Oct. 31, 1950 L. A. VIGNERE 2,527,976

APPARATUS FOR HANDLING STRIP

Filed Sept. 7, 1944 2 Sheets-Sheet 1

FIG. 2

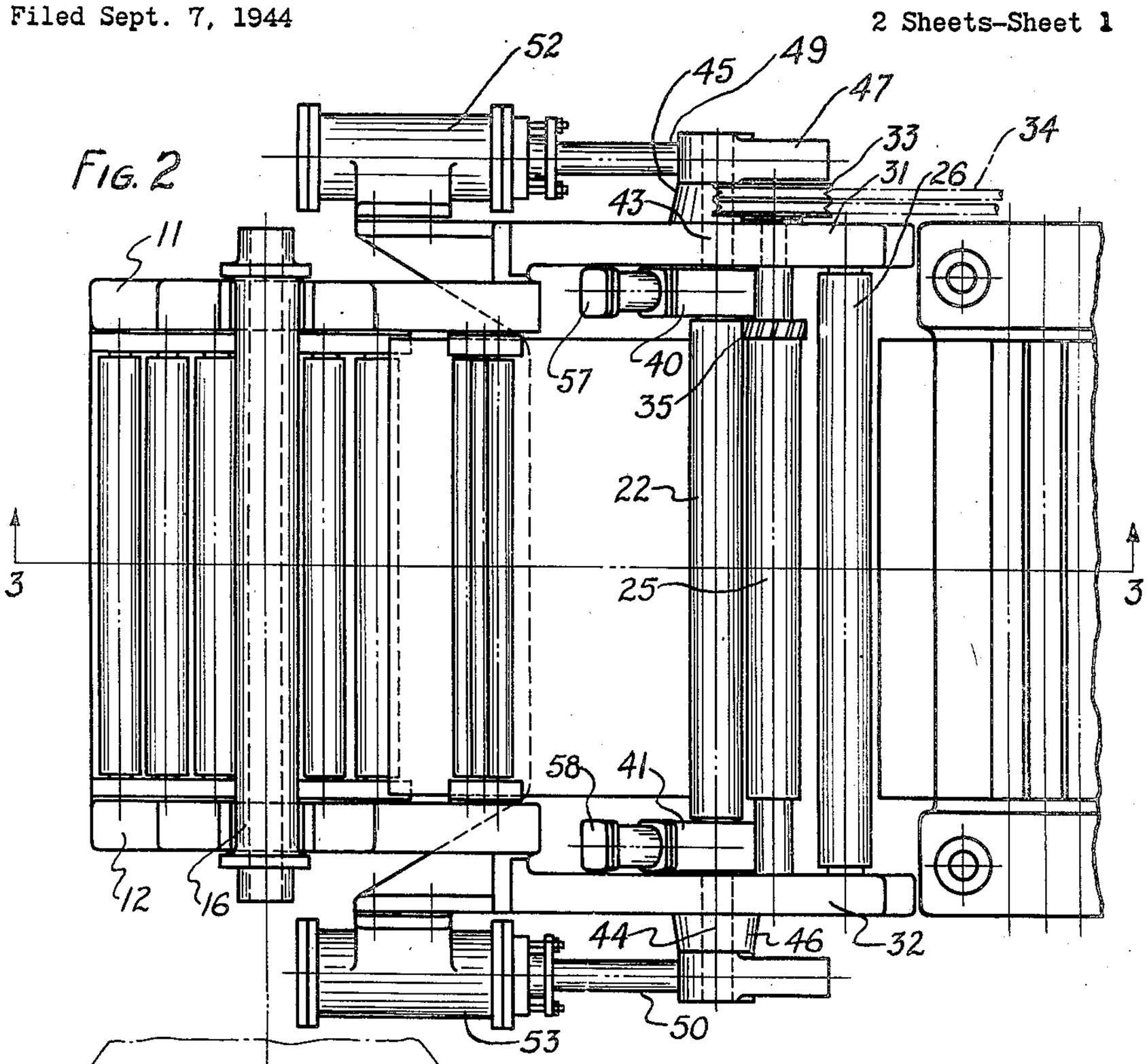

FIG. 1

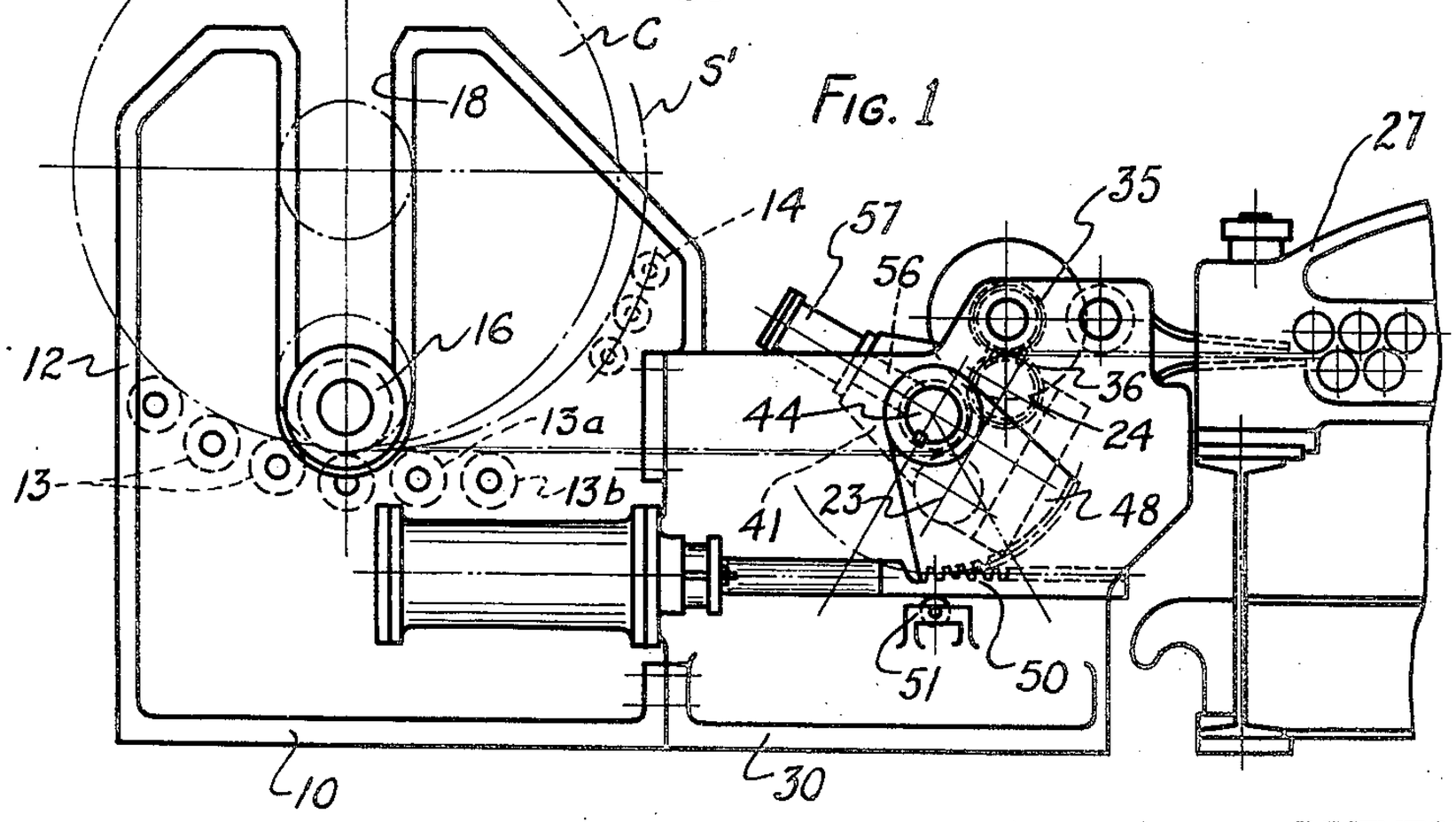

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FIG. 4

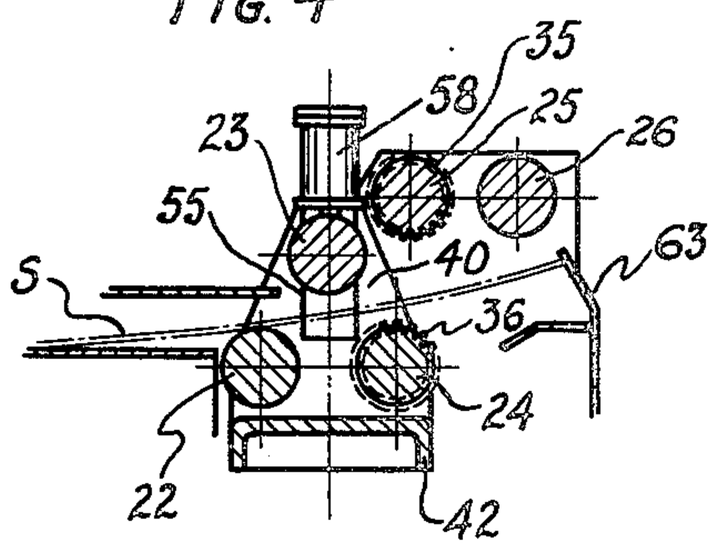


FIG. 5

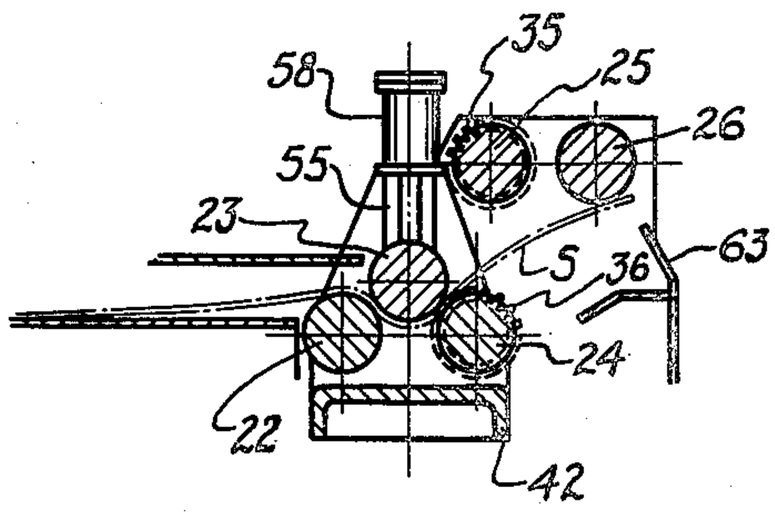
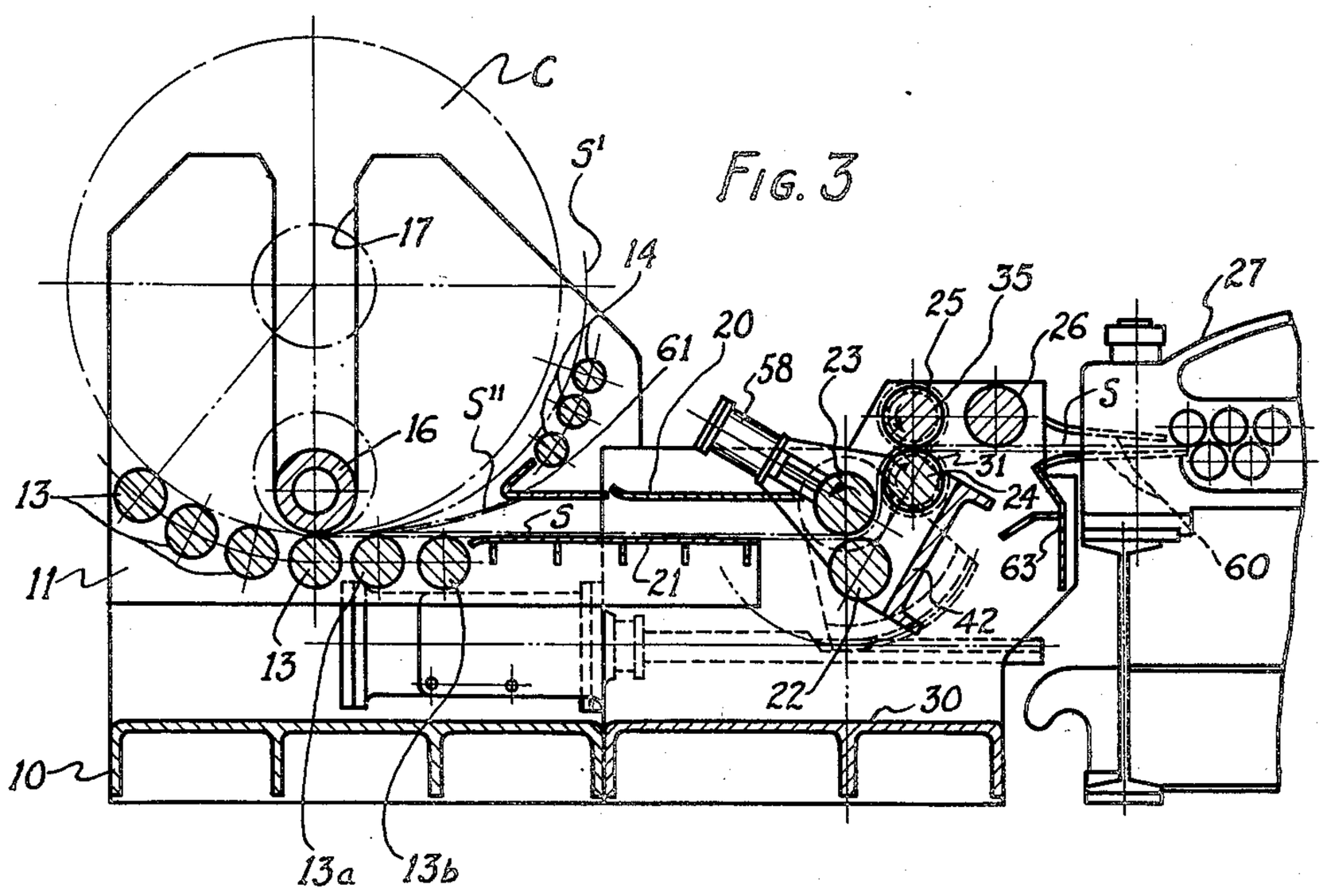


FIG. 3



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Patented Oct. 31, 1950

2,527,976

UNITED STATES PATENT OFFICE

2,527,976

APPARATUS FOR HANDLING STRIP

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Application September 7, 1944, Serial No. 553,053

7 Claims. (Cl. 153—54)

1

This invention relates to apparatus for handling sheet or strip steel and the like. Strip steel is ordinarily furnished to the users in the form of large coils and before being subjected to stamping or other forming operations, the strip material, as it is withdrawn from the coil, ordinarily is subjected to a so-called "processing" operation where it is cold worked severely. The strip is then passed through a roller leveler to work the metal further and to insure that it will be delivered in perfectly flat form to the subsequent operations.

Heretofore considerable difficulty has been experienced in starting the end of a coil of strip steel through the processing rolls and into the roller leveler, or where the processing rolls are omitted in starting the strip into the roller leveler. The present invention relates to an apparatus whereby no manual operations are necessary to start the end of the coil into and through the processing rolls and into the roller leveler. A general object of the invention is to provide a simple and efficient apparatus of this sort wherein the end of a coil may be started with a minimum of effort on the part of the operator and with a minimum loss of time. Another object is to provide such an apparatus in which the material being withdrawn from the coil is subjected to severe cold working by the processing rolls shortly after it is withdrawn from the coil and in such manner as to prevent damage to the metal by the uncoiling operation. Further objects and advantages of the invention will become apparent from the following description of a preferred form thereof, reference being made to the accompanying drawings, the essential characteristics are summarized in the claims.

Briefly I accomplish the above and other objects of the invention by providing an apparatus embodying a cradle for receiving a coil of strip material to be unwound, the cradle being provided with driven rolls so that the end or "fish-tail" of the coil can be fed into guides by operation of the driven rolls supporting the coil in the cradle. The end of the strip is fed through a cluster of three rolls, clamped in the roll cluster by movement of one of the cluster rolls toward the other two rolls, and is then directed through pinch rolls to the roller leveler by rocking the cluster bodily to put a reverse bend into the end of the strip and direct the end into the guide of the roller leveler. Thereafter the strip may be uncoiled rapidly from the coil by driving the rolls of the cradle, the pinch rolls and the roller leveler in substantial synchronism.

2

Referring to the drawings, Figure 1 is a side elevation of a preferred form of apparatus embodying my invention and showing the apparatus with the rolls in the position they occupy after the strip has been fed into the leveler and while the uncoiling, processing and leveling operation is being carried out; Figure 2 is a plan view of the apparatus shown in Figure 1 with the coil of metal omitted for convenience in illustration; Figure 3 is a vertical section taken along the line 3—3 of Figure 2; and Figures 4 and 5 are fragmentary sections through the cluster, pinch and guide rolls showing the rolls in the initial position when strip is being fed therebetween, and in the intermediate position, respectively.

As noted above the coil C of strip S to be processed is supported on and uncoiled from a cradle, the coil being indicated by broken lines in Figures 1 and 3. The cradle preferably comprises a suitable frame member or base member 10, and two oppositely disposed upright frame members 11 and 12 in which a plurality of supporting rolls 13 and guide rolls 14 are suitably journaled. Four of the rolls 13 are preferably arranged with their centers lying on a circular arc as shown while the last two rolls 13*a* and 13*b* are disposed along a tangent to the arc. Thus rolls 13*a* and 13*b* guide and support the strip as it leaves the coil on its way to the processing rolls. All of the rolls 13 are preferably arranged to be driven in either direction by conventional drive mechanism not shown in the drawings. The smaller guide rolls 14 prevent displacement of the coil from the cradle and need not be driven. By controlling the driving mechanism for the rolls 13, a coil disposed on the cradle can be rotated in either direction. In order to stabilize the coil on the cradle, to insure uniform withdrawal of strip from the coil and to prevent the coil from jumping on the cradle or becoming dislodged therefrom, I preferably employ the stabilizer bar or roll 16 which is adapted to pass through the central opening of the coil C. The roll is shown in the drawing at the bottom of the slot which is the position it occupies when there is no coil in the machine. In use, roll 16 is disposed in the center of the coil, is guided by vertical slots 17 and 18 in the end or upright frame merbers 11 and 12, respectively, and slides downwardly in the guides as the coil becomes smaller.

From the cradle the strip S passes between guides 20 and 21 and between the first cluster roll 22 and the intermediate cluster roll 23. Then the strip bends around about 90° of the cluster roll 23 and passes between the third cluster roll 24 and

the pinch roll **25**, being bent in a reverse direction around nearly 90° of the roll **24**. Finally, the strip passes beneath the guide roll **26** to the roller leveler which may be of any conventional construction, the entering end of the leveler being indicated generally at **27**.

The several cluster, pinch and guide rolls are supported on a frame work made up of a base portion **30** and vertical frame members **31** and **32**. The pinch roll **25** and the guide roll **26** are journaled directly in the frame members **31** and **32**, the pinch roll **25** being provided with drive pulleys **33** so that the roll may be driven by belts **34** which in turn are driven from any suitable source of power (not shown) such as the drive mechanism for the roller leveler **27**. The roll **25** is also provided with a gear **35** adjacent one end thereof which is adapted to mesh with the gear **36** carried by the cluster roll **24**. Thus when the cluster rolls are in the position shown in Figures 1 and 3, the roll **24** is driven with the roll **25** and the two rolls together constitute a pair of pinch rolls.

The cluster rolls **22**, **23** and **24** are not supported directly in the upright frame members **31** and **32**, but are carried by a sub-frame made up of end members **40** and **41** and a transverse member **42**. The end members **40** and **41** are provided with projecting supporting shafts **43** and **44**, respectively, these being journaled in bosses **45** and **46** of the upright frame members **31** and **32**. Thus the supporting frame is mounted so that it can be rocked bodily with respect to the main frame, and to accomplish this purpose segmental gears **47** and **48** are keyed to the projecting ends of shafts **43** and **44**. The gears are engaged by racks **49** and **50** supported by suitable guide rollers **51** and reciprocated by power cylinders **52** and **53**. It will be evident that upon admission of actuating fluid to the ends of the cylinders **52** and **53** away from the rack, the frame will be rocked to the position shown in Figures 1, 2 and 3, whereas when fluid is admitted to the opposite end of the cylinders **52** and **53**, the subframe will be rocked so that it occupies the position shown in Figures 4 and 5.

The first and third cluster rolls **22** and **24** are journaled directly in the end members **40** and **41** of the sub-frame. However, the intermediate cluster roll **23** is carried by bearing blocks slideably mounted in slots **55** and **56** in the end members **40** and **41**. The end members also carry power cylinders **57** and **58**, to the piston rods of which the bearing blocks for the roll **23** are secured. With this arrangement when fluid under pressure is admitted to the lower ends of the cylinders **57** and **58**, the roll **23** will be raised to the position shown in Figure 4, whereas when fluid pressure is admitted to the upper ends of the cylinders, the pistons will be forced downwardly and the roll **23** moved toward the rolls **22** and **24** into the position shown in Figures 3 and 5. In this lower position, the axis of the roll **23** substantially coincides with the axis of rotation of the sub-frame.

The arrangement just described enables the end of the coil of strip to be fed rapidly and easily into the guides **60** of the roller leveler **27**, and also subjects the strip passing between the rolls to severe cold working by bending the strip in opposite directions around the rolls **23** and **24**, thus putting the strip into proper condition for subsequent operations and preventing damage to the structure of the strip by the uncoiling operation. The feeding of the end of the strip through

the various rolls and into the roller leveler is accomplished as follows:

The coil C of strip S is loaded onto the cradle with the stabilizer bar **16** inserted through the central opening of the coil and engaged in the guiding slots **17** and **18** of the upright frame members **11** and **12**. The end or "fishtail" of the strip is bent outwardly therefrom into some such position as indicated at S' in the drawing. Then the coil is rotated by means of the rolls **13**, in a direction opposite to the direction of rotation for withdrawing strip from the coil (clockwise in the arrangement shown in the drawing) so that the end of the strip is disposed beneath the corner or angle **61** of the guide **20** as indicated at S''.

The rolls **13** then are driven in the direction to withdraw the strip from the coil (counterclockwise from the arrangement shown in the drawing) thereby to feed the end of the strip between the guides **20** and **21** and beneath the cluster roll **23** and above the cluster rolls **22** and **24** as shown in Figure 4 of the drawings. At this time, the sub-frame is arranged as shown in Figure 4 of the drawings with the end members and cylinders **57** and **58** substantially vertical while the intermediate cluster roll **23** is raised to its uppermost position to provide a relatively large gap through which the end of the strip can be fed. During the initial feeding operation, the end of the strip ordinarily is only slightly curved, and may be considered as substantially straight, for there are no abrupt bends in the material. The strip is fed through the gap between the rolls by rotation of the cradle rolls **13** until the end of the strip strikes the adjustable stop **63** as shown in Figure 4. Then the rotation of the cradle rolls **13** is stopped and actuating fluid is supplied to the upper ends of the cylinders **57** and **58** to force the roll **23** downwardly toward the rolls **22** and **24**, securely clamping the strip between the rolls and bending the strip as shown in Figure 5. The bending action results in the end of the strip swinging upwardly into engagement with the guide roll **26**, the lower surface of the roll **26** being disposed substantially at the level of the pass line of the roller leveler **27**.

After the strip has reached the position shown in Figure 5, fluid under pressure is admitted to the ends of the cylinders **52** and **53** remote from the racks **49** and **50**, forcing the racks to the right in the arrangement shown in the drawings, and rocking the sub-frame carrying the rolls **22**, **23** and **24** in a counterclockwise direction in the embodiment shown into the position shown in Figure 3. Rocking the cluster rolls to this position results in the bending of the strip upwardly around the intermediate roll **23** so that it takes a substantially vertical direction, and then bending the strip in the reverse through approximately 90° around the third roll **24** so that it takes a horizontal position with the end of the strip lying substantially parallel to, but offset from the portion of the strip leading from the coil to the bite of the rolls **22** and **23**. In this position, the end is disposed beneath the roll **26** and in alignment with the entering guides **60** of the leveler **27**. As the sub-frame is swung to the position in Figure 3, the roll **24** engages and pinches the strip against the roll **25** and the gear **36** comes into mesh with the gear **35**. The rolls **24** and **25** thus act as pinch rolls. Then the operator has only to start the drive mechanism for the leveler, the rolls **24** and **25**, and the rolls **13**, thus causing the strip to be unwound from the coil, to pass between the cluster rolls which then constitute processing

rolls, and finally to pass through the roller leveler. From the leveler, the strip may go to a flying shear, or other apparatus not pertinent to the present invention.

From the foregoing description of a preferred form of my invention, it will be evident that I have provided a mechanism whereby strip material may be rapidly and efficiently uncoiled, processed and leveled. With my apparatus the operator merely by manipulating the controls for the driving mechanism of the several units can readily and rapidly enter the end of a coil of strip through the processing rolls and into the roller leveler. The apparatus subjects the metal to severe cold working shortly after it is withdrawn from the coil and because of this working and because of the fact that the coil is steadied or stabilized on the cradle, damage to the metal as it is being withdrawn from the coil is substantially eliminated. My apparatus is simple and sturdy and can be manufactured at reasonable cost. While the apparatus is shown here as adapted for use with material in coil form, it will be evident that the processing rolls can be used with equal facility in the processing of sheets and in feeding sheets to a leveler or other apparatus.

Various changes and modifications in my invention will be apparent to those skilled in the art. It is therefore to be understood that my patent is not limited to the preferred embodiment of my invention described in detail herein, but that the foregoing detailed description is given by way of example and not by way of limitation.

I claim:

1. A strip entering and processing apparatus adapted to receive strip material, subject it to cold working and guide it to a roller leveler, said apparatus comprising a main frame, a pinch roll mounted in said main frame, a sub-frame mounted for rocking movement with respect to said main frame, a plurality of rolls carried by said sub-frame, one of said rolls being bodily movable with respect to the others, means for moving said movable roll from open position wherein a relatively large space is provided to receive the end of a strip of material to closed position wherein the strip is engaged by the rolls and bent part way around one of the rolls with the end of the strip engaging the guide roll, and means for rocking the sub-frame to bring one of the rolls carried thereby adjacent said pinch roll with the strip engaged therebetween.

2. A strip entering and processing apparatus adapted to receive strip material, subject it to cold working and guide it to a roller leveler, said apparatus comprising a main frame, a pinch roll and a guide roll mounted in said main frame, a sub-frame mounted for rocking movement with respect to said main frame, a plurality of rolls carried by said sub-frame, one of said rolls being bodily movable with respect to the others, means for moving said movable roll from open position wherein a relatively large space is provided to receive the end of a strip of material to closed position wherein the strip is engaged by the rolls and bent part way around one of the rolls with the end of the strip engaging the guide roll, means for rocking the sub-frame to bring one of the rolls carried thereby adjacent said pinch roll with the strip engaged therebetween, means for driving said pinch roll, and means for driving the roll adjacent thereto from said pinch roll.

3. A strip entering and processing apparatus adapted to receive strip material, subject it to cold working and guide it to a roller leveler, said apparatus comprising a main frame, a pinch roll and a guide roll mounted in said main frame, a sub-frame mounted for rocking movement with respect to said main frame, a plurality of rolls carried by said sub-frame, one of said rolls being bodily movable with respect to the others, there being a relatively large space between said rolls to receive the end of a strip of material when said roll is in open position, stop means engageable by the end of a strip projecting through said rolls only when said roll is in open position, means for moving said roll to closed position wherein the strip is engaged by the rolls and bent part way around one of the rolls with the end of the strip engaging the guide roll and disengaged from said stop means, means for rocking the sub-frame to bring one of the rolls carried thereby adjacent said pinch roll with the strip engaged therebetween, means for driving said pinch roll, and means for driving the roll adjacent thereto from said pinch roll.

4. In an apparatus of the class described, the combination of a cradle comprising a plurality of rolls adapted to support a coil of strip material, and a group of processing rolls, said processing rolls being adapted to receive strip material from said coil, subject the material to cold working, and feed the material to a roller leveler, said processing rolls including a cluster of three rolls, a pinch roll and a guide roll, the intermediate roll of said cluster being bodily movable with respect to the first and third roll to provide, in one position a relatively large space to receive the end of the strip and in another position to urge the strip against said first and third rolls thereby causing a strip positioned therebetween to be bent part way around said intermediate roll and causing the end of the strip to engage said guide roll, and means for rocking said cluster of rolls to bring said third roll closely adjacent said pinch roll thereby engaging the strip between said third roll and said pinch roll, imparting a reverse bend to the strip and guiding the end thereof to said roller leveler.

5. In an apparatus of the class described, the combination of a cradle comprising a plurality of rolls adapted to support a coil of strip material, and a group of processing rolls, said processing rolls being adapted to receive strip material from said coil, subject the material to cold working, and feed the material to a roller leveler, said processing rolls including a cluster of three rolls, the intermediate roll of said cluster being bodily movable with respect to the first and third rolls to provide, in one position, a relatively large space to receive the end of the strip and in another position to urge the strip against said first and third rolls thereby causing a strip positioned therebetween to be bent part way around said intermediate roll, and means for rocking said cluster of rolls to impart a reverse bend to the strip.

6. A processing apparatus, a group of processing rolls comprising a cluster of three rolls and a pinch roll, the intermediate roll of said cluster being bodily movable with respect to the first and third rolls to provide, in one position, a relatively large space to receive the end of a sheet or strip and in another position to urge the sheet or strip against said first and third rolls thereby causing a sheet or strip material positioned therebetween to be bent part way around said intermediate roll, and means for rocking said cluster

rolls to bring said third roll closely adjacent said pinch roll thereby engaging the sheet or strip between said third roll and said pinch roll and imparting a reverse bend thereto.

7. Processing apparatus for sheet or strip material comprising a plurality of rolls, means for supporting said rolls in an entering position wherein a space is provided to permit the end of a sheet or strip to pass between and project beyond said rolls without requiring engagement between the material and the rolls or bending of the material, a stop engageable by the projecting end of the sheet or strip, and means for moving the rolls to disengage said end from said stop, engage said sheet or strip to impart a reverse bend thereto and guide said end in a direction substantially parallel to but offset from the direction of the strip or sheet entering said rolls.

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