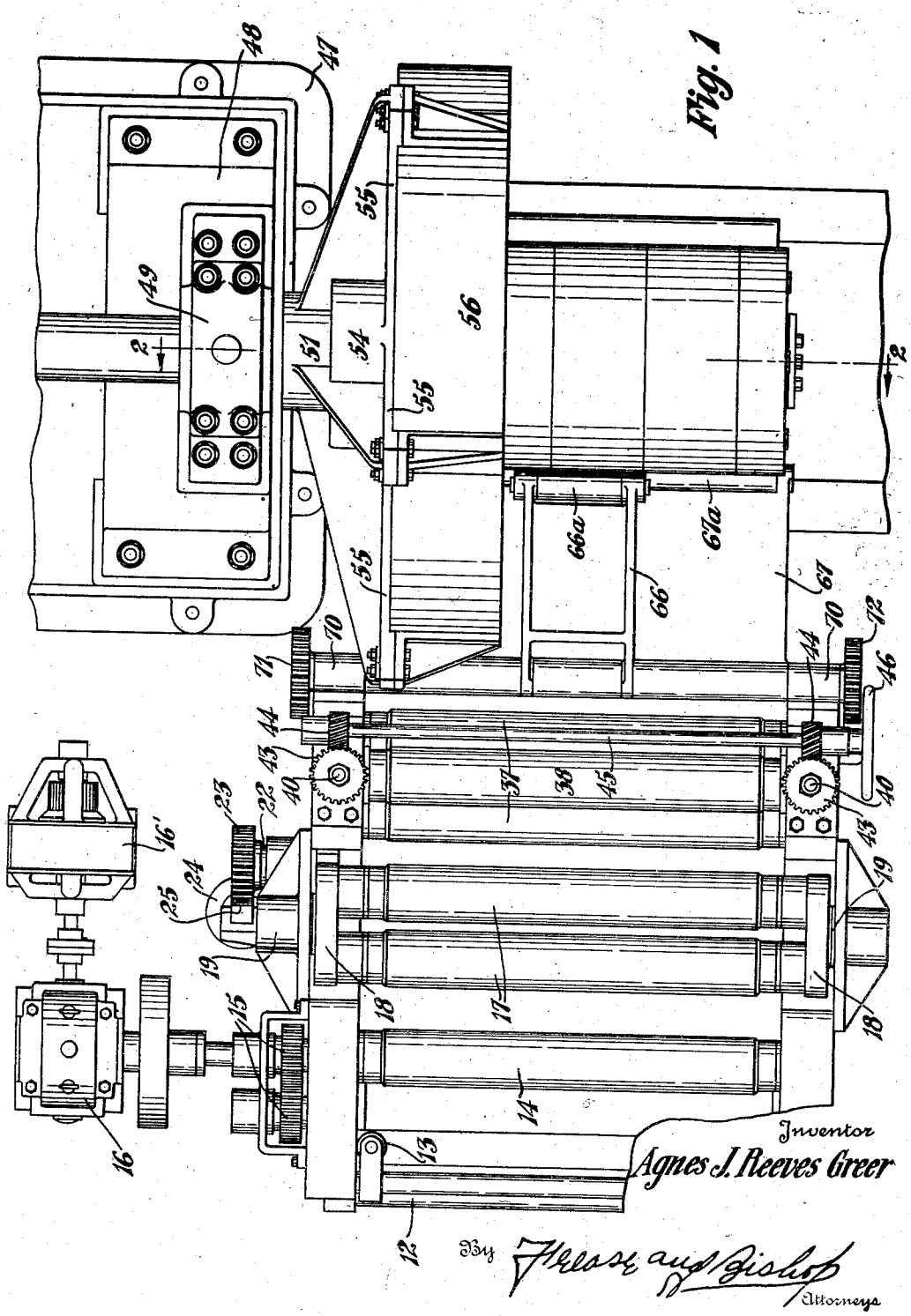
Oct. 7, 1941. A. J. R. GREER 2,257,743

RECOILER FOR METAL STRIPS

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Fig. 1



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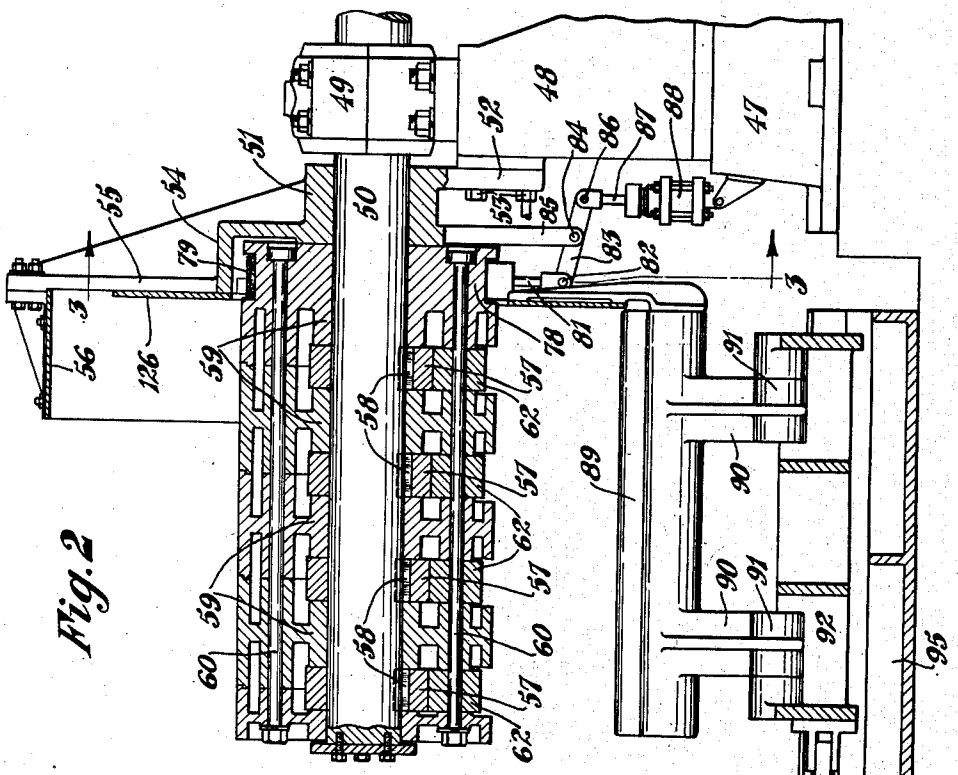


Fig. 2

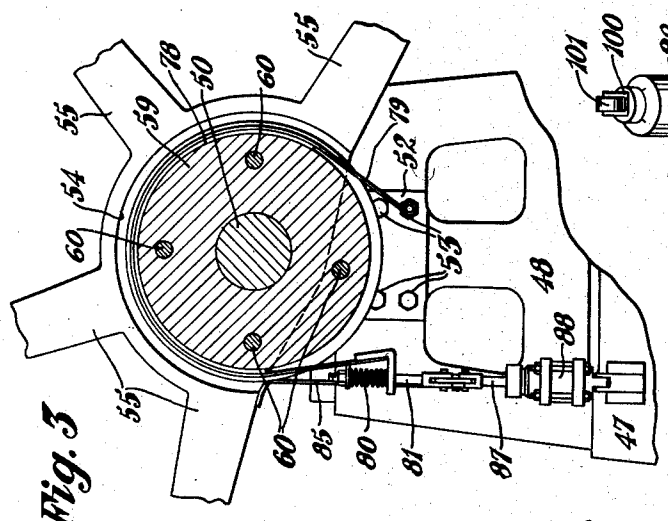


Fig. 3

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RECOILER FOR METAL STRIPS

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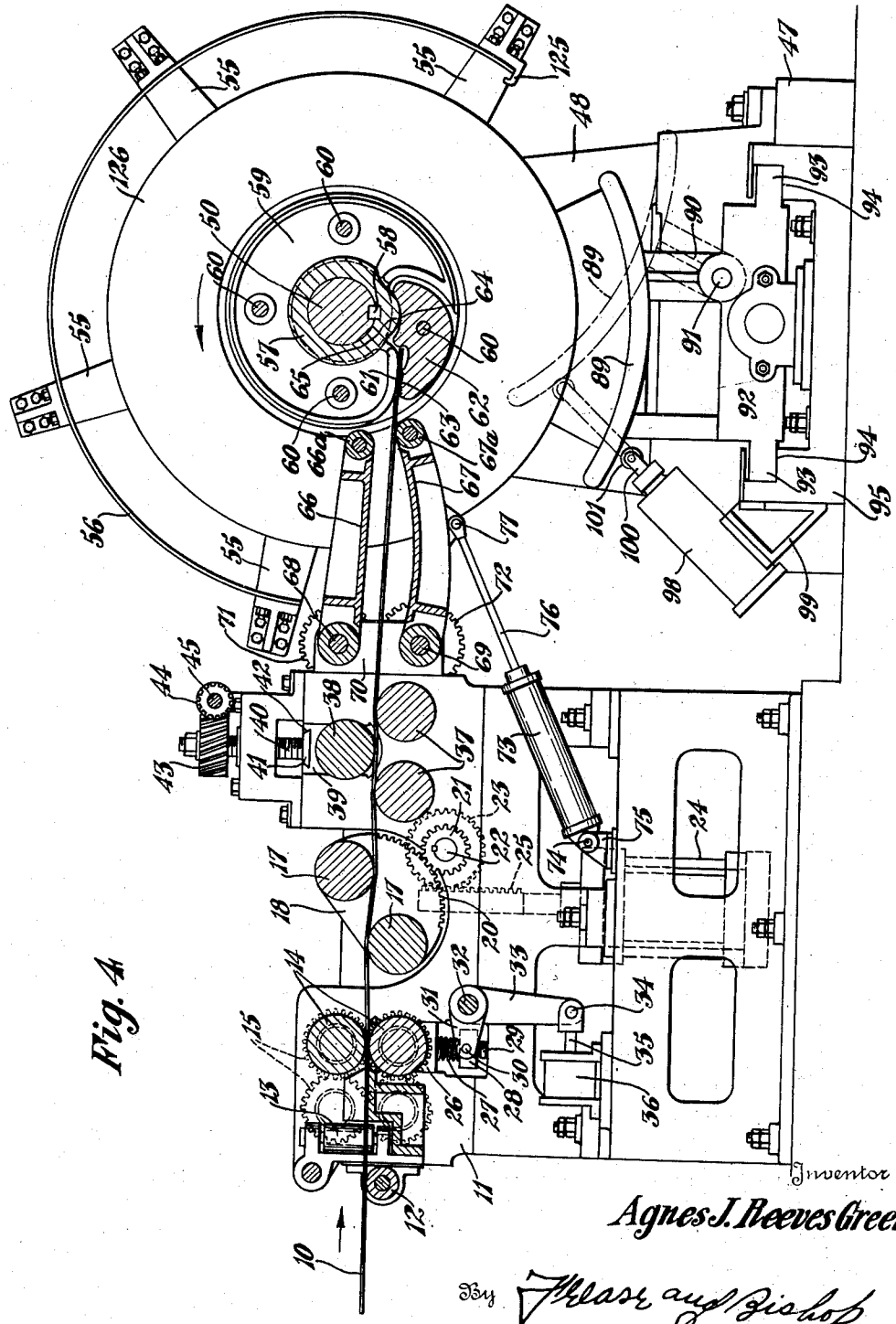


Fig. 4

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RECOILER FOR METAL STRIPS

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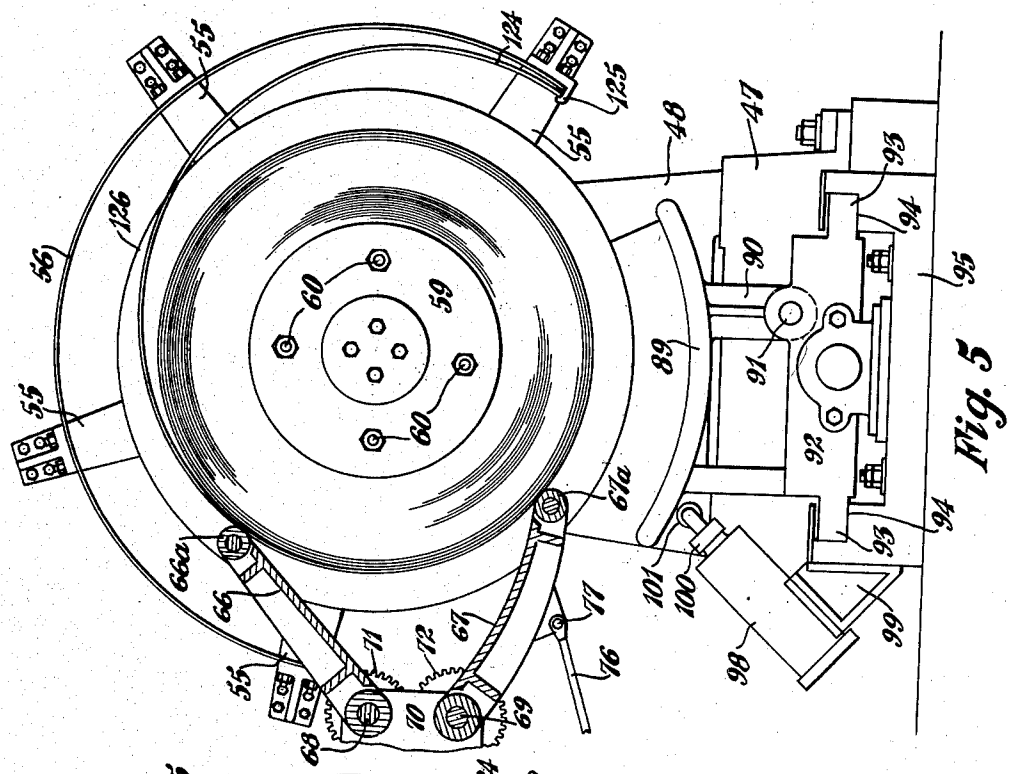


Fig. 5

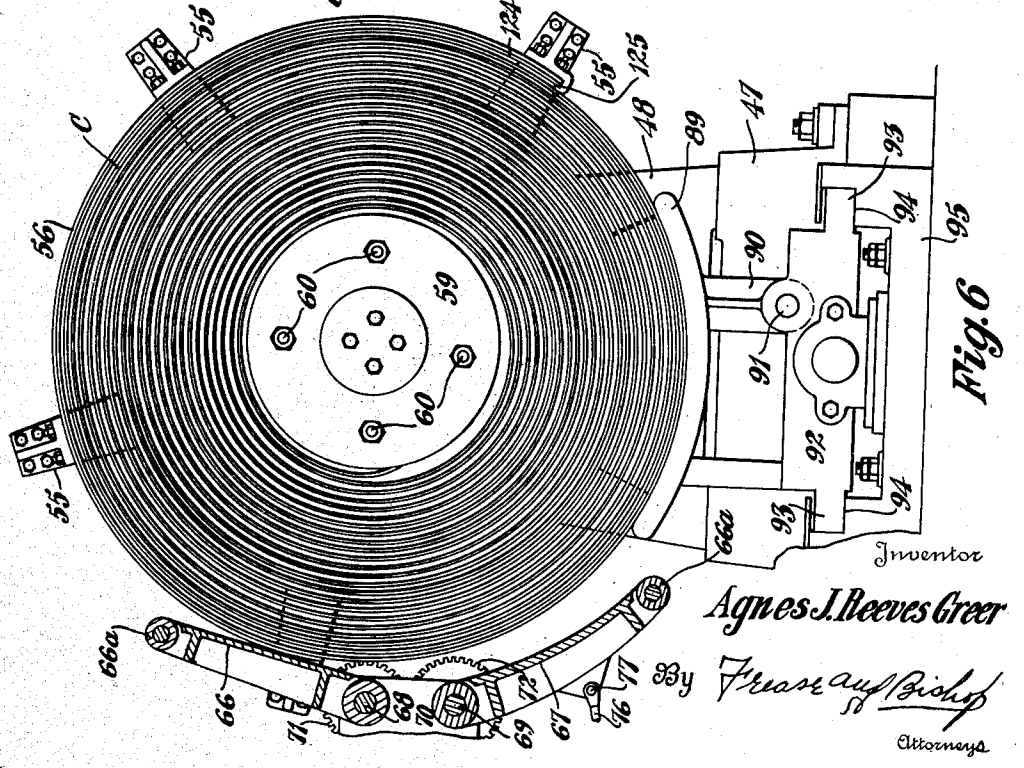


Fig. 6

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RECOILER FOR METAL STRIPS

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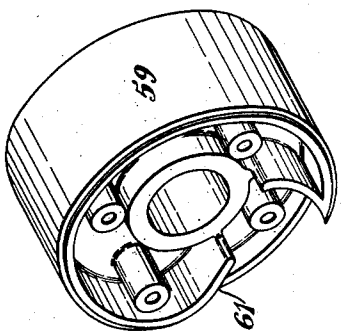


Fig. 8

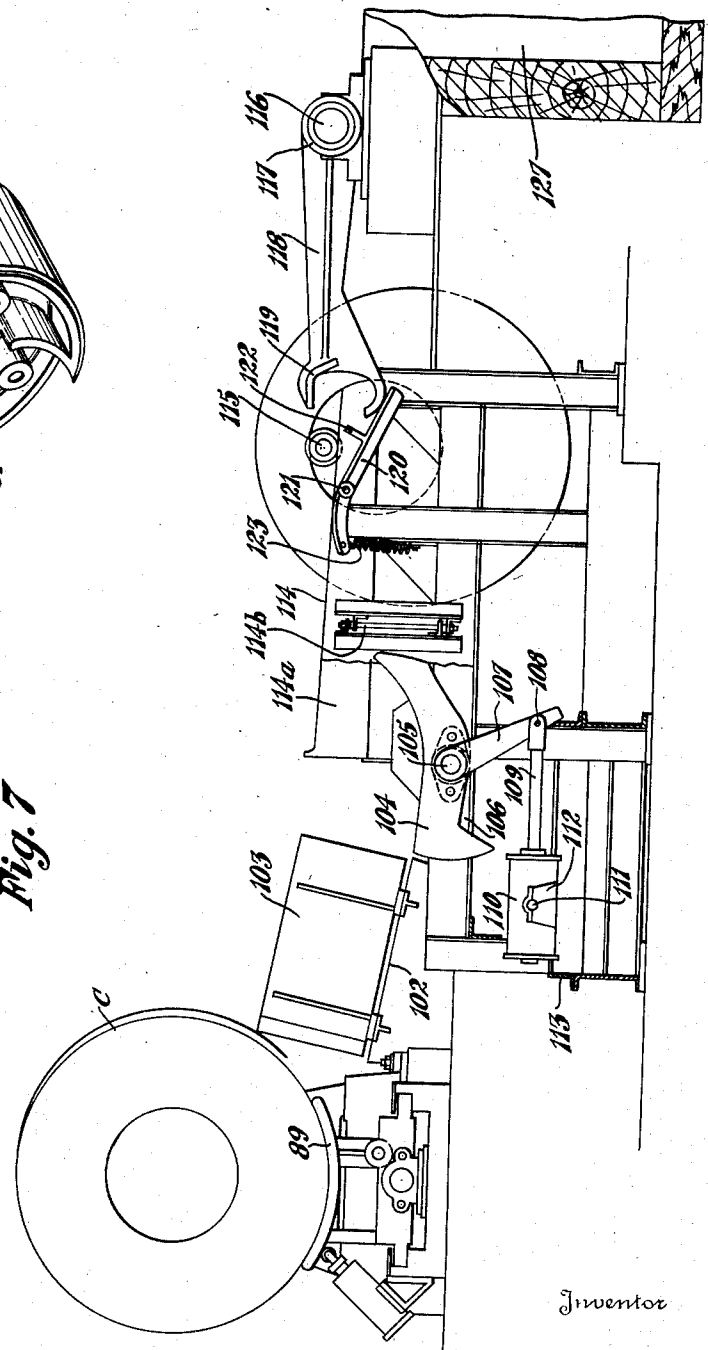


Fig. 7

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UNITED STATES PATENT OFFICE

2,257,743

RECOILER FOR METAL STRIPS

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Application September 16, 1938, Serial No. 230,304

6 Claims. (Cl. 242—78)

The invention relates to apparatus used in the pickling of coils of strip metal and more particularly to certain improvements upon the recoiling mechanism for preparing the coils for pickling in apparatus such as shown in my prior Patent No. 2,091,921, issued August 31, 1937, and Shoemaker Patent No. 2,120,843, issued June 14, 1938.

Pickling apparatus of the general character disclosed in the patents mentioned comprise means for supporting the coils of metal strip upon mandrels which are rotated as they are progressed through the pickling and washing tanks whereby the coils are rotated upon the mandrels as they pass through the pickling and washing solutions.

Before the coils are entered into such a pickling machine it is necessary that the laminae of the coil be sufficiently separated so that no portion thereof will touch any other portion of the strip while in the pickling solution, in order to prevent the formation of black spots or marks on the pickled material.

The Shoemaker patent above referred to discloses a back spinner interposed between the recoiler and the pickling tank for the purpose of opening up the laminae of each coil after it has been loosely coiled upon the recoiler.

While this back spinner has been found in actual practice to operate satisfactorily, it considerably slows up the pickling operation since it is necessary that each coil be first loosely recoiled upon the recoiler and then transferred to the back spinner where it is back spun until all of the laminae of the coil are sufficiently separated to insure satisfactory pickling of the metal.

The present invention contemplates the provision of a novel recoiler, which recoils the strip and then back spins the coil to the desired extent all in a single continuous operation, thus, eliminating the back spinner disclosed in the Shoemaker patent, thereby cutting down the cost of the pickling apparatus as well as the space required to house the same, and considerably speeding up the operation of the machine.

An object of the present invention is to provide a recoiler which will operate to coil a strip of sheet steel or the like, so constructed that when the coil is formed the recoiler may be operated in reverse direction to back spin the coil so as to separate the laminae thereof from one another.

Another object of the invention is to provide means for guiding the strip onto the rotatable drum of the recoiler and for automatically clamping the leading end of the strip to the drum.

A further object is to provide means for holding the outer end of the coil against movement as the drum is rotated in reverse direction to back spin the coil.

A still further object is to provide means for quickly and easily removing the coil from the drum of the recoiler after the back spinning operation.

Still another object is to provide means for straightening the strip as it is fed to the recoiler.

A further object is to provide means for holding the strip under tension as it is fed onto the recoiler.

Another object is to provide means for conveying the coil from the recoiler to the charging mechanism by means of which the coil is charged into the pickling machine.

The above objects together with others which will be apparent from the drawings and following description or which may be later referred to may be attained by constructing the improved recoiler in the manner illustrated in the accompanying drawings in which—

Figure 1 is a top plan view of a recoiler embodying the invention;

Fig. 2, a vertical sectional view taken as on the line 2—2, Fig. 1;

Fig. 3, a fragmentary section taken on the line 3—3, Fig. 2, showing the brake mechanism for the drum of the recoiler;

Fig. 4, a sectional end elevation of the recoiler showing the manner in which a strip is fed to the drum of the recoiler and automatically clamped thereon;

Fig. 5, a fragmentary end elevation of the recoiler showing the coil formed thereon;

Fig. 6, a view similar to Fig. 5 showing the coil after the back spinning operation;

Fig. 7, a side elevation showing the mechanism for conveying the coils from the recoiler to the charging mechanism of the pickling machine; and

Fig. 8, a perspective view of one of the sections of the drum.

Similar numerals refer to similar parts throughout the drawings.

The strip indicated generally at 10 is fed to the recoiler by means of apparatus such as shown in Figs. 1 and 4 and carried within a housing 11.

This feeding mechanism may include a roller 12 journaled in the housing 11 and guiding the strip between the vertical edge rolls 13.

Located beyond the edge rolls 13 is a pair of

pinch rolls 14 geared together as by the gearing 15 and driven through a reduction gear 16 as by the motor 16' to feed the strip forward to the recoiler.

Beyond the pinch rolls 14 is located a braking device for putting a tension on the strip 10. This apparatus may comprise a pair of rolls 17 journaled in segmental brackets 18, which are concentrically journaled as at 19 within the housing 11.

One of the brackets 18 may be provided around its peripheral edge with gear teeth 20 meshing with the pinion 21 fixed upon a shaft 22, which is journaled through one side of the housing 11 and has fixed to its outer end a gear wheel 23.

A hydraulic or pneumatic cylinder 24 is provided with a plunger in the form of a rack bar 25 meshing with the gear 23 whereby operation of the cylinder will, through the gearing above described, rock the brackets 18 and with them the rolls 17 around the centers of the journals 19.

The lower pinch roll 14 may be mounted in a vertically adjustable bearing 26 adapted to be urged upward toward the upper roll as by the spring 27 interposed between the slidable bearing 26 and the movable head 28 which is adapted to rest upon the stop screw 29 and is connected as by the pin 30 with the arm 31 of a bell crank lever fulcrumed as at 32 within the housing, the arm 33 of said bell crank lever being pivotally connected as at 34 to the plunger 35 of the fluid cylinder 36 by means of which the tension upon the spring 27 may be increased.

Located beyond the brake rolls 17 within the housing is a set of level rolls including the two lower rolls 37 which may be journaled in fixed bearings and the upper roll 38 journaled in vertically slidable bearings 39 adapted to be vertically adjusted as by the screws 40 having dove-tail heads 41 engaged within the dove-tail groove 42 in the bearings 39.

A spiral gear 43 is fixed upon each screw shaft 40 and meshes with the corresponding spiral pinion 44 upon the adjusting shaft 45, a hand wheel 46 being fixed upon the shaft 45 for manually adjusting the upper roll 38 toward or from the lower rolls 37.

The recoiling and back spinning drum and associated parts are mounted upon a base 47 located beyond the housing 11, a standard 48 being supported upon said base and having the single bearing 49 mounted thereon.

The shaft 50 of the recoiler drum is journaled through said bearing and is adapted to be driven, in either direction, by any suitable motor or prime mover (not shown).

A bearing portion 51 is journaled upon the shaft 50 and may be provided with a depending flange 52 rigidly connected to the standard 48 by the bolts 53 so that the bearing 51 and parts carried thereby will remain stationary as the shaft rotates in either direction.

The bearing 51 is provided with an annular housing portion 54 from which radiate several spokes 55, to the outer portions of which is connected a substantially semi-cylindric guard plate 56.

A plurality of spaced cams 57 is fixed upon the shaft 50 as by the keys 58 and interposed between said cams is a plurality of annular sections 59 loosely journaled upon the shaft 50 and tied together by a plurality of longitudinally disposed tie-bolts 60.

The peripheral portions of the sections 59 extend longitudinally into abutment with each other beyond the peripheries of the cams 57, and at one point the peripheries of all of the sections 59 are cut away as indicated at 61.

Within these cut-away portions of the sections 59 is located a plurality of latch members 62 pivotally mounted upon one of the tie-bolts 60 and provided with serrated or toothed edges 63 adapted to cooperate with the corresponding edge portions 61 of the sections 59 to clamp the leading end of the strip 10 therebetween when the drum is rotated in the direction of the arrow shown in Fig. 4.

The inner face of each latch member 62 is provided with a longitudinal concavity 64 adapted to be engaged by the cam lug 65 upon the corresponding cam 57.

A pair of pivoted guiding arms 66 and 67 is carried upon the housings 11 and extend above and below the strip 10 to a point adjacent the circumference of the drum of the recoiler.

The lower arm 67 may be of a width substantially equal to the length of the drum while the upper arm 66, as best shown in Figure 1, may, preferably, be considerably narrower so as not to interfere with the cylindric shield 56.

The arms 66 and 67 are fixed upon shafts 68 and 69, respectively, journaled in suitable bearing blocks 70 mounted upon the housings 11 and pinions 71 and 72 are fixed upon the ends of shafts 68 and 69, respectively, and meshed with each other whereby the arms may be swung toward or from each other in unison so that the rollers 66*a* and 67*a* may rest upon the coil.

For the purpose of controlling the movement and position of the arms, a fluid cylinder 73 may be provided. This cylinder may have its lower or inner end pivotally connected as at 74 to a bracket 75 mounted between the housings 11, the plunger 76 and cylinder being pivotally connected as at 77 to the lower arm 67.

For the purpose of placing tension upon the drum, when desired, brake mechanism is provided comprising a brake drum 78 formed at the inner end portion of the drum upon the innermost section 59, a brake band 79 surrounding said brake drum, one end of the brake band being connected to one of the bolts 53 while the other end is connected through a tension spring 80 to the rod 81, which is pivotally connected at its lower end as at 82 to one end of a lever 83 fulcrumed intermediate its ends as at 84 upon a bracket 85, the other end of the lever being pivotally connected as at 86 to the plunger 87 of a fluid operated cylinder 88.

A platform is provided for receiving the coil from the drum of the recoiler, and may be in the form of a tilting cradle 89, having the depending arms 90 pivoted as at 91 upon the sliding platform 92 provided with the horizontal flanges 93 slidable within the guideways 94 formed in the base 95.

A fluid cylinder 96 may be mounted at the forward end of said base and provided with a plunger 97 connected to the sliding platform 92.

An inclined fluid cylinder 98 may be mounted as upon the bracket 99 at one side of the base 95 and at a point beyond the drum, the plunger 100 of said cylinder being provided at its upper end with a roller 101 adapted to engage the underside of the cradle 89 as will be later explained.

Located beyond the cradle 89 and adapted to receive the coil therefrom is an inclined platform 102, as shown in Fig. 7, having side boards

103 to guide the coil downward upon the platform and onto the stop 104, which is pivoted intermediate its ends as at 105 to the frame 106 and provided with the depending rocker arm 107, which may be pivotally connected, as at 108, to the plunger 109 to the fluid cylinder 110 or other mechanism for swinging said rocker arm upon the pivot 105.

In order to compensate for the oscillating movement of the rocker arm 107, the cylinder 110 may be journaled as at 111 in brackets 112 mounted upon the supporting frame 113.

The coil loading mechanism includes the inclined rails 114, at which point a mandrel 115 may be inserted into each coil, the mandrel being supported upon the rails 114 and in turn supporting the coil thereon, as illustrated and described in detail in the prior patents above referred to.

In order to facilitate the insertion of the mandrel within the coil, a portion of one of the inclined rails 114 may be hinged as indicated at 114_a and adapted to be swung outward upon the hinge 114_b, providing sufficient clearance to place the mandrel in position through the coil, as disclosed in said Shoemaker Patent No. 2,120,843.

The loading or charging mechanism includes a rocker shaft 116 journaled in suitable bearings 117 mounted upon the foundation of the machine and provided with the charging arms 118 having the forked outer ends 119, any suitable means being provided for oscillating the shaft 116 as disclosed in detail in the prior patents above mentioned.

Stop levers 120 may be fulcrumed intermediate their ends as at 121 upon the inclined rails 114 and provided with upwardly disposed stop lugs 122 adapted to be normally held in the path of the mandrel 115 as by a coil spring 123 so as to hold the mandrel with the coil supported thereon at this point until the charging arms 118 are moved to the loading position shown in Fig. 7 when the forward ends of the levers 120 are depressed by the charging arms is indicated in said figure, moving the stop lugs 122 below the top edges of the inclined rails 114.

In the operation of the machine, to coil a strip of sheet steel or the like, the cylinded 24 is operated in a direction to cause the rack bar plunger 25 thereof to rotate shaft 22 clockwise so as to swing the segmental rack brackets 18 in a counterclockwise direction so that the braking rollers 17 carried thereby will be spaced above and below the path of the incoming strip.

The cylinder 36 is operated to move the lower movable feed roller 14 upward into operative position relative to the upper roller 14. The hand wheel 46 is operated to properly position the upper movable leveling roller relative to the lower leveling rollers 37, the cylinder 73 is operated to move the guiding arms 66 and 67 substantially to the position shown in Fig. 4, and the cylinder 88 is operated to apply the brake band 79 around the brake drum 78 so as to hold the drum sections 59 against rotation.

The strip 10 is then fed forward in the direction of the arrow shown in Fig. 4, over the roller 12 between the edging rollers 13 and into the pinch of the feed rollers 14, the strip being carried forwardly between the braking rollers 17 through the leveling rolls 37—38 between the guiding arms 66 and 67 and the leading end of the strip is fed into the recesses 61 of the drum sections 59.

At this point the shaft 50 of the drum is started in the direction of the arrow shown in Fig. 4, and as the drum sections 59 are held against rotation, the rotation of the shaft 50 in this direction will move with it the cam members 57, the cam lugs 65 thereof, engaging in the concavities 64 of the latch members 62 swinging the toothed or serrated ends 63 thereof upward to clamp the leading end of the strip against the surfaces 61 of the drum sections 59, as illustrated in Fig. 4.

At this point the cylinder 88 is operated to release the brake band 79 from the brake drum 78 and the cylinder 24 is operated to swing the braking rollers 17 into the position shown in Fig. 4 so as to place a tension upon the strip between said braking rollers and the drum.

As the drum continues to rotate in this direction, the strip will be coiled thereon until the entire strip has been formed into a coil as shown in Fig. 5.

During this operation the cylinder 73 may be operated to move the guide arms 66 and 67 outward toward the position shown in Fig. 5, so as to accommodate the coil as it increases in diameter.

In order to back spin the coil the shaft 50 is then rotated in a clockwise direction, the loose outer end 124 of the coil is received against the stop 125 upon one of the spokes 55 of the coil guard and as the coil is thus rotated in the opposite direction with the outer end thereof held against movement, the back spinning of the coil takes place, the laminae thereof being separated until the coil is completely back spun as shown in Fig. 6.

To remove the coil from the drum the cylinder 96 is operated, moving the cradle 89 on which the coil is seated and with it the stripper plate 126 connected to the cradle which slides the coil longitudinally off of the drum.

The cylinder 98 may then be operated to tilt the cradle 89 to the broken line position in Fig. 4, causing the completed back spun coil, as indicated at C, to roll onto the inclined platform 102 between the side boards 103 and onto the stop member 104 from which the coil may be charged into the pickling tank indicated generally at 127 in the manner illustrated and described in detail in the prior patents above referred to.

I claim:

1. A recoiler for coiling a strip of metal and separating the convolutions of the coil, comprising a bearing, a shaft journaled at one end in the bearing, a drum mounted upon the shaft for clamping one end of a metal strip, means for rotating the drum in one direction for coiling the strip thereon, means operated by the rotation of the drum in said one direction for operating the clamping means, a housing surrounding the journaled end of the drum and fixed to said bearing, a plurality of radial spokes fixed to the housing and extending outward from the drum, a semi-cylindric guard plate carried by the spokes and spaced outwardly from the drum, means for rotating the drum in the opposite direction to separate the convolutions of the coil, and a hooked stop at one end of the guard plate for engaging and holding the outer end of the coil from movement when the drum is rotated in said opposite direction.

2. A recoiler for coiling a strip of metal and separating the laminae of the coil, comprising a drum, clamping means upon the drum for

clamping one end of a metal strip, a substantially semi-cylindric guard plate surrounding and spaced from the upper side of the drum, means for rotating the drum in one direction for coiling the strip thereon, a stop adjacent to the drum for engaging and holding the outer end of the coil from movement, means for rotating the drum in the opposite direction to separate the laminae of the coil, a cradle below the drum provided with an arcuate platform having the same radius and center as the guard plate for receiving the coil when the laminae are separated, and means for removing the coil from the drum and simultaneously moving the cradle beyond the drum.

3. A recoiler for coiling a strip of metal and separating the laminae of the coil, comprising a drum, clamping means upon the drum for clamping one end of a metal strip, a substantially semi-cylindric guard plate surrounding and spaced from the upper side of the drum, means for rotating the drum in one direction for coiling the strip thereon, a stop adjacent to the drum for engaging and holding the outer end of the coil from movement, means for rotating the drum in the opposite direction to separate the laminae of the coil, a cradle below the drum provided with an arcuate platform having the same radius and center as the guard plate for receiving the coil when the laminae are separated, means for removing the coil from the drum and simultaneously moving the cradle beyond the drum, and means for tilting the cradle to discharge the coil therefrom.

4. A recoiler for coiling a strip of metal and separating the laminae of the coil, comprising a drum, clamping means upon the drum for clamping one end of a metal strip, a substantially semi-cylindric guard plate surrounding and spaced from the upper side of the drum, means for rotating the drum in one direction for coiling the strip thereon, a stop adjacent to the drum for engaging and holding the outer end of the coil from movement, means for rotating the drum in the opposite direction to separate the laminae of the coil, a cradle below the drum provided with an arcuate platform having the same radius and center as the guard plate for receiving the coil when the laminae are separated, a stripper plate carried by the cradle, and means for moving the cradle beyond the drum to remove the coil from the drum and deposit the coil upon the cradle.

5. A recoiler for coiling a strip of metal and separating the convolutions of the coil comprising a drum, clamping means upon the drum for clamping one end of a metal strip, means for rotating the drum in one direction for coiling the strip thereon, a pair of guide arms between which the strip is fed to the drum said guide arms being pivoted on opposite sides of the path of the strip at points spaced from the drum and their free ends extending toward the drum and being arranged for contact with the periphery of the coil and means for separating said arms as the coil increases in diameter, said separating means comprising meshing gears connected to the pivotal ends of the arms, a fluid cylinder and a plunger in the cylinder connected to one arm.

6. A recoiler for coiling a strip of metal and separating the laminae of the coil, comprising a drum, clamping means upon the drum for clamping one end of a metal strip, means for rotating the drum in one direction for coiling the strip thereon, a pair of guide arms between which the strip is fed to the drum, said guide arms being pivoted on opposite sides of the path of the strip at points spaced from the drum rollers upon the ends of the arms, arranged for contact with the periphery of the coil and means for separating said arms as the coil increases in diameter so that the rollers will contact the circumference of the coil, said separating means including meshing pinions fixed to the pivoted ends of the arms, a fluid cylinder, and a plunger in the cylinder connected to one arm.

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