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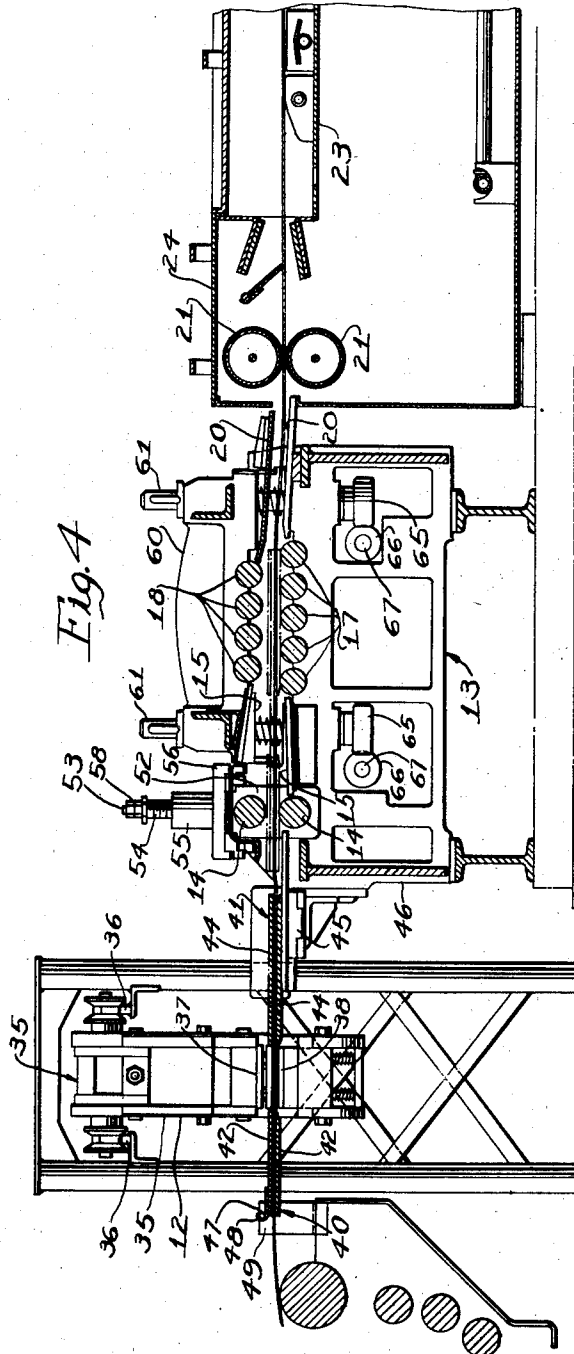
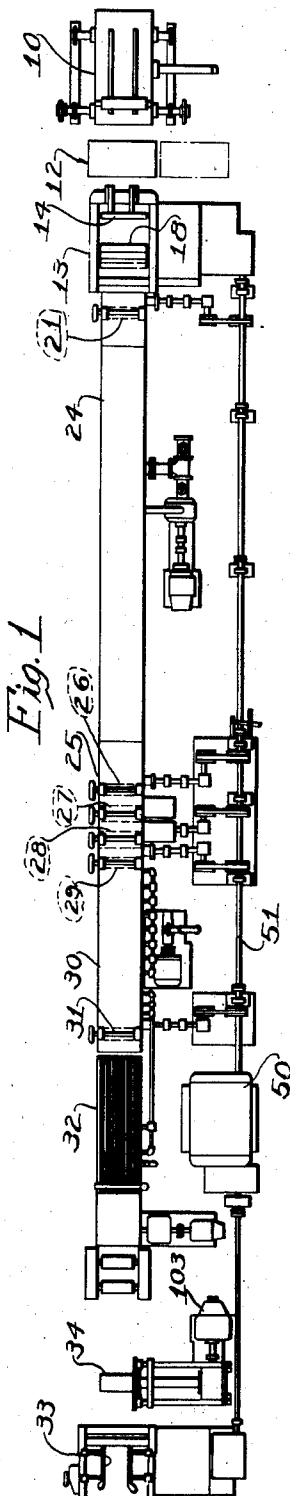
F. J. WOOD

2,304,432

CONTINUOUS STRIP PICKLING AND CLEANING DEVICE

Filed June 9, 1941

4 Sheets-Sheet 1



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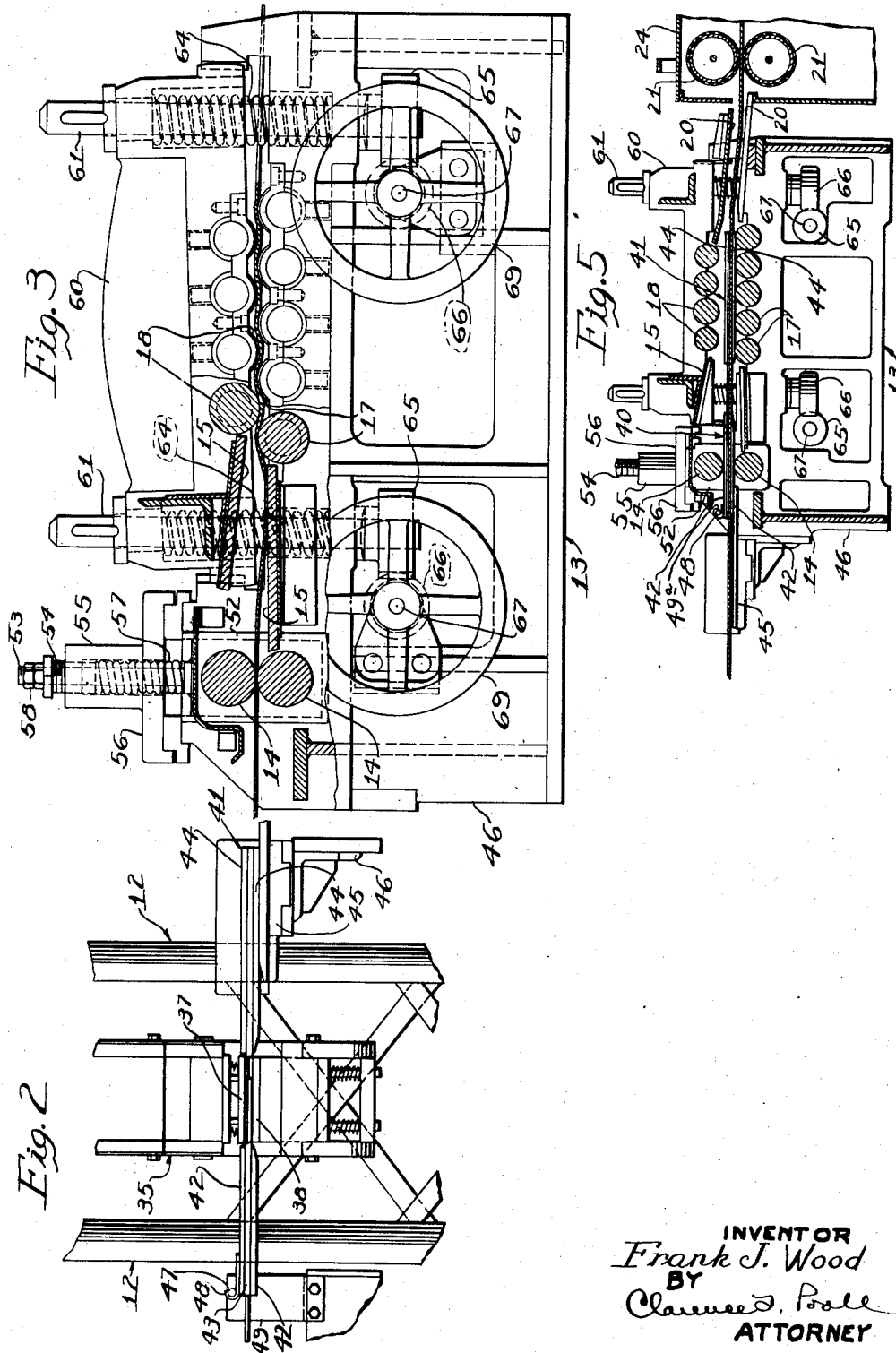
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4 Sheets-Sheet 2



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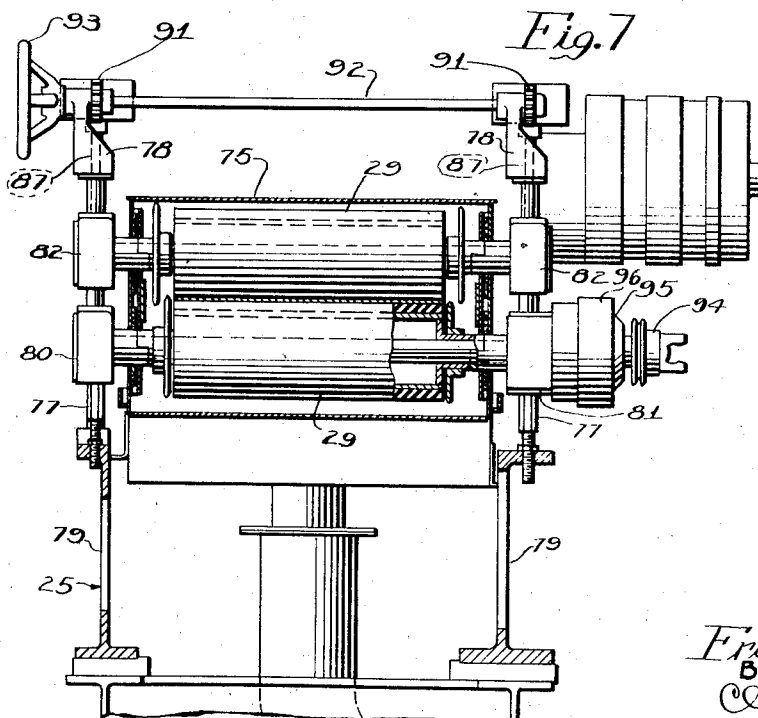
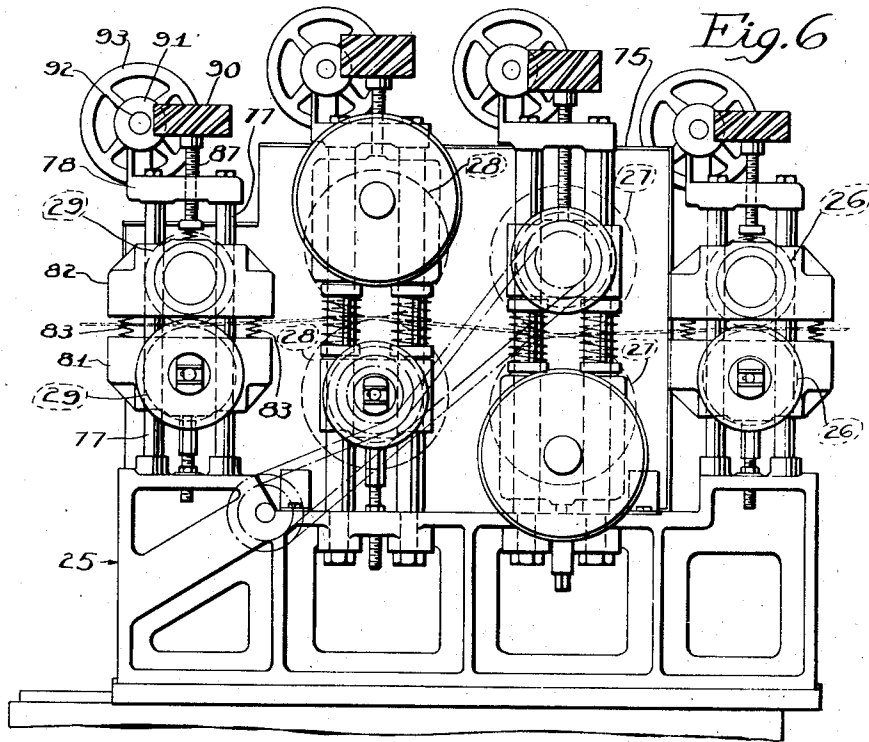
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4 Sheets-Sheet 3



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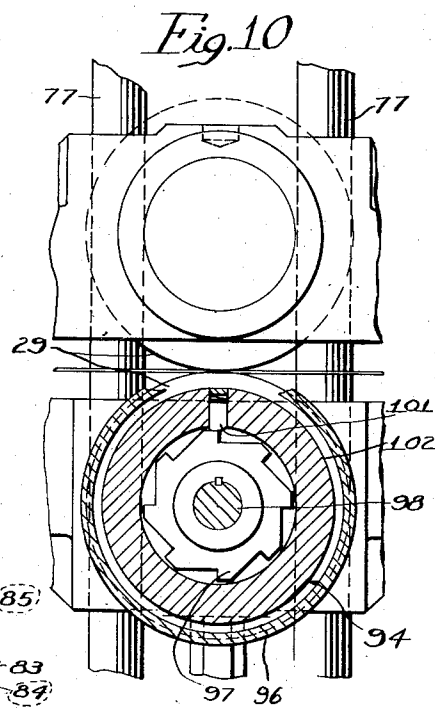
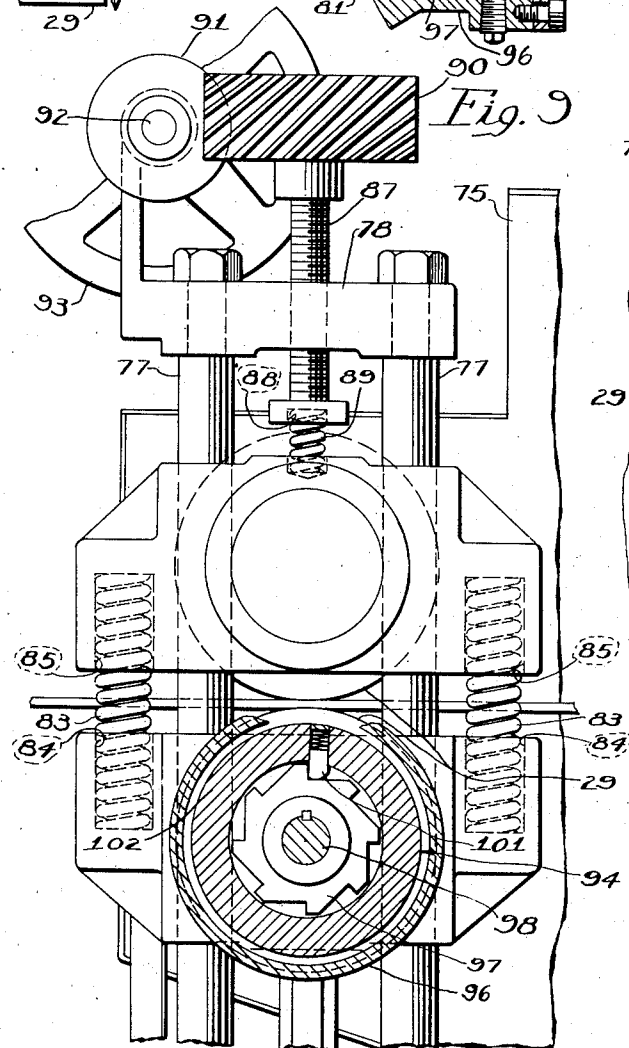
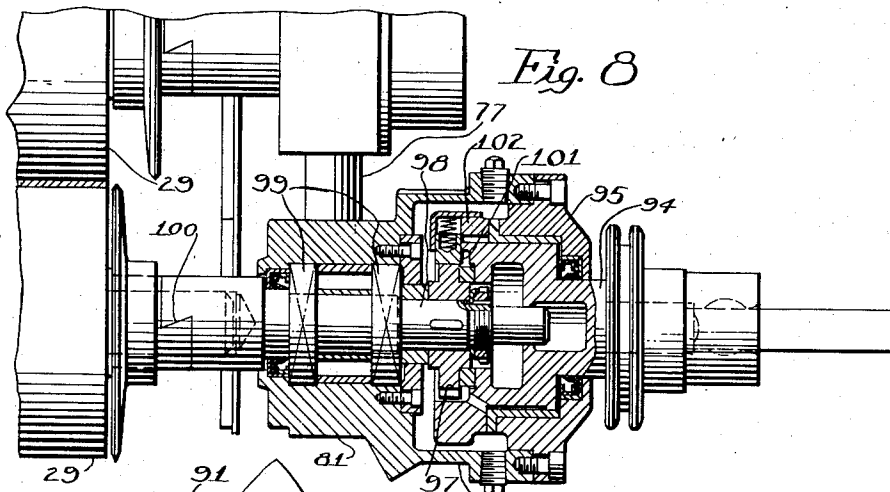
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CONTINUOUS STRIP PICKLING AND CLEANING DEVICE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,304,432

CONTINUOUS STRIP PICKLING AND
CLEANING DEVICE

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Application June 9, 1941, Serial No. 397,219

7 Claims. (Cl. 266—3)

This invention relates to improvements in pickling and cleaning devices and has as its principal objects to provide a novel form of pickling and cleaning device arranged to handle either heavy or light gauge metal.

Another object of my invention is to provide a pickling and cleaning device so arranged that relatively heavy gauge metal may be pushed through the pickling and cleaning system, during the cleaning operation, or light gauge metal may be pulled through the pickling and cleaning system, during the cleaning operation.

A more specific object of my invention is to provide a pickling and cleaning device of the class described which includes a novel form and arrangement of a drive to the pinch or squeegee rolls, so arranged that said rolls will push heavy gauge metal through the system and will freely rotate with respect to their drive members when light gauge metal is being pulled through the system.

A still further object of my invention is to provide a new and improved form of pickling and cleaning device, so arranged that heavy metal, pushed through the system, may thread the light metal through the system, and also so arranged that the guides for the metal during stitching of the adjacent ends of the metal together, for the pull through pickling operation, may also serve to protect the leveler rolls during the pull through pickling operation.

Other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a diagrammatic view in plan of a pickling and cleaning apparatus constructed in accordance with my invention;

Figure 2 is an enlarged partial fragmentary view in side elevation of the stitcher employed in the pickling system, illustrating certain details thereof;

Figure 3 is an enlarged partial fragmentary view in side elevation of the leveler, when positioned for flattening the heavy metal as it is being pushed through the system;

Figure 4 is a view in side elevation, drawn to a somewhat smaller scale than Figure 3, with certain parts showing a longitudinal section and illustrating the stitcher during the stitching operation and the position of the leveler rolls at the start of the pull through pickling operation;

Figure 5 is a view somewhat similar to Figure 3, but drawn to a reduced scale, and showing the stitcher guides in position in the leveler, for pro-

tecting the leveler rolls during the pull through pickling operation;

Figure 6 is a view in side elevation of the brushing and scrubbing unit;

Figure 7 is a transverse sectional view taken through the squeegee rolls of the brushing and scrubbing unit;

Figure 8 is an enlarged partial fragmentary transverse sectional view taken through the squeegee rolls, showing certain details of the drive to one of the lower squeegee rolls;

Figure 9 is an enlarged fragmentary view of the squeegee rolls in side elevation, with certain parts shown in longitudinal section, in order to illustrate certain details of the drive to one of the squeegee rolls; and

Figure 10 is a fragmentary view in side elevation, somewhat similar to Figure 9, but showing the drive member to the lower squeegee roll as being freely rotatable with respect to its driving member during the pull through pickling operation.

In the embodiment of my invention illustrated in the drawings, Figure 1 diagrammatically shows a pickling and cleaning device which includes a coil supporting or sticking box 10 at the entering end of the apparatus and having a coil of strip metal mounted therein and adapted to be trained through the pickling and cleaning apparatus. A stitcher 12 is disposed in advance of said coil supporting box and is mounted for movement into position to attach adjacent ends of the metal together, by riveting one strip of metal to the other, so one coil of metal may pull the next succeeding coil of metal through the system.

A leveler 13 is disposed in advance of the stitcher 10, for flattening and breaking the scale on heavy gauge metal. Said leveler may be of a usual construction, and as herein shown consists of a pair of opposed vertically spaced advance power driven pinch rolls 14, 14, for pushing heavy gauge metal through the pickling and cleaning apparatus, a pair of vertically spaced guides 15, 15 disposed in advance of said pinch rolls, a plurality of power driven longitudinally spaced lower leveling rolls 17, 17, and a pair of power driven longitudinally spaced upper leveling rolls 18, 18, disposed above and between said lower rolls and adapted to engage the metal with said lower rolls and flatten it. A pair of vertically spaced guides 20, 20 are disposed at the discharge end of said leveler, to prevent vertical displacement of the metal and to guide it into squeegee rolls 21, 21 at the entering end of a pickling trough 23.

The squeegee rolls 21, 21, as herein shown, are

provided with a yieldable face which may be made from rubber, for yieldably engaging opposite sides of the metal and pushing it through the system (see Figure 3) and for preventing pickling fluid from flowing backwardly along the metal into the guides 20, 20 of the leveler 13. Said lower squeegee roll 21 is power driven, in a manner which will more clearly appear as this specification proceeds, and said upper roll is yieldably urged into engagement with said lower roll. From said squeegee rolls the metal passes through the pickling trough 23 which extends along and is disposed above a pickling tank 24. Pickling fluid is circulated in said pickling trough in a usual manner and excess fluid is discharged from opposite ends of said trough into said pickling tank, from which it may be recirculated through the system.

From the pickling trough 23, the metal passes through a brushing and scrubbing stand 25, which includes squeegee rolls 26, 26 similar to the pinch rolls 21, 21, brushing and scrubbing rolls 27 and 28 and squeegee rolls 29, 29. The strip metal then passes through a steam bath and hot water tank generally indicated by reference character 30, through squeegee rolls 31, 31 similar to the pinch rolls 21, 21 and over a drying table 32. From said drying table heavy gauge metal is coiled on an open coiler 33 while light gauge metal may be pulled through the system by means of a blocking coiler 34. Said stitcher, leveler, pickling and cleaning trough and tank, steam and hot water bath, drying table, and coilers are no part of my present invention so are only herein shown and described insofar as is necessary to make my present invention readily understandable.

The stitcher 12 may be of any usual construction and includes a carriage 35 mounted on transversely extending spaced tracks 36, 36, for transverse slidable movement with respect to the strip of metal, to permit stitching jaws 37 and 38 to fasten adjacent ends of the strip metal together by riveting, so that one coil of metal may pull the next succeeding coil of metal through the system, during the pull through pickling operation.

During the stitching operation, the metal is adapted to pass through spaced apart guides 40 and 41, to hold the metal in place. The guide 40 includes a pair of vertically spaced plates 42, 42, secured at their ends to opposite sides of laterally spaced longitudinally extending bars 43, 43 (see Figure 2). The guide 41 includes a pair of vertically spaced plates 44, 44, secured at their ends to opposite sides of the bars 43, 43 and spaced in advance of the plates 42, 42. The stitching operation is effected by the jaws 37 and 38 in the space between said pairs of plates 42, 42 and 44, 44. The lower plate 44 rests on a rearwardly projecting table portion 45 of a frame 46 for the leveler 13. The upper plate 42 is mounted on a part of the framework for the coil supporting box 10 by means of a rod 47. Said rod passes through the up-turned hook-shaped ends of a pair of spaced apart members 48, 48, mounted on the top of the upper plate 42, and thus holds said guide plates 42, 42 and 44, 44 in position on said stitcher. Said rod is detachably mounted at its ends in bracket members 49, 49, projecting upwardly from said coil supporting box. After the stitching operation, the rod 47 is removed and the upper rolls 14 and 18, 18 of the leveler 13 are raised above the lower rolls, to permit said guides to be placed between said rolls so that thin gauge metal may be pulled through

said leveler during the pull through pickling operation, without damaging said rolls, it being understood that no power is supplied to said rolls during the pull through pickling operation. When said guides are in position between the leveler rolls, the hook-shaped members 48, 48 are adapted to engage a transversely extending rod 49a detachably mounted in the side walls of said leveler (see Figure 5), to hold said guides 42, 42 and 44, 44 in position between the rolls of said leveler.

The leveler 13 is of a usual construction. The bottom pinch rolls 14 and the leveler rolls 17, 17 are mounted in the frame 46 and are driven by power from a motor 50, through line shaft 51 (see Figure 1) and a suitable geared reduction drive, which will not herein be shown or described, since it is no part of my present invention.

The upper pinch rolls 14 are yieldably engaged with said lower rolls. Said upper pinch rolls and the leveler rolls 18, 18 are driven from the motor 50 and line shaft 51 through a suitable drive. Said last mentioned pinch and leveler rolls are vertically adjustable, to adjust said pinch rolls and the rolls of said leveler for different gauges of metal, and to permit the insertion of the guides 40 and 41 between said rolls during the pull through operation.

The upper pinch roll 14 is mounted at its opposite ends in bearing boxes 52, 52, guided for vertical movement in the frame 45. A threaded rod 53 projects upwardly from each of said bearing boxes and is slidably guided in a sleeve 54, threaded within a boss 55 of a cap piece 56, which is secured to said frame. A compression spring 57 encircles each rod 53 and is interposed between the upper side of the bearing box 52 and the underside of the threaded sleeve 54, for yieldably engaging said upper roll with said lower roll. Nuts 58, 58 are provided on the upper ends of the rods 53, 53, to vertically move the upper rolls out of engagement with the lower rolls.

The upper leveling rolls 18, 18 are journaled in a frame member 60, which is guided in the frame 46 for vertical movement with respect thereto. Said frame member, as herein shown, is slidably mounted at its forward and rear ends on two pairs of longitudinally spaced vertical shafts 61, 61. Compression springs 64, 64 are seated in the frame 45 and in said upper frame member and encircle said vertical shafts. Said springs serve to move said upper frame member away from said lower frame member. Worm gears 65, 65, threaded on the lower ends of said vertical shafts are engaged with and driven from worms 66, 66, on transverse shafts 67, 67, for vertically moving said shafts with respect to the frame 46, to adjust the spacing between said upper and lower rolls and to permit said springs to move said upper rolls out of engagement with said lower rolls, as is shown in Figures 4 and 5. Said worms and worm gears are rotated by means of hand wheels 69, 69 on the transverse shafts 67, 67. Thus the space between the upper and lower rolls of the leveler may readily be adjusted and the upper rolls may be moved completely out of engagement with the lower rolls, to permit the guides 40 and 41 to be positioned therebetween.

With reference now in particular to the pinch rolls 21, 21, 26, 26, and 29, 29 and the novel form of drive thereto, said rolls are all of a similar construction and are driven in the same manner, so one set of said rolls only need herein be shown

or described. For illustrative purposes the brushing and scrubbing stand 25 is shown in detail and the rolls 29, 29, at the discharge end of said stand will be described. Said last mentioned rolls are enclosed in a housing 75, herein shown as being made from sheet metal and also covering the brushing and scrubbing rolls.

The support for said squeegee rolls, as herein shown, includes two pairs of laterally spaced vertical parallel rods 77, 77. Said rods are connected together at their upper ends by a frame member 78 and are mounted at their lower ends on a frame 79 for said brushing and scrubbing stand. Lower bearing boxes 80 and 81 are mounted on and secured to said rods and form bearing supports for the lower squeegee roll 29. Upper bearing boxes 82, 82 are slidably mounted on said rods and form bearing supports for the upper squeegee roll 29. Said bearing boxes are held in spaced relation with respect to each other by means of springs 83, 83, seated in spring seats 84 and 85 in respective of said boxes.

The upper pinch roll 29 is moved into engagement with the upper side of the metal, for positively engaging the metal with the lower pinch roll by means of threaded shafts 87, 87, threaded in frame members 78, 78. A spring seat 88 is provided on the lower end of each threaded shaft 87 and a spring 89 is interposed between said seat and the upper side of the bearing box 82. Said shafts are rotatably driven by helical gears 90, 90 secured to the upper ends thereof and meshing with and driven from helical gears 91, 91 on a transverse shaft 92. Said transverse shaft is rotated by means of a hand wheel 93.

The drive to the lower of said pinch rolls includes a driving member 94, journaled in an end frame member 95, mounted in an outwardly projecting housing portion 96 of the lower bearing box 81 (see Figure 7). Said driving member is driven from the motor 50 and shaft 51 by means of a usual form of variable speed drive and geared reduction drive, which are not herein shown or described in detail since they are not part of my present invention. The driving member 94 extends inwardly of and encircles a ratchet wheel 97, keyed to the transversely extending shaft 98 (see Figure 8). Said shaft is journaled in the bearing box 81, on ball bearings 99, 99. Said shaft is disposed coaxially with the lower roller 29 and forms a support for one end of said roller and also forms a means for driving said roller through jaws 100, 100. A spring pressed pawl 101 is mounted in an annular portion 102 of the driving member 94 and is adapted to engage the teeth of the ratchet wheel 97, for driving said ratchet wheel, upon rotation of said driving member.

Thus when the driving member 94 is driven in a direction, which in Figure 9 is shown as being a counterclockwise direction, said driving member will positively drive the lower squeegee roll 29 through the ratchet wheel 97 and transverse shaft 98, to push heavy gauge metal through the pickling and cleaning device. When, however, thin gauge metal is pulled between said squeegee rolls, through the pickling and cleaning device, said lower squeegee rolls and the ratchet wheel 97 are free to rotate in a counterclockwise direction with respect to said drive member. During the pull through operation, said squeegee rolls may thus serve to remove moisture or excess pickling fluid from the metal, but perform no conveying function.

When it is desired to change from the pick-

ling of heavy to light gauge metal, the tail end of the heavy gauge metal may be stitched to the advance end of the light gauge metal, as in Figure 2, to permit the heavy gauge metal to thread the light gauge metal through the pickling and cleaning device and thus eliminate threading of the metal through the device by hand.

In this operation, the advance end of the light metal is cut from the trailing end of the heavy metal, as it reaches the block coiler 34. The light metal is then secured to the block of said coiler and coiled thereon and pulled through the system by means of said coiler. As soon as the stitching operation between the light and the heavy metal has been completed, however, the rolls 14 and 18 of the leveler are raised and the guides 40 and 41 are moved forwardly between said rolls in the hereinbefore described manner, to prevent the light metal from scratching the rolls of said leveler.

When the light metal has been attached to the block of the block coiler 34, the motor 50, which drives the pinch rolls 14, 14 and the squeegee rolls 21, 26, 29 and 31, is turned off and a motor 103 which serves to drive the coiler 34, is turned on, to cause said coiler to positively pull the light metal through the system. At this time, the lower squeegee rolls 21, 26, 29 and 31 are free to rotate with respect to their respective driving members 94, 94, so they will not buckle the metal, but will squeegee excess moisture from the metal and permit the metal to be freely pulled through the pickling and cleaning system by means of said coiler.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated, excepting as it may be limited to the appended claims.

I claim as my invention:

1. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a pickling trough, a pair of vertically spaced squeegee rolls at the entering end of said trough, for pushing heavy gauge strip metal through said trough, a coiler adjacent the discharge end of said trough, for pulling light gauge strip metal through said trough, and an overriding clutch for driving one of said rolls and arranged to permit free rotation thereof, when said coiler is pulling the metal through said pickling trough.

2. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a pickling trough through which the metal is adapted to pass during the pickling operation, a coiler spaced longitudinally from the discharge end of said trough for pulling thin metal through said trough, squeegee rolls at the entering end of said trough, for pushing heavy metal through said trough, mechanism for securing adjacent ends of the metal together, for permitting said coiler to pull a succession of joined strips of thin metal through said trough, said mechanism being adapted to join a light piece of metal to a heavy piece of metal so said heavy piece of metal may thread said light piece of metal through the pickling system, and an overrunning clutch for driving said squeegee rolls, so arranged as to permit free rotation of said rolls, when thin metal

is being pulled through said system by said coiler.

3. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a leveler including a plurality of horizontally and vertically spaced rollers for reversely bending the metal before entering said pickling trough, a pickling and cleaning trough, through which the metal is adapted to pass during the pickling operation, spaced in advance of said leveler, squeegee rolls at the entering and discharge ends of said trough, for pushing heavy gauge metal through the pickling and cleaning device, a coiler spaced in advance of said pickling trough for pulling light gauge metal through the pickling and cleaning device, a stitcher, for stitching adjacent ends of the light gauge metal together, said stitcher being adapted to stitch the leading end of a light strip of metal to the trailing end of a heavy strip of metal, so said heavy metal may train said light metal through said pickling and cleaning trough; said upper rolls of, said leveler being movable vertically with respect to said lower rolls, to render said leveler inoperative when metal is being pulled through said pickling and cleaning trough, and means for driving said squeegee rolls in such a manner as to permit free rotation thereof with respect to said driving means when metal is being pulled through the pickling and cleaning device.

4. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a leveler including a plurality of horizontally and vertically spaced rollers adapted to engage opposite sides of the metal, a pickling and cleaning trough, through which the metal is adapted to pass during the pickling operation, disposed in advance of said leveler, squeegee rolls at the entering and discharge ends of said trough, for pushing heavy gauge metal through the pickling and cleaning device, a coiler spaced in advance of said pickling trough for pulling light gauge metal through the pickling and cleaning device, a stitcher at the entering end of said leveler, for stitching adjacent ends of light gauge metal together, said stitcher being adapted to stitch the leading end of a light strip of metal to the trailing end of a heavy strip of metal so said heavy metal may thread said light metal through said pickling trough, guides associated with said stitcher, through which the metal is adapted to pass, and said upper rolls of said leveler being movable vertically with respect to said lower rolls to permit said guides to be placed between said rolls while metal is being pulled through said leveler and pickling trough.

5. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a leveler including a plurality of horizontally and vertically spaced rolls for reversely bending the metal before entering said pickling trough, a

pickling and cleaning trough through which the metal is adapted to pass during the pickling operation, spaced in advance of said leveler, squeegee rolls at the entering and discharge ends of said trough, for pushing heavy gauge metal through the pickling and cleaning device, means for driving said squeegee rolls in such a manner as to permit free rotation thereof with respect to said driving means, and a coiler spaced in advance of said pickling trough for pulling light gauge metal through the pickling and cleaning device, a stitcher, for stitching adjacent ends of the light gauge metal together, said stitcher being adapted to stitch the leading end of a light strip of metal to the trailing end of a heavy strip of metal, so said heavy metal may train said light metal through said pickling and cleaning trough, guides associated with said stitcher and adapted to have the metal pass therethrough during the stitching operation, and said upper rolls of said leveler being movable vertically with respect to said lower rolls, to receive said guides therebetween when metal is being pulled through said pickling and cleaning trough.

6. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a pickling trough through which the metal is adapted to pass during the pickling operation, means for propelling heavy gauge metal through said trough and squeezing excess pickling fluid therefrom, including squeegee rolls at the entering and discharge ends of said trough and a power driven drive connection for driving one of said rolls of each set of said squeegee rolls, means for pulling light gauge strip metal through said pickling trough, and means in said drive to said squeegee rolls to permit said light gauge metal to freely rotate said squeegee rolls as it is being pulled through said trough, so said rolls will perform their squeegee function but will place no drag on said light gauge metal.

7. A push-through pull-through pickling and cleaning device selectively operable for cleaning light and heavy gauge strip metal including a pickling trough through which the metal is adapted to pass during the pickling operation, means for propelling heavy gauge metal through said trough and squeezing excess pickling fluid therefrom, including squeegee rolls at the entering and discharge ends of said trough and a power driven drive connection for driving one of said rolls of each set of said squeegee rolls, means for pulling light gauge strip metal through said pickling trough, and an overriding clutch in the drive to the squeegee roll of each set of squeegee rolls, for permitting said light gauge metal to freely rotate said squeegee rolls as it is being pulled through said pickling and cleaning trough, so said rolls will perform their squeegee function but will place no drag on said light gauge metal.

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