

July 26, 1932.

C. E. BEDELL ET AL

1,869,004

APPARATUS FOR REREELING STRIP METAL

Filed Jan. 25, 1930

4 Sheets-Sheet 1

Fig. 1.

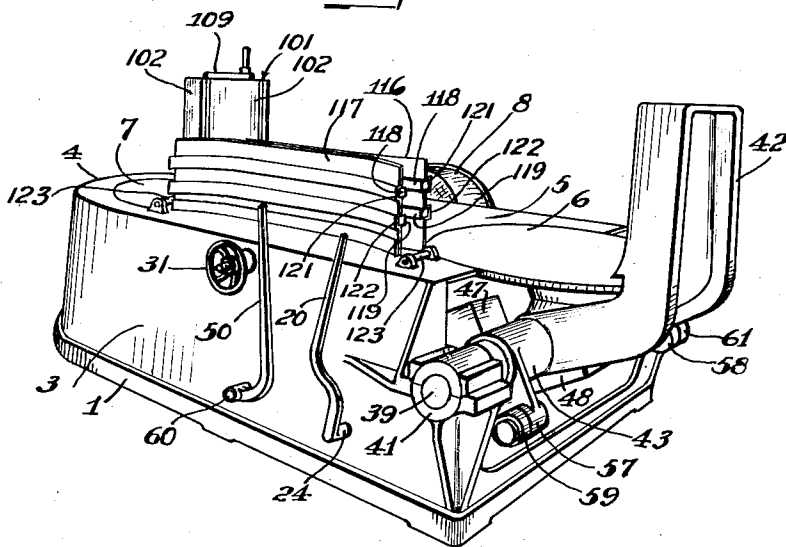
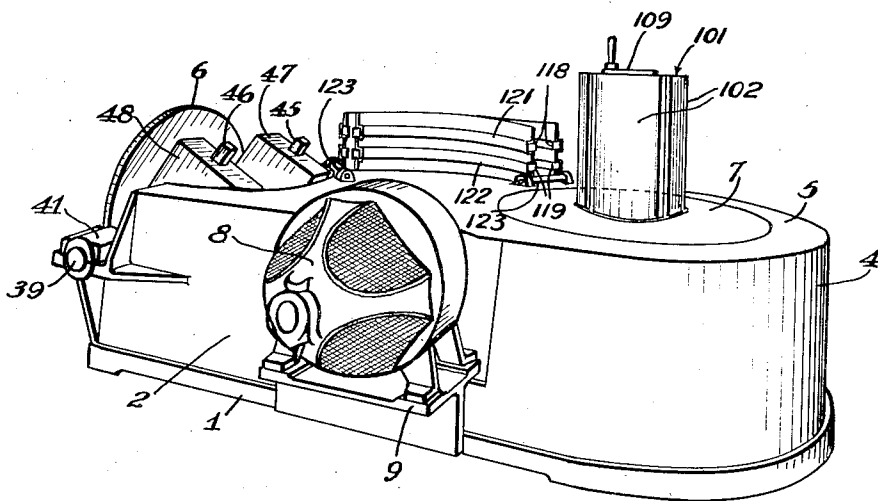


Fig. 2.



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4 Sheets-Sheet 2

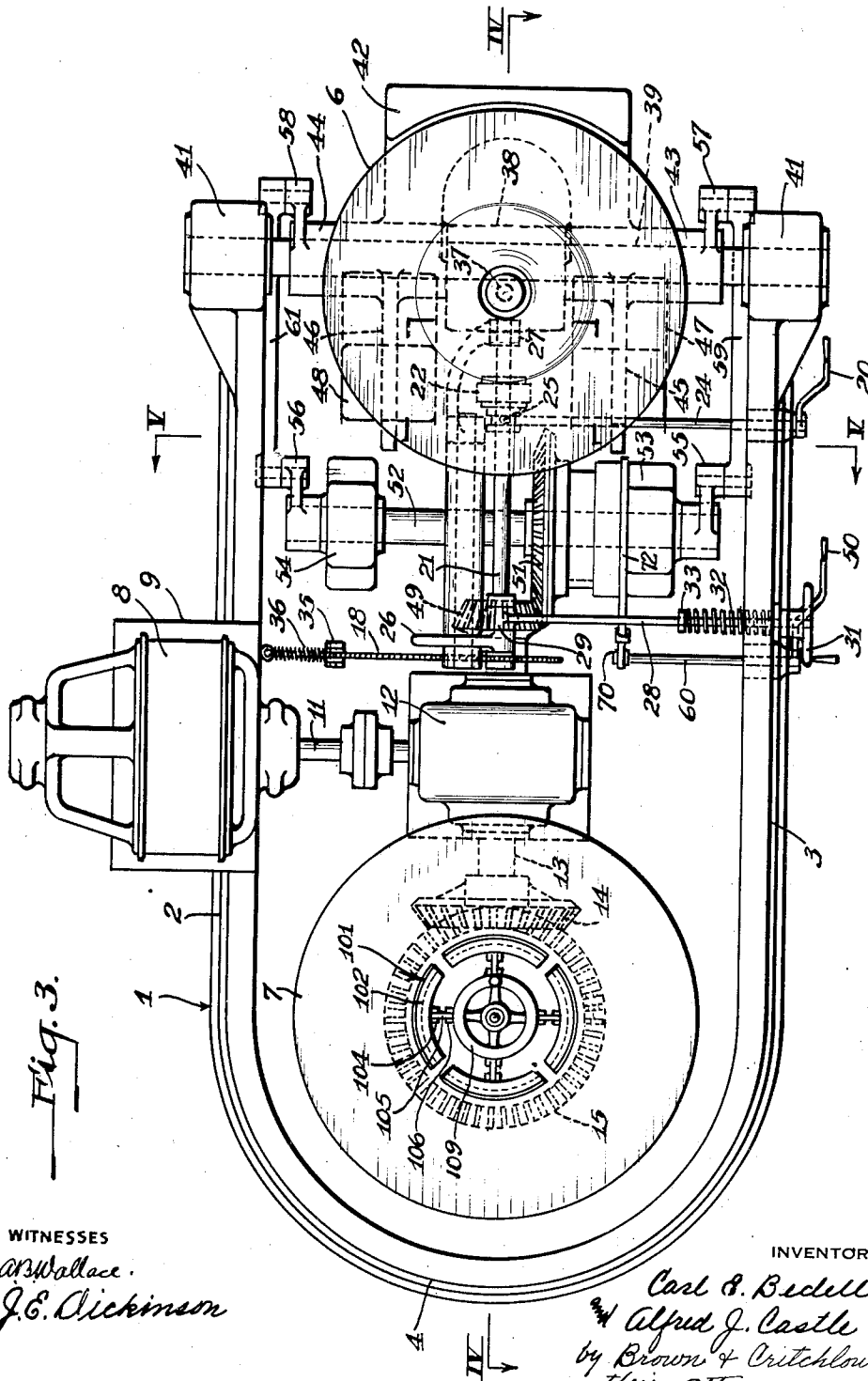


Fig. 3.

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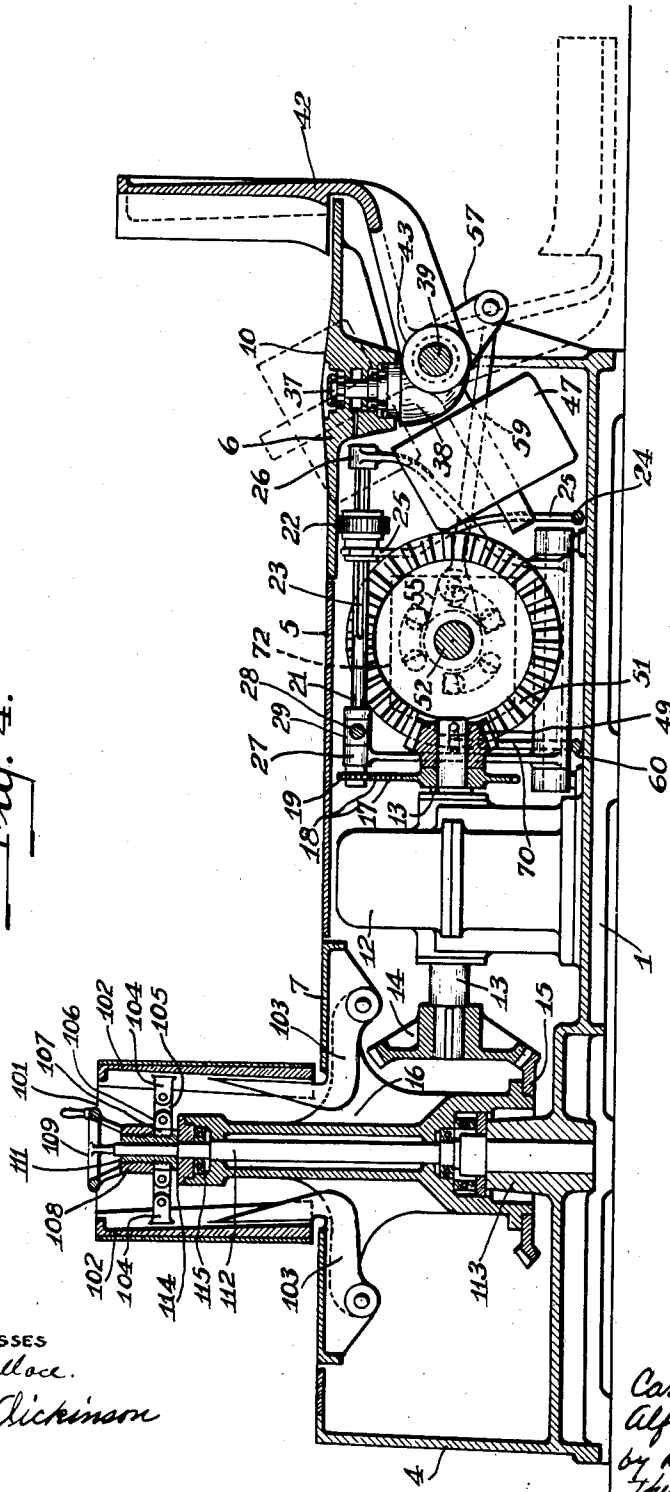
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4 Sheets-Sheet 3

Fig. 4.



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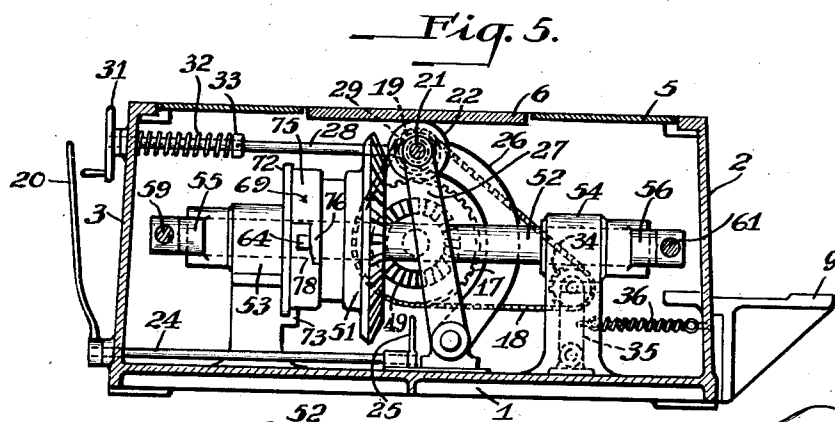
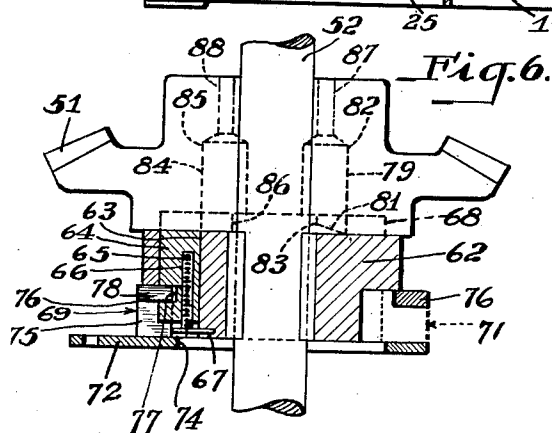
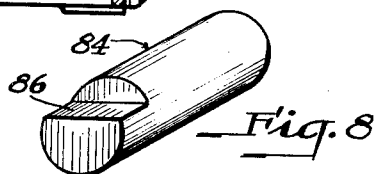
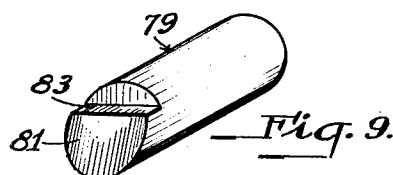
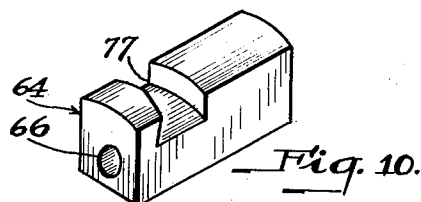
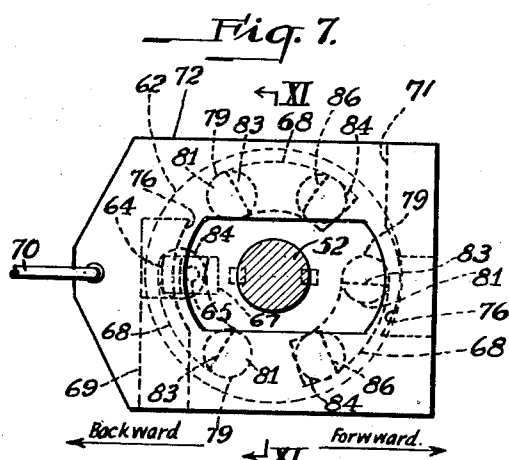
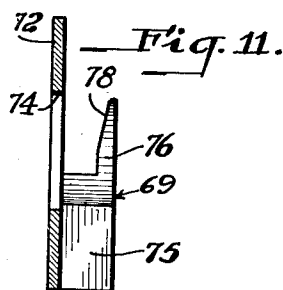
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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APPARATUS FOR REREELING STRIP METAL

Application filed January 25, 1930. Serial No. 423,359.

This invention relates to a machine for re-reeling coils of metal strip, and while it may be utilized for tightly rereeling loosely reeled strip, it is particularly applicable to loosely rereeling tightly reeled strip, and is so illustrated and described herein.

It is a very common practice in the manufacture of strip metal, which is usually produced in long and unwieldy strips, to reel the strips into coils as they issue from the rolling mills so that they will be easier to handle. The strips when so coiled are usually subjected to so much tension that there is insufficient space between the adjacent turns of the coils to permit an annealing or heat treating atmosphere to penetrate between them when the coils are subjected to a treatment of this nature. Hence it is necessary to either unwind the coils and anneal the strips flat, or to prolong the annealing of the reeled coils for such periods of time as are necessary to permit the heat to penetrate them.

The primary object of this invention is to provide a machine for speedily and dependably unreeling tightly wound coils of strip metal and rereeling them in such a way that adequate space is allowed between their adjacent turns to permit an annealing or like atmosphere to penetrate them with ease.

For insuring a space between the adjacent turns of a coil being rereeled, it is an object of the invention to provide for positively driving both of the rotatable reels upon which the unreeling and rereeling coils are mounted, and to further provide for controlling their relative speeds in such a way that the tension of the strip being rereeled will be at all times under the control of the operator.

A further object is to provide in the machine for tilting the unreeling reel in a manner to facilitate the loading of the coils thereon, and for also collapsing the rereeling reel so that a rereeled coil may be lifted from it with ease.

A still further object is to provide a machine of the above described character which is of simple, sturdy and compact construction, which is both speedy and dependable

in operation, and also capable of being manufactured at a comparatively low cost.

These and other objects, as well as the novel features and advantages of the invention will become more apparent when the following detailed description is read in conjunction with the accompanying drawings, of which Fig. 1 is a perspective view looking from one side of a machine constructed in accordance with what is now considered to be the preferred embodiment of the invention; Fig. 2 a similar view taken from the opposite side of the same machine; Fig. 3 a top plan view of the same with the cover plate removed; Fig. 4 a sectional view taken on the line IV—IV of Fig. 3; Fig. 5 a sectional view taken on the line V—V of Fig. 3; Fig. 6 a sectional view taken on a horizontal plane through a clutch mechanism; Fig. 7 a detail elevation of the clutch mechanism shown in Fig. 6 taken from the outer face of the clutch plate; Figs. 8 and 9 perspective views, respectively, of pins employed in the ends of the grooves in the clutch gear; Fig. 10 a similar view of the clutch gear engaging pin; and Fig. 11 a section taken on the line XI—XI of Fig. 7.

Referring now to the drawings, the numeral 1 designates the base of the machine, and the numerals 2, 3 and 4, respectively, the two side walls and one end wall of a housing. Over the tops of these walls there is suitably secured a cover plate 5, in which, or flush with which, an unreeling reel 6 and a rereeling reel 7 are rotatably mounted on vertical axes, the former being arranged in the end of the machine where there is no housing wall so that it may be tilted downwardly to assist in loading coils to be rewound upon the machine, and being provided with a slightly elevated cone-like center portion 10 for centralizing the coils thereon. To further insure against a coil getting out of place in this reel holes may be drilled adjacent its center and pins placed in them to positively hold the coils on the reel.

In order that the tension on the strip, as it is being rereeled, may be controlled or entirely eliminated as may be desired, for the purpose of determining spacing between the

adjacent turns of the rereeled coil, both the unreeling and the rereeling reels are power driven, and the relative speeds made controllable at the will of the operator. For driving the two a single electric motor 8 (Fig. 3) mounted upon a shelf 9 is employed, its armature being connected to a shaft 11 that in turn is connected through a suitable gear unit 12 to a main drive shaft 13. On the rear end of this shaft there is keyed a beveled gear 14 meshing with a cooperating bevel gear 15 secured to the bottom of a hub-like supporting member 16 (Fig. 4) upon which the rereeling reel is mounted, and through which arrangement the rereeling table is driven at a constantly relative speed with respect to that of the driving motor.

With the rereeling table thus driven at a constant relative speed with respect to that of the driving motor, it is necessary to provide for variably controlling the speed of the unreeling table in order to make it possible to control the tension in a strip being recoiled or to eliminate it entirely if such is desired. Toward this end a variable drive is provided for the unreeling reel comprising a sprocket wheel 17 keyed to the front end of the main drive shaft 13 (Fig. 5). From this sprocket wheel a chain 18 is passed over another sprocket wheel 19 mounted on an auxiliary drive shaft 21, which in turn carries a friction wheel 22 (Fig. 4) bearing against the underside of the unreeling reel. To provide for varying the speed imparted to the unreeling reel, friction wheel 22 is mounted for axial movement along the length of shaft 21 by means of a key which is passed through a longitudinal slot 23 cut in the shaft. Hence by moving the friction wheel, which is driven at a constant speed with respect to that of the motor, toward or away from the center of the unreeling reel, such reel may be caused to rotate at different speeds, the speed depending upon the displacement of the friction wheel from the center of the unreeling reel.

For rendering the friction wheel readily movable at the will of the operator, so that he may change the speed of rotation of the unreeling reel in accordance with the change in the diameters of the unreeling and rereeling coils, and in that way control the tension upon the strip as it is recoiled, a control lever 20 (Fig. 1) is connected, by means of a shaft 24 and a connecting link 25 (Figs. 4 and 5), to the hub of the friction wheel, the connecting link having an eye on its wheel-engaging end which loosely moves in an annular groove in the hub of the friction wheel.

In order that the frictional engagement between friction wheel 22 and the unreeling reel may be varied to take up the slack between the two as the surface of the friction wheel wears away, shaft 21 is mounted in a pair of arms 26 and 27 pivotally supported in the base of frame 1 at a point somewhat

displaced from the center line of the machine, as illustrated in Fig. 5, and made sufficiently long to maintain the friction wheel in engagement with the underside of the unreeling table. Hence, by rotating these arms about their pivoted ends, the friction wheel may be raised toward or moved away from the unreeling table to vary its frictional engagement therewith. For moving shaft 21 in the manner desired, and for retaining it in a selected position with respect to the unreeling table, an adjusting rod 28 (Figs. 3 and 5) is employed. One end of this rod is connected by means of loosely fitting eye 29 to shaft 21, and the other end is passed through a hole in the wall 3 where it is engaged by an adjustable wheel 31 threaded thereon. For biasing shaft 21 to the position selected by the adjustment of wheel 31, a spring 32 is mounted on rod 28 between the wall of the machine and a lug 33 formed on the rod at a distance spaced from the wall.

In order to make it possible to move shaft 21 to vary the engagement between friction wheel 22 and the underside of the unreeling table without changing the length of chain 19, and also to keep the chain taut at all times, an idler wheel 34 (Fig. 5) is pivotally supported by a link 35 and biased toward its chain-tightening position by a spring 36 connected between the link and wall 2.

To facilitate the loading of coils upon the machine, as has been referred to hereinbefore, the unreeling reel is tiltably mounted in the open end of the machine. The reel itself is rotatably supported upon a normally vertically disposed stub shaft 37 (Fig. 4) which forms the free end of a pivotally mounted support member 38 securely keyed to the center of a transverse shaft 39 mounted in a pair of bearing supports 41. This support member is curved for placing the center of gravity of the unreeling reel between the center of shaft 39 and friction wheel 22 on which the reel rests so that the weight of the reel and the coil mounted thereon automatically holds the reel in engagement with the friction wheel when it is in its operating position. By mounting the unreeling reel in this way, it may be tilted on its side, as shown in full lines in Fig. 2 and in dotted lines in Fig. 4, to facilitate the placing of a coil on it. Thereafter, the reel may be raised to its operative position by simply rotating shaft 39. For supporting a coil when it is leaned against the reel, and for holding it in place when the reel is raised, an arm 42 is employed, the arm being provided with a pair of trunnions 43 and 44 keyed to shaft 39. For counterbalancing the unbalanced weight of arm 42, and a coil mounted thereon, levers 45 and 46 are formed integral with trunnions 43 and 44 and extended therefrom on the opposite side of shaft 39 to that of the arm, and on these levers a

pair of adjustable counterbalancing weights 47 and 48 are mounted.

In order to utilize motor 8 for tilting the unreeling reel to its coil-receiving position and for returning it again to its operating position, a driving connection is provided between drive shaft 13 and reel supporting shaft 39. This driving connection comprises a bevel gear 49 (Figs. 3 and 4) keyed to the unreeling end of shaft 13 and meshing with a cooperating bevel gear 51 loosely arranged upon a transverse shaft 52 mounted in a pair of bearing supports 53 and 54. For transmitting the movement of shaft 52 to shaft 39, a pair of crank arms 55 and 56, mounted on shaft 52, are connected to a pair of cooperating cranks 57 and 58, made integral with the trunnions 43 and 44 of arm 42, by means of a pair of connecting rods 59 and 61, respectively, the arrangement and lengths of these cranks and rods being such that a complete revolution of shaft 52 causes reel 6 to move to and from its operating and tilted positions.

A clutch is provided between gear 51 and shaft 52 so that reel 6 may at will be moved to and from its operating and tilted positions, and maintained in each. This clutch comprises a ring-shaped clutch block 62 (Figs. 6 and 7) keyed to shaft 52 with one of its faces adjacent one face of gear 51. In an axially disposed slot 63 cut in block 62 at a distance spaced from the center thereof, there is slidably fitted a clutch pin 64. This pin is normally biased toward the face of the gear 51 by a spring 65 arranged in a hole 66 cut in the pin, and having one of its ends bearing against the bottom of the hole and the other against a plate 67 fitted in a slot in the clutch block. In the face of gear 51 directly opposite to the clutch pin three arcuate pin-engaging grooves 68 are provided, into which grooves pin 64 is caused to move to engage the clutch block with gear 51 and cause the shaft 52 to rotate with gear 51.

For releasably holding the clutch pin 64 out of operative engagement with the grooves 68 in gear 51, a pair of clutch cams 69 and 71 are mounted upon a clutch plate 72 which in turn is slidably mounted in a groove 73 disposed on the inner side of bearing support 53. In plate 72 there is an elongate opening 74 having rounded ends adjacent to which the cams are secured, this opening being made only sufficiently long to permit the plate to be moved far enough in one direction or the other to release clutch pin 64, which is normally held by one of the cams, and place the other cam in the path of the pin so that the pin will be again raised to its inoperative position after it has been permitted to travel an angular distance of 180 degrees, or in other words after it has moved to the other side of the shaft from

which it started. This corresponds to a movement sufficient to move the unreeling reel from its operating position to its coil-receiving position, or vice versa.

Each of cams 69 and 71 are spaced from the clutch plate toward gear 51 by a block portion 75, and each has a projecting cam portion 76 adapted to engage in a slot 77 in the outside face of the clutch pin when the cam comes in contact with it. The free ends of these cam portions 76 are tapered at 78 toward the face of the gear 51 so that the clutch plate side of the clutch pin groove 77, which is rounded at the edge for that reason, will come in contact with the slanted side of the cams and be gradually lifted out of engagement with the ends of grooves 68 in gear 51 as it moves. When the clutch pin is once picked up in this way, the connection between shaft 52 and gear 51 is broken, hence no movement thereafter will be imparted to the unreeling table, except that occasioned by momentum of the machine and, to insure against carrying the clutch pin out of engagement with the cam, block portions 75 are adapted to prevent the pins moving all the way across the cams.

In order to release the clutch pin after it has been picked up by one of the cams and again set shaft 52 in motion, all that is necessary is to move the clutch plate sufficiently to disengage the cam from the slot 77 in the pin and allow spring 65 to project the pin against the face of the gear, so that it will be forced into the first groove 68 passing thereunder. The movement of the clutch plate this amount places the opposite cam in the path of the clutch pin, whereby the pin is again lifted out of engagement with gear 51 after it has caused shaft 52 to rotate 180 degrees. For moving the clutch plate from one position to another, a lever 50 is connected to the plate by means of a shaft 60 and a connecting link 70.

To protect clutch pin 64 from being injured when it is forced into one of the grooves 68 by the spring 65 upon being released by one of the cams, a gear pin 79, having a sloping portion 81 on its exposed end, is fitted in a hole 82 in gear 51 at the forward end of each of the grooves 68. Hence, as the clutch pin moves into one of these grooves it slides down the inclined portion 81 of the gear pin toward the bottom of the groove instead of being snapped thereinto by spring 65. However, in order that the clutch pin may be firmly seated in the groove, a notch 83 is cut in the side of each of the gear pins facing the groove, so that the clutch pin will be permitted to snap a short distance from the face of the gear pins to the bottom of the groove.

For protecting the ends of the grooves 68 against which the clutch pins impinge from being injured by the jamming action thereof,

gear pins 84 are arranged in holes 85 cut in the gear 51 at the pin-engaging ends of the grooves. To provide a flat surface against which the clutch pin may bear, a notch 86 is cut in each of these latter gear pins. In order that the different gear pins 79 and 84 may be readily removed when they become worn or otherwise damaged, comparatively small holes 87 and 88 are drilled from the opposite side of gear 51 into the pin holes 82 and 85 for the reception of instruments by means of which the gear pins may be driven out of their respective holes.

For engaging the strip on the rereeling reel, and for forming a core about which it may be coiled, a collapsible core 101 (Figs. 1, 2 and 4) is arranged in the center of reel 7. This is formed of a plurality of radially-adjustable cylindrical-shaped sections 102, each of which is pivotally connected to the underside of the table by an arm 103 and on the inside of each of which there is formed a bracket 104. Between each of these brackets and a similar bracket 106, formed on a ring 107 loosely fitted in an annular groove in an adjusting sleeve 108, there is a connecting link 105. Sleeve 108 is provided with a wheel 109 at its upper end by means of which it may be readily turned at the will of the operator, and is provided with an internal thread which engages a thread on the outer surface of a sleeve 111 arranged so that turning of sleeve 108 causes it to be raised or lowered. Sections 102 of the reel are thereby caused to expand or contract in accordance with the movement imparted thereto by links 105.

The sleeve 111 is loosely mounted upon the end of a shaft 112 which is extended upwardly through the center of reel support member 16. The lower end of this shaft rests on a projection 113 formed in the base of the machine. For engaging the bottom of sleeve 111 and holding it in place, a cap 114 is fitted upon the upper end of reel support member 16, and beneath it there is a bearing 115.

While the coils rereeled on the machine may be lifted from collapsible core 101 in any desired manner, they may be lifted by a circular magnet. To prevent the collapsible core from affecting the flux set up by the magnet so as not to attract the inner turns of the coil to the core and thereby pull the coil apart as it is lifted from the machine, core sections 102 are preferably made of some non-magnetic material, such as brass, or at least provided with a sufficiently thick outer shell of non-magnetic material to make them substantially non-magnetic.

For guiding the strip as it moves from the unreeling to the rereeling reel, a pair of guides 116 and 117 (Figs. 1 and 2) are mounted on cover plate 5 between the two reels. These guides are tapered outwardly at their ends to facilitate the movement of the strip

through them, and, to prevent the strip from being injured by contact with their walls, a pair of buffer-like ribs 118 and 119 are secured in grooves 121 and 122, respectively. These ribs may be made of wood or any other suitable material capable of withstanding the wear, but nevertheless soft enough not to injure the strip. To prevent the edge of the strip which rides on the top of the machine from unnecessarily wearing away the cover plate, and for also reducing the friction between it and the top of the machine, a roller 123 is mounted on the cover plate immediately forward of the guide members.

To rereel a coil of strip on the machine, motor 8 is set in motion and the lever 50 actuated to release the clutch pin from the clutch cam which is holding it, and thus permit the unreeling reel to be tilted to its coil-receiving position. In this position a coil is rolled onto arm 42 and leaned against the unreeling reel. The clutch is then again moved and the coil and table raised to the top of the machine. When it reaches this position the motor is stopped, and the loose end of the strip fed through the guides and engaged in the collapsible core 101 on the rereeling reel, which core is then expanded and the motor restarted, thus starting the rereeling. Simultaneously with this the operator starts manipulating the speed regulating lever 20 to control the speed of the unreeling reel in such a way that it is driven at the proper speed to obtain the desired tension on the strip, the speeds of this reel being continuously changed as the diameters of the two coils change. After the rereeling operation has been completed, the motor is stopped and the collapsible core contracted. The rereeled coil is then lifted from the rereeling reel, placing the machine in shape for a repetition of the cycle of operation.

As will be readily appreciated by those skilled in the art, a machine thus constructed, although especially adapted for use in loosely rereeling tightly wound coils of metal strip, is also capable of use for tightly rereeling loosely reeled coils by merely making the speed of the unreeling reel sufficiently slower than that of the rereeling coil to provide the necessary tension in the strip.

Among the chief advantages of the invention is the simple, economic, and speedy manner in which tightly wound coils of metal strip may be loosely rewound to prepare them for an annealing treatment or treatment of that character. Another advantage of the invention resides in the minimum amount of manual labor required to operate the machine.

According to the provisions of the patent statutes, we have explained the principle and operation of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within

the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim as our invention:

1. In a machine for unreeling and rereeling coils of metal strip, the combination with a power driven rereeling reel fixedly arranged for rotation on a vertical axis, of a power driven unreeling reel arranged for rotation on a vertical axis and pivotally mounted to permit its being tilted at an angle thereto for loading coils upon it.

2. In a machine for unreeling and rereeling coils of metal strip, the combination of a rereeling reel arranged for rotation on a vertical axis, an unreeling reel arranged for rotation on a vertical axis and pivotally mounted on a horizontal axis to permit its being tilted to facilitate the loading of a coil thereon, means for driving the rereeling reel at a constant speed and the unreeling reel at a variable speed, and means for tilting the unreeling reel to its coil receiving position and returning it again to its operating position.

3. In a machine for unreeling and rereeling coils of metal strip, the combination of a power driven rereeling reel having a table arranged for rotation in a horizontal plane, a disc-like unreeling reel having a table arranged for rotation in the same plane and pivotally mounted to permit its being tilted to facilitate the loading of a coil thereon, and a power driven adjustably mounted friction wheel arranged to bear on the under side of said unreeling table and rotate it, said unreeling reel having its center of gravity spaced from its pivotal support toward the point where it is engaged by said friction wheel whereby its table is automatically held in engagement with the friction wheel when in its operating position.

4. In a machine for unreeling and rereeling coils of metal strip, the combination of a power driven rereeling reel having a table arranged for rotation in a horizontal plane, a tiltably mounted power driven unreeling reel having a table arranged for rotation in the same plane, and power operable means controllable at will for tilting the table of said unreeling reel at an angle to its plane of rotation and for returning it again to its operating position.

5. In a machine for unreeling and rereeling coils of metal strip, the combination with a rereeling reel having a table arranged for rotation in a horizontal plane, an unreeling reel having a table tiltably mounted for rotation in the same plane, a motor for driving both of said reels and for tilting the unreeling reel, means for connecting said motor to said rereeling reel to drive it at a constant speed, means for adjustably connecting said motor to said unreeling reel to drive it at variable speeds, and releasable

means for connecting said motor to the tilting mechanism of the unreeling reel to render the tilting of said reel controllable at will.

6. In a machine for unreeling and rereeling coils of metal strip, the combination of an unreeling and rereeling coil each having a table arranged for rotation in a horizontal plane, power means for rotating said rereeling reel at a constant speed and said unreeling reel at variable speeds, means operated by said power means for tilting the table of said unreeling reel at an angle to its plane of rotation to facilitate the loading of a coil upon it and returning it and the coil to the unreeling position, and a clutch interposed between said power and tilting means for controlling the operation of the latter at will.

In testimony whereof, we hereunto sign our names.

CARL E. BEDELL.
ALFRED J. CASTLE.

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