip to the coiling machine, guide mechanism for the strip between the roller and conveyor including a convex-surface guide roller, means for driving said guide roller, and other means for creating a frictional drag between said guide roller and said strip.

8. In a machine for coiling metal strip, the combination of a plurality of movable coil forming elements defining a coil forming space and including a first entry forming element, and means for independently adjusting said first entry forming element laterally to angularly displace the longitudinal axis of said first entry forming element with respect to the other elements for guiding said strip to align the marginal edges of successive convolutions and thus prevent telescoping of the same.

9. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements including a first entry roller adapted to provide a substantially enclosed circular unobstructed coiling space, means for independently adjusting said first entry roller out of parallel relation with the other elements to angularly displace the longitudinal axis of said first entry roller with respect to the other elements for guiding said strip to align the marginal edges of successive convolutions to thereby prevent telescoping of the same.

10. In a machine for coiling metal strips, the combination of a plurality of coil forming elements defining a coiling space and adapted to cooperate with a strip fed into said space and form the same into a coil, said coil forming elements including a coil forming roller, a guide frame journalling said coil forming roller at one end of the frame, means pivotally supporting the other end of the frame, said means providing for lateral adjustment of said frame at the end journalling the coil forming roller whereby said coil forming roller is laterally adjustable to guide said strip and align marginal edges of successive convolutions, and other means connecting with the guide frame at the first mentioned end for adjustably positioning the coil forming roller to secure the proper pressure relation thereof on the coil as the same is being formed.



11. In a machine for coiling metal strip, the combination of a plurality of movable coil forming elements defining a coil forming space and including a coil forming roller, a guide frame journalling said coil forming roller at one end of the frame, means pivotally supporting the other end of the frame, said means providing for lateral adjustment of said frame at the end journalling the coil forming roller whereby said coil forming roller is laterally adjustable to guide said strip and align marginal edges of successive convolutions, a conveyor for delivering said metal strip to the coiling machine, guide mechanism for the strip between the roller and conveyor including a convex-surface guide roller, means for driving said guide roller, and other means for creating a frictional drag between said guide roller and said strip.

12. In a machine for coiling metal strips, the combination of a plurality of movable coil forming elements including a coil forming roller adapted to provide a substantially enclosed circular unobstructed coiling space, a guide frame journalling said coil forming roller at one end of the frame, means supporting the other end of the frame in a manner providing for lateral adjustment of said frame at the end journalling the roller whereby said roller is adjustable laterally to guide said strip and align the marginal edges, and other means supporting the frame and thus the roller for adjustment toward or from the coiling space to secure the proper pressure relation thereof on the coil as the same is being formed.

BENJAMIN S. BURRELL.

## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS


| Number | Name | Date |
|---|---|---|
| 1,462,411 | Johnson | July 17, 1923 |
| 1,654,651 | Johnson | Jan. 3, 1928 |
| 1,791,288 | Schweitzer | Feb. 3, 1931 |
| 1,935,092 | Iversen et al. | Nov. 14, 1933 |
| 2,155,879 | Washburn et al. | Apr. 25, 1939 |
| 2,267,161 | Miller | Dec. 23, 1941 |
| 2,285,358 | Rode et al. | June 2, 1942 |
| 2,307,880 | Croft et al. | Jan. 12, 1943 |
| 2,312,428 | Lorig | Mar. 2, 1943 |
| 2,325,559 | Washam | July 27, 1943 |