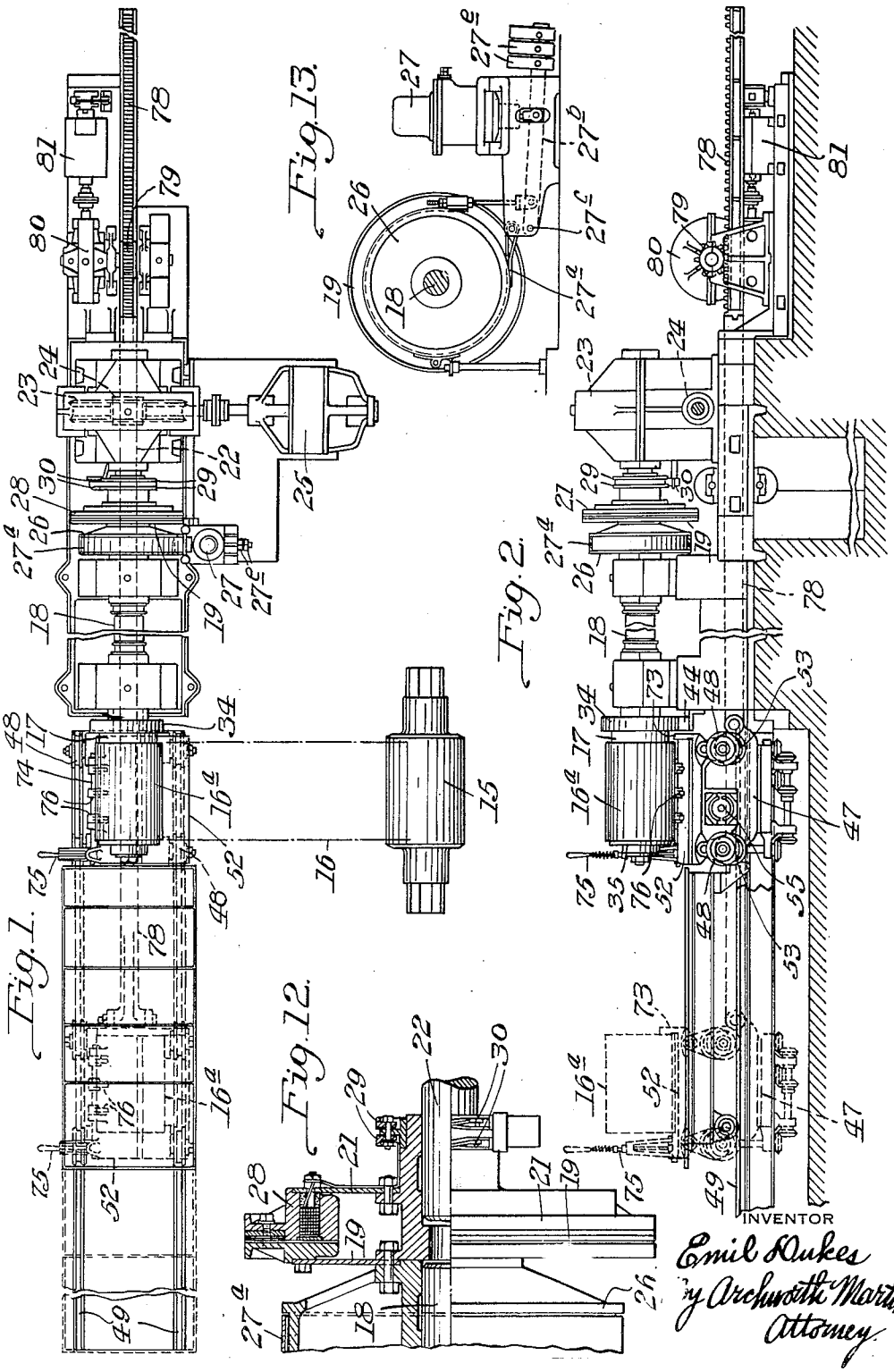
Oct. 6, 1931. E. DUKES 1,825,657

APPARATUS FOR COILING STRIPS, ETC

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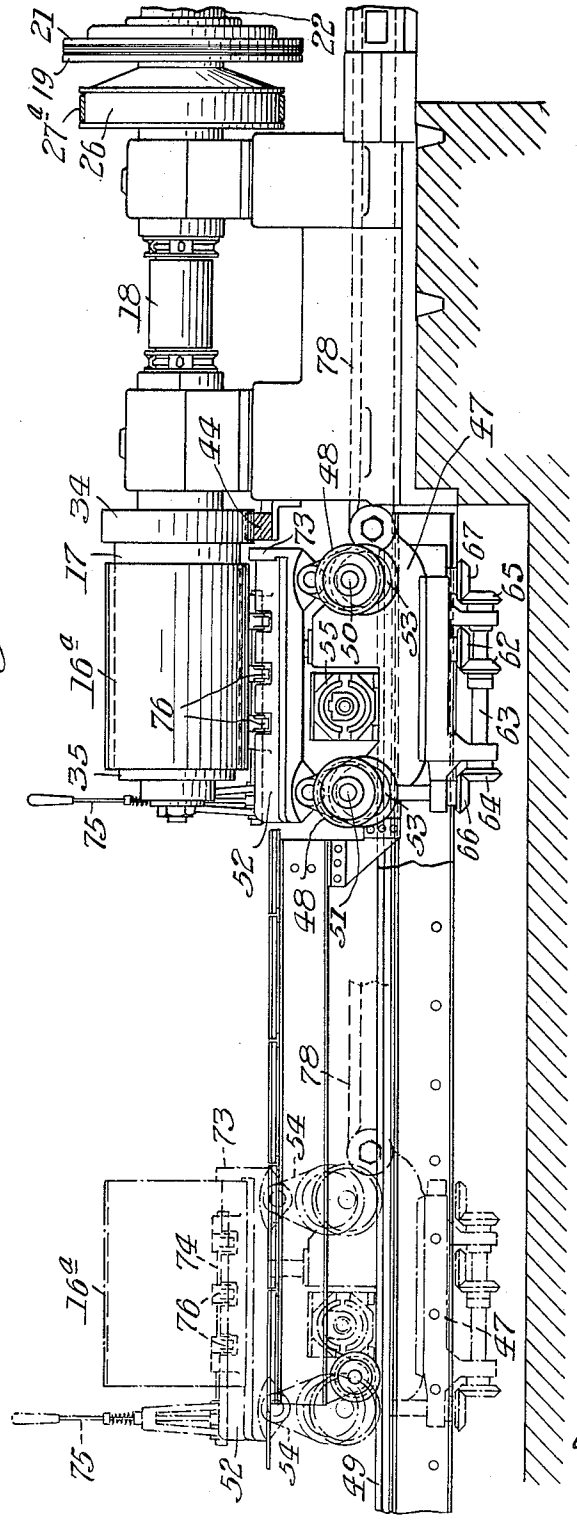
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Fig. 3.



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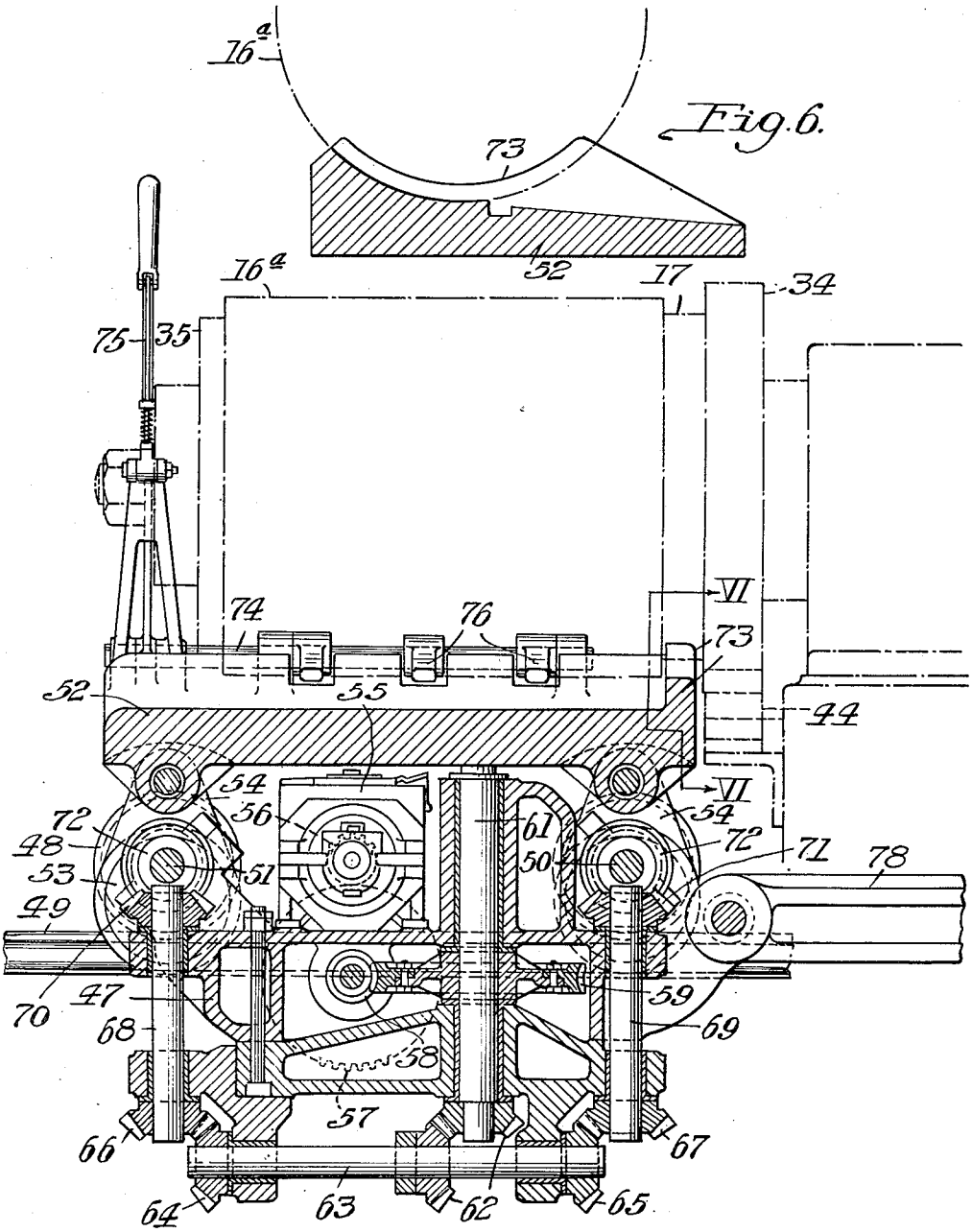


Fig. 6.

Fig. 4.

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Fig. 5.

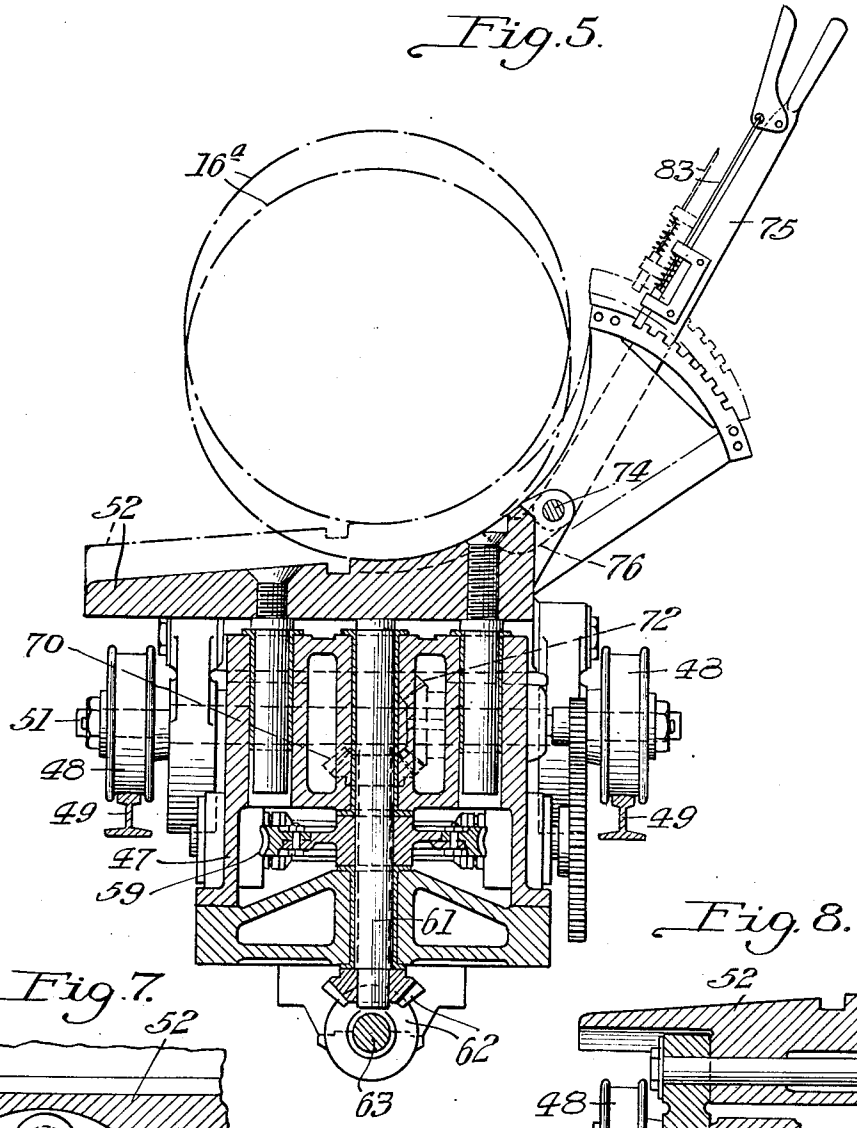


Fig. 7.

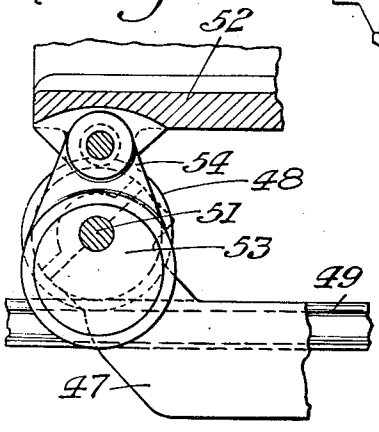
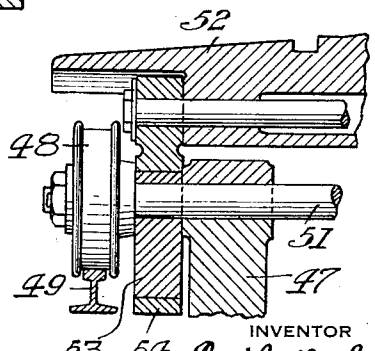


Fig. 8.



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Fig. 9.

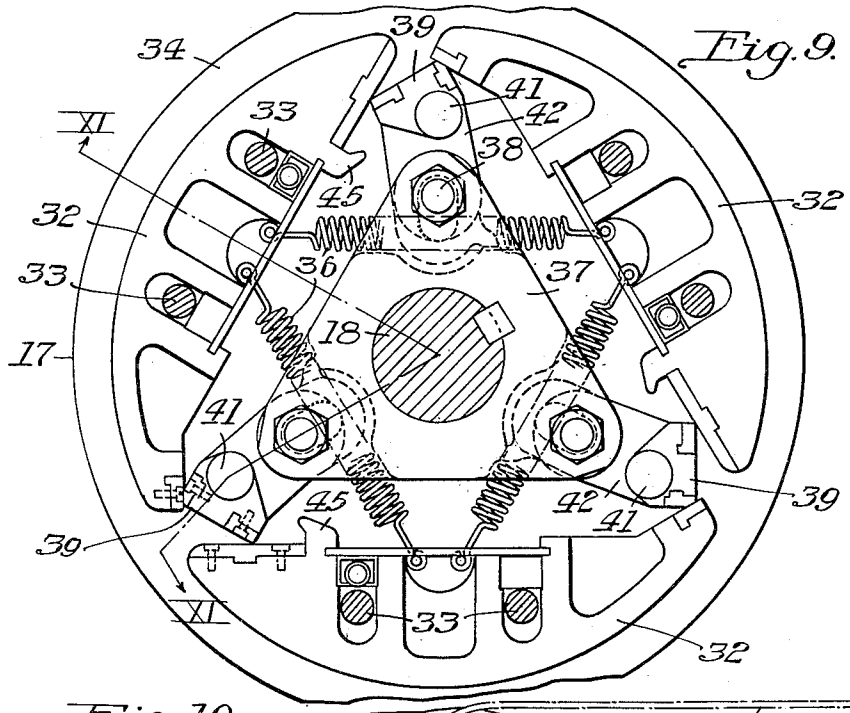


Fig. 10.

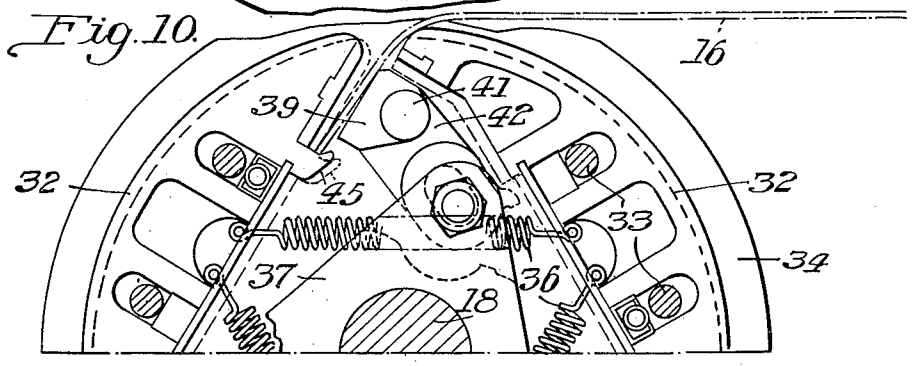
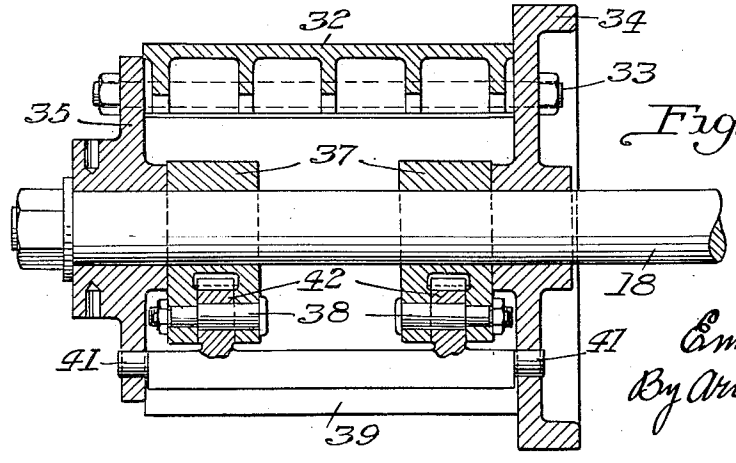


Fig. 11.



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1,825,657

UNITED STATES PATENT OFFICE

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APPARATUS FOR COILING STRIPS, ETC.

Application filed January 24, 1928. Serial No. 249,166.

My invention relates to a coiling method and apparatus, and is particularly suitable for use in the coiling or reeling up of strip steel as it comes from the rolls of continuous rolling mills, for instance; but the invention as a whole, as well as various features thereof, is also suitable for use in various other relations.

One object of my invention is to provide reeling or coiling apparatus of improved form with respect to the strip-engaging and releasing mechanisms.

Another object of my invention is to provide a simplified and improved form of apparatus for removing a coil of material from a reel.

Another object of my invention is to provide in coiling or reeling mechanisms, a magnetic clutch and brake device in direct operative relation to the reel shaft.

Still another object of my invention is to provide an improved form of mechanism for handling a coil after it has been wound by the reel.

Still another object of my invention is to simplify and improve generally the structure and operation of devices of the character referred to.

One form which my invention may take is shown in the accompanying drawings, wherein Figure 1 is a plan view; Fig. 2 is a side elevational view, partly broken away, of the apparatus of Fig. 1; Fig. 3 is an elevational view of a portion of the apparatus of Fig. 2, but on an enlarged scale; Fig. 4 is a longitudinal sectional view, on an enlarged scale, of the carriage or truck of Fig. 3; Fig. 5 is a cross sectional view thereof; Fig. 6 is a view taken on the line VI—VI of Fig. 4; Fig. 7 is an enlarged view of a portion of the table raising mechanism of the structure of Fig. 4; Fig. 8 is a cross sectional view of the structure of Fig. 7; Fig. 9 is an end elevational view of the reel, with the end plate removed, showing the parts thereof in one position; Fig. 10 is a similar view, showing certain of the reel parts in another position; Fig. 11 is a view taken on the line XI—XI of Fig. 9; Fig. 12 is an enlarged sectional view showing a portion of the clutch mechanism of Figs. 1 and 2, and Fig. 13 is a view showing details of the brake mechanism for the reel shaft.

Referring now more particularly to Figs. 1, 2 and 3, I show the mechanism arranged for drawing strip or sheet steel, for instance, from rolling mill rolls represented by the numeral 15, the strip being represented by the numeral 16. This strip is wound upon a reel or drum structure 17 that is constructed and driven as hereinafter described. The reel 17 is connected to a shaft 18 that carries a disc 19 of a magnetic cluch. The other disc, 21, of the magnetic clutch is connected to a shaft 22 which carries a worm gear 23 that is driven by a worm 24. A motor 25 drives the worm 24.

The motor 25 is preferably of series or shunt wound type, so that it will run at substantially a constant speed, the speed of the motor being such that the reel 17 will be driven at a rate of speed relative to the rolls 15, which will result in the strip 16 being maintained under tension sufficient to prevent irregularities in or buckling of the strip 16, which is highly desirable, particularly in the case of strips which are to be employed in the construction of automobile bodies, etc. The coiling tension may be as much as ten thousand pounds on sheets of various standard widths, but should not be sufficient to actually stretch or elongate the sheet and will be varied in accordance with the width and gage of the strips being coiled.

The magnetic clutch is provided, so that the reel 17 and the shaft 18 can be readily disconnected from and connected to the shaft 22. A brake drum 26 is secured to the shaft 18 and a brake-operating magnet 27 of any one of various well-known forms is provided for causing the reel 17 and the shaft 18 to be quickly brought to rest when the driving connection between the shafts 18 and 22 is broken. The circuits of the magnetic brake 27 and the magnetic clutch 19—21 may be controlled by push button switches or in any other suitable manner.

As shown more clearly in Figs. 1 and 12, the magnetizable portion 28 of the driving disc 21 is provided with the usual coils that have connection with collector rings 29 and

brushes 30. These parts may be of any form well-known in the art and need not be here described in detail.

The magnet coils for operating the clutch and the brake are preferably connected in series and their circuit controlled by a single push button. Brake shoes or a brake band 27*a* (Fig. 13) are controlled by the magnet 27. The band 27*a* is normally held in gripping or braking engagement with the brake drum 26, by a lever 27*b* which is pivotally mounted at 27*c* and carries weights 27*e*. Springs may be substituted for these weights. The armature of the magnet 27 has link connection with a mid portion of the lever 27*b*, and serves, when energized to attract and raise the lever to release the band 27*a* from the brake drum. Closing of the circuit, to energize the magnet 27*a* results in also energizing the clutch magnet coils and effect driving connection between the shafts 22 and 18. It follows that upon de-energization of the clutch coils and the brake magnet, the driving connection will be broken and the brake band will be simultaneously applied by the weights 27*e* operating through the lever 27*b*.

The reel 17 is constructed as shown more clearly in Figs. 9, 10 and 11, and comprises three peripheral or drum members 32 that are of generally segmental form. The segments 32 have radial slots through which bolts or rods 33 extend and by which the segments are supported and guided in their radial movements. The ends of the rods 33 are supported in end plates 34 and 35, such end plates being supported by, but rotatable relative to, the shaft 18. The segments are interconnected by tension springs 36 which tend to draw the segments inwardly toward the shaft 18 and thus tilt the grippers 39 to sheet-receiving position, as shown in Fig. 10.

Spiders 37 of generally triangular form are secured to the shaft 18 so as to rotate therewith. Each spider is bifurcated or slotted adjacent to each of its three corners, and carries pins or bolts 38 that extend through such bifurcations. Gripping bars 39 are pivotally supported from the end plates 34 and 35 by their pin-like extensions 41 that extend through openings in the end plates, as shown more clearly in Fig. 11. Each of the grippers 39 is provided with a pair of ears or lugs 42 that are slotted for the reception of the bolts 38, so that upon counter-clockwise rotative movement of the spiders 37, relative to the end plates 34 and 35, the grippers 39 will be rotated about their axes 41, in a clockwise direction (Figs. 9 and 10).

The outer end of each of the grippers 39, upon movement in clockwise direction, are brought toward abutting engagement with the adjacent surfaces of the segments 32 (as in Fig. 9). With the parts as shown in Fig. 10, the front edge of the strip 16 is brought into position to be gripped by the reel (Fig. 10), and the shaft 18 is then set in motion. A friction block 44 of wood or other suitable material (Fig. 2) retards movement of the end plate 34 and also of the end plate 35, since these plates are connected by bolts 33 and the plates are loosely mounted on the shaft 18. Therefore, the spiders 37 will be advanced relative to the end plates and the segments 32 thus tilting the grippers 39 about their axes 41, from their positions shown in Fig. 10 toward the positions shown in Fig. 9, thereby gripping the end of the sheet 16 between the forward lower corners of a gripper 39 and the adjacent segment 32. Stop members 45 (Fig. 10) are provided for limiting inward movement of the sheet 16.

Continued rotation of the shaft 18 will result in the strip 16 being wound upon the reel. When a coil 16*a* has been completely formed, the friction clutch 19—21 is de-energized by breaking the magnetic circuit, with the result that the shaft 18 and the reel 16 tend to continue rotation by reason of their momentum. Simultaneously with deenergization of the clutch, braking force is applied to the drum 26, to bring the shaft 18 quickly to rest, but the end plates 34 and 35 and the segments 32 continue their rotative movement for a slight distance, thus tilting the outer edges of the grippers 39 about their axes 38 and causing them to move from approximately the position shown in Fig. 9 to the positions shown in Fig. 10, which will permit release of the inner edge of the sheet 16. The tension of the springs 36 will thereupon draw the segments inward, thus producing a collapsing effect which causes the coil to be loosely supported on the reel, through reduction in diameter of the reel.

In order to remove the coil 16*a* from the reel, I provide a carriage 47 that has flanged wheels 48 which are supported by track rails 49. The wheels 48 are rotatably supported upon axles or shafts 50 and 51. The carriage 47 supports a table 52 that is movable vertically by means of eccentrics 53, which are secured to the shafts 50 and 51 and which operate in pitmen 54, that are pivotally connected to the corners of the table 52.

The table carries an electric motor 55 that operates, through a pinion 56 and a gear wheel 57, to drive a worm 58 and a worm wheel 59. The worm wheel 59 is secured to a vertical shaft 61 that is journaled in the framework of the table and operates through a pair of bevelled gears 62 to drive a shaft 63. The shaft 63 carries bevelled gear wheels 64 and 65 that mesh with gear wheels 66 and 67, respectively, that are secured to the lower ends of shafts 68 and 69 which are journaled in the framework of the table. The upper ends of the shafts 68 and 69 carry gear wheels 70 and 71, respectively, that mesh with gear

wheels 72 which are secured to the axles 50 and 51, respectively, so that when the motor 55 operates in one direction, the table 52 will be raised relative to the carriage, through the driving connections just described.

The table 52 is provided with an upstanding flange 73 at one end and has its outer portion inclined toward one side of the carriage, as shown more clearly in Fig. 5. A rock shaft 74 is journaled in one edge of the table and extends longitudinally thereof; such shaft being actuated by a lever 75 that is secured thereto. The shaft 74 carries ejector bars 76 whose outer ends normally lie flush with the adjacent curved surfaces of the table, as shown in Fig. 5.

When a coil 16*a* is completed as heretofore explained, and the inner end thereof released by the gripping members 39, the carriage 47 is moved to the position shown in full lines in Fig. 3, whereupon the motor 55 is energized to raise the table 52, thus taking the weight of the coil 16*a* off the reel 17, there being clearance between the inner periphery of the coil and the reel or drum members, by reason of the fact that the springs 36 have contracted segments 32 as shown in Fig. 10. The carriage is then advanced toward its dotted line position in Fig. 3, the flange 73 of the table engaging the rear end of the coil 16*a* and stripping it from the reel.

Movement of the carriage along the tracks 49 is effected by means of a rack bar 78 that is connected to the rear end of the carriage and extends rearwardly, as shown more clearly in Figs. 1 to 3. The rack bar 78, and hence the carriage 47, is driven back and forth by a pinion 79 that meshes with the rack bar, such pinion being driven through worm reduction gearing 80, from a motor 81.

When the carriage 47, with a coil 16*a*, has been advanced to the position indicated by dotted lines in Figs. 2 and 3, the lever 75 is thrown back to cause the bars 76 to impart the force necessary to cause the coil 16*a* to roll from the curved depression in the table 52 to the inclined surface from whence it will roll by gravity. After this discharging operation, the carriage may again be returned to coil-receiving position, the table of course having been previously lowered through operation of the motor 55. The lever 75 is provided with a ratchet device 83 for holding it in set positions, and particularly in the position shown in Fig. 5, so that the lever will not be thrown violently upward upon imposition of weight upon the bars 76.

An important feature of my invention resides in the arrangement and nature of the clutch and brake mechanisms. Upon disengagement of the clutch, the brake is automatically applied as a result of the deenergization of its controlling magnet. The weights 27*e* and the leverage are such as to cause the brake band to be applied with great force, so that the reel shaft will be stopped very quickly and the contraction of the reel segments effected. By reason of the fact that the brake acts directly upon the reel shaft there is less mass of rotating parts whose momentum must be overcome, than if the brake were placed farther back in the train of driving mechanism. Further, the control of the clutch magnet and the brake magnet by a single push button insures that the brake will act at approximately the instant the clutch is disconnected, and insuring the proper snap action, in the reel, which will result in loosening of the coil thereon.

I claim as my invention:—

1. Coiling apparatus comprising a driving motor, a shaft, drum segments around said shaft and movable radially thereof, means pivotally mounted adjacent to the said segments for expanding the segments upon a rotative movement thereof, and a rotatable lost motion driving connection between said shaft and said segments operable to rotate said means in one direction to expand the segments during the initial rotative movement of the shaft, and operable to rotate said means in the other direction and to contract the segments during deceleration of said shaft.

2. The combination with a segmental and radially expansible reel device having a central shaft, of means for expanding and contracting said device during acceleration and deceleration thereof, comprising rotatable means pivotally supported adjacent to the ends of the segments and inwardly thereof, spider members secured to said shaft, and a rotatable lost-motion driving connection between said spiders and said means operative to rotate the said means about their axes to move the said segments radially of the shaft into their expanded position.

3. The combination with a segmental and radially expansible reel device having a central shaft, of pivotally-mounted members for expanding and contracting said device during acceleration and deceleration thereof, a spider secured to said shaft, and a rotatable lost-motion driving connection between said spider and the inner ends of said members operative to oscillate the said members about their axes to move the said segments radially of the shaft into their expanded position.

In testimony whereof I, the said EMIL DUKES, have hereunto set my hand.

EMIL DUKES.