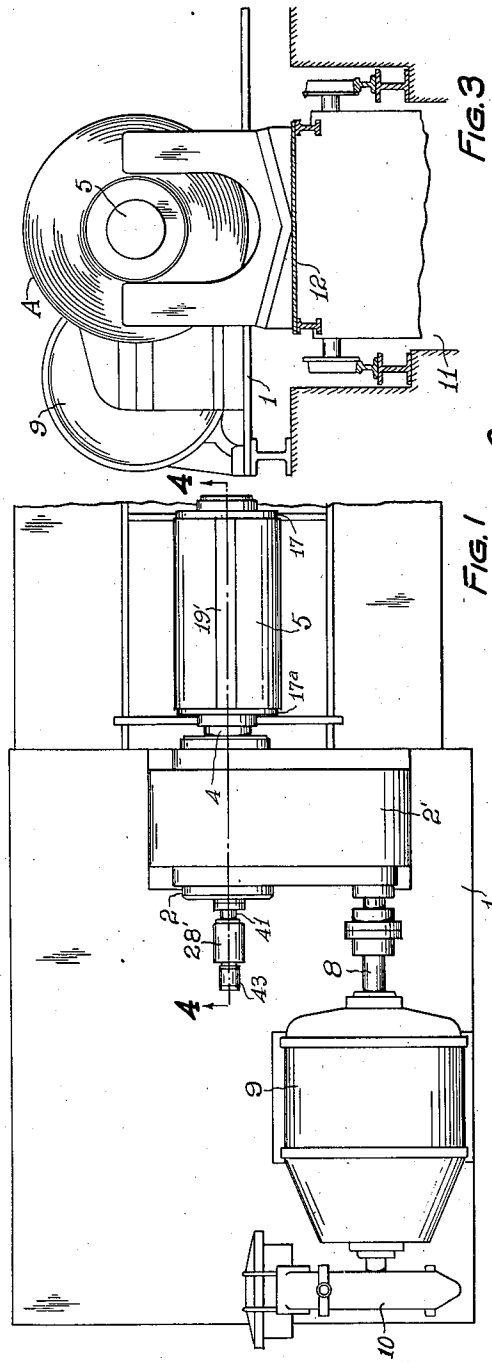
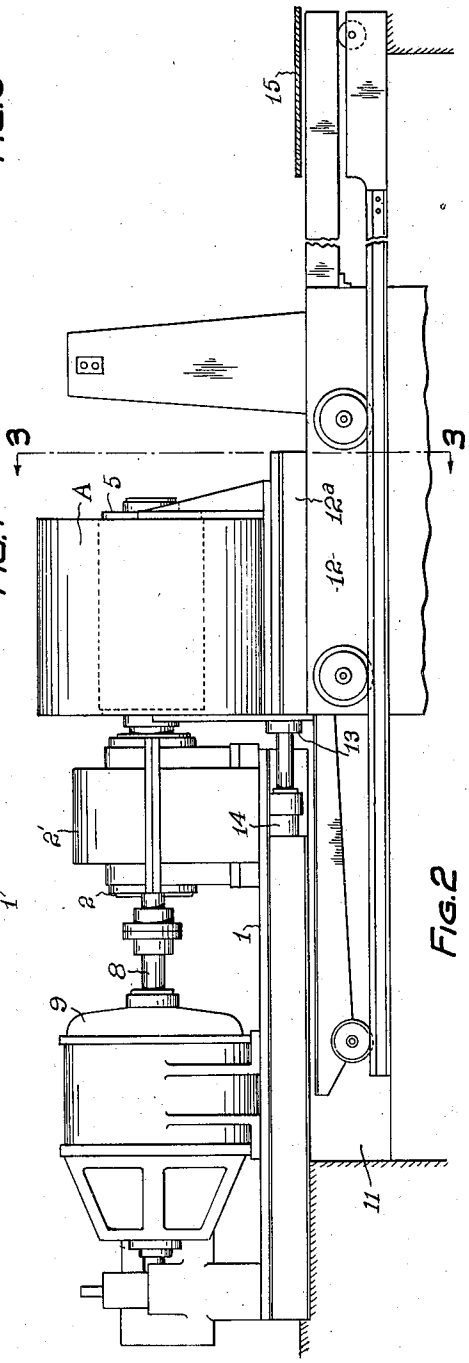
June 20, 1944. E. VANDER LINDE 2,352,042

APPARATUS FOR COILING SHEET MATERIAL

Filed March 31, 1941 5 Sheets-Sheet 1





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APPARATUS FOR COILING SHEET MATERIAL

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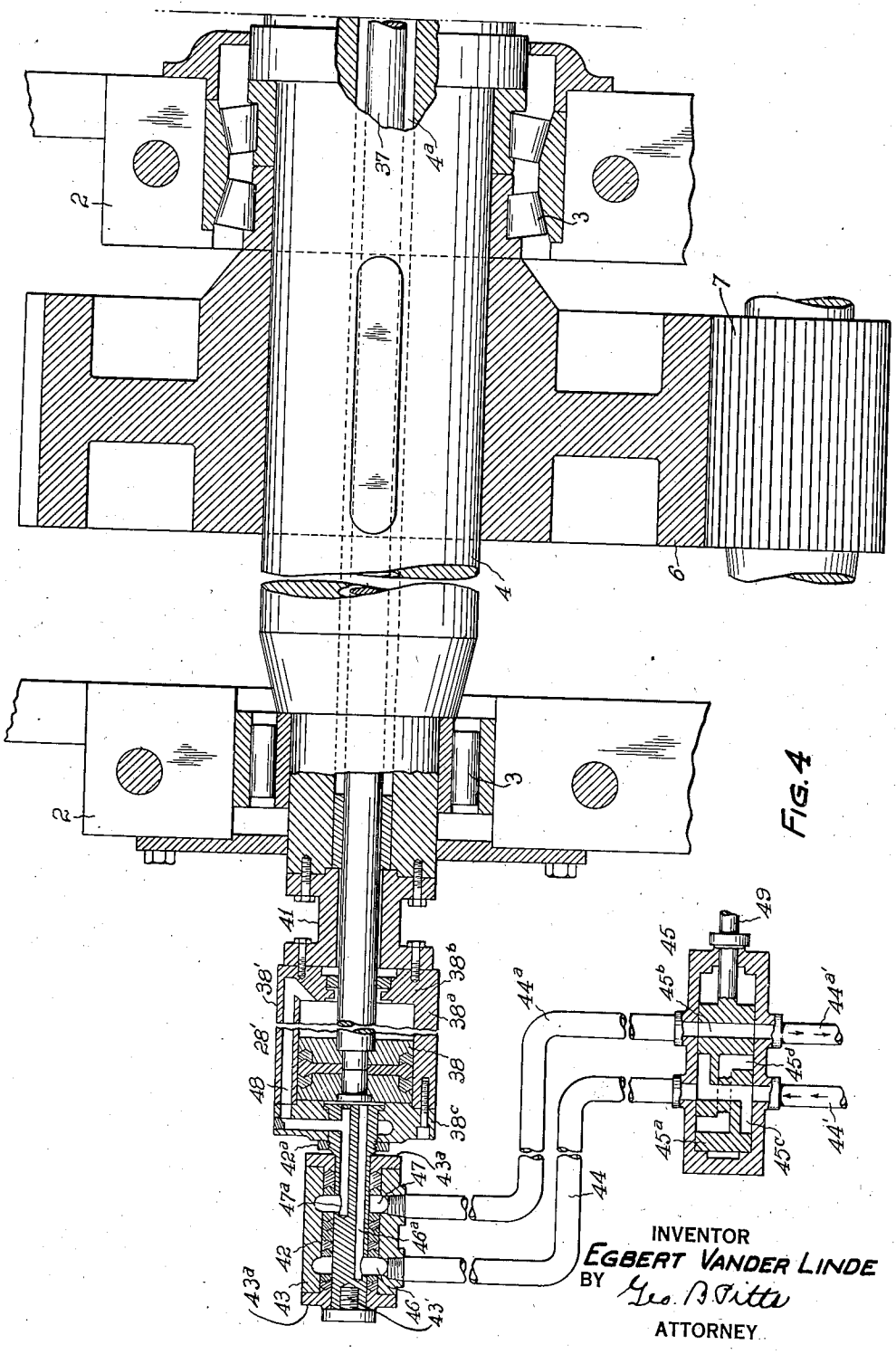


FIG. 4

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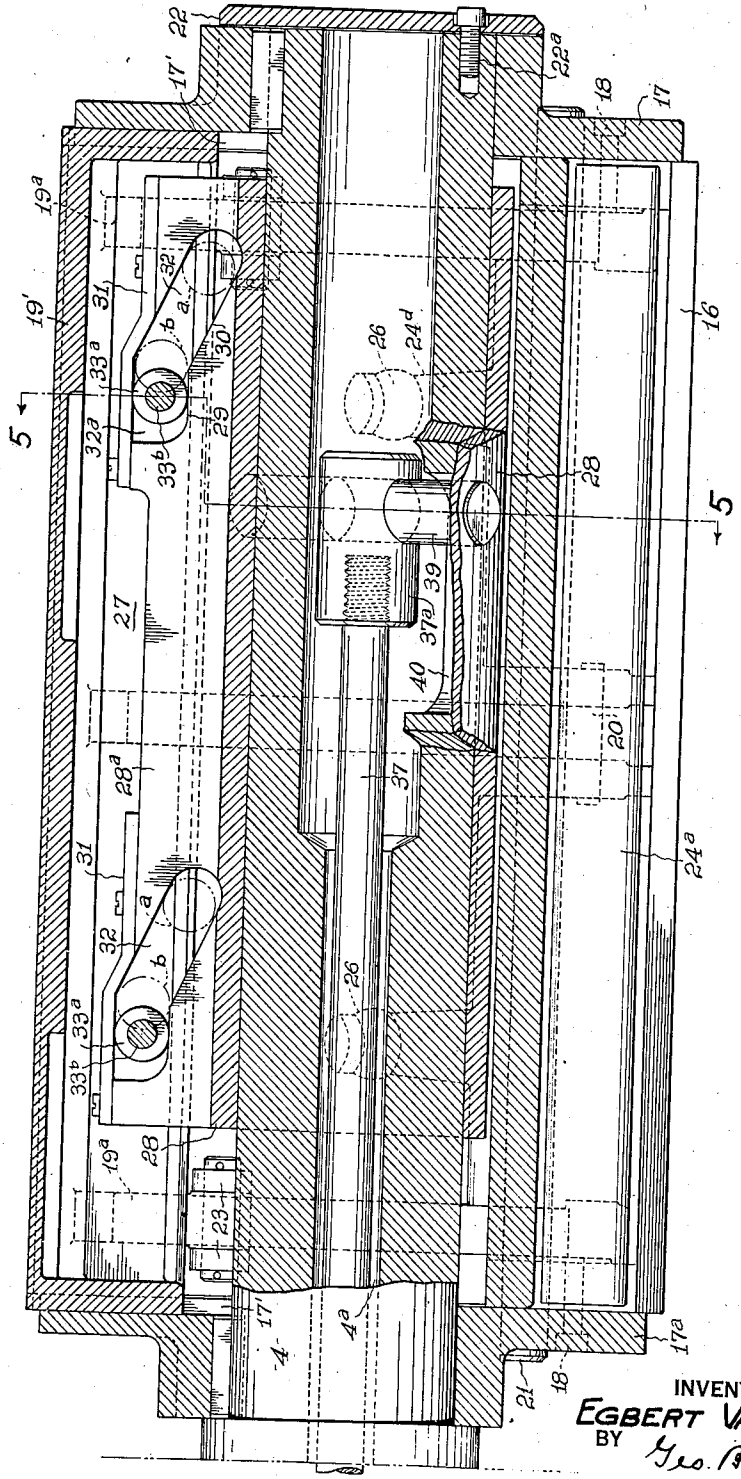


FIG. 4A

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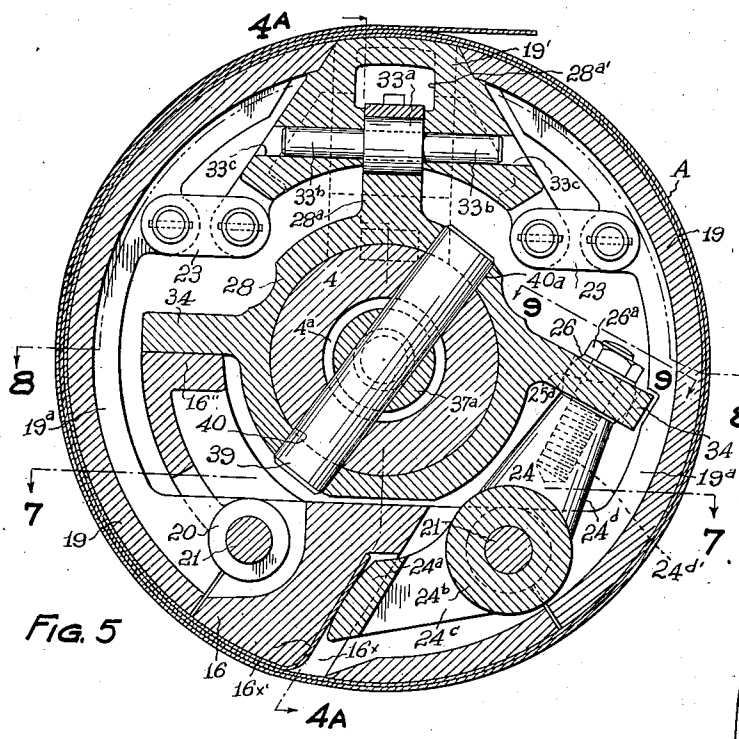


FIG. 5

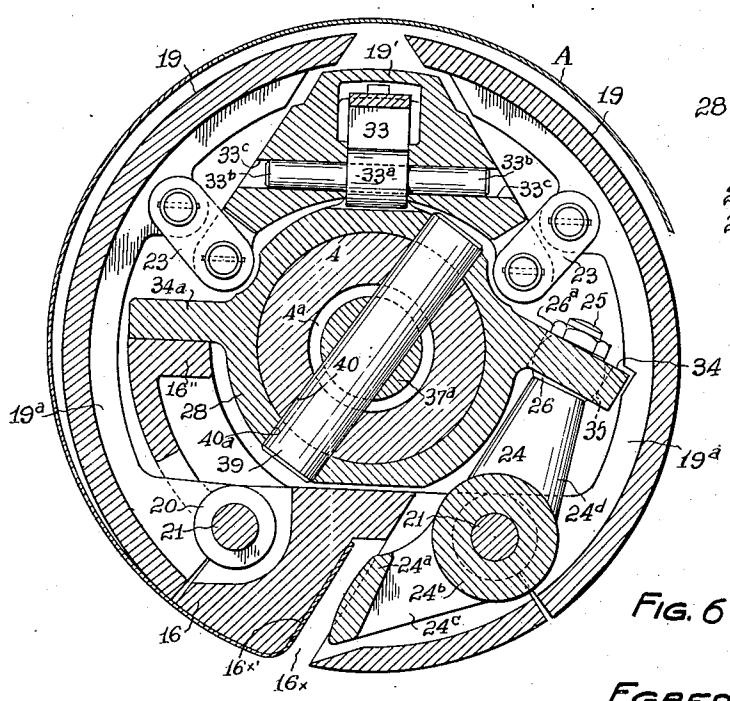


FIG. 6

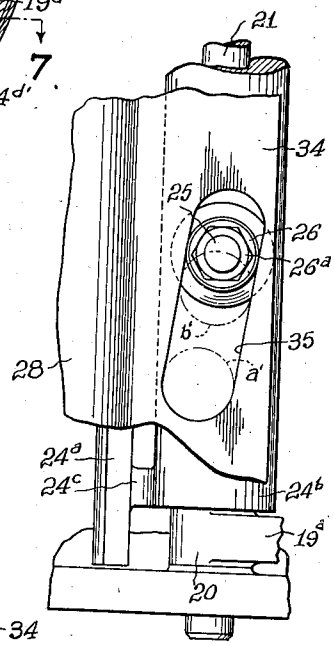


FIG. 9

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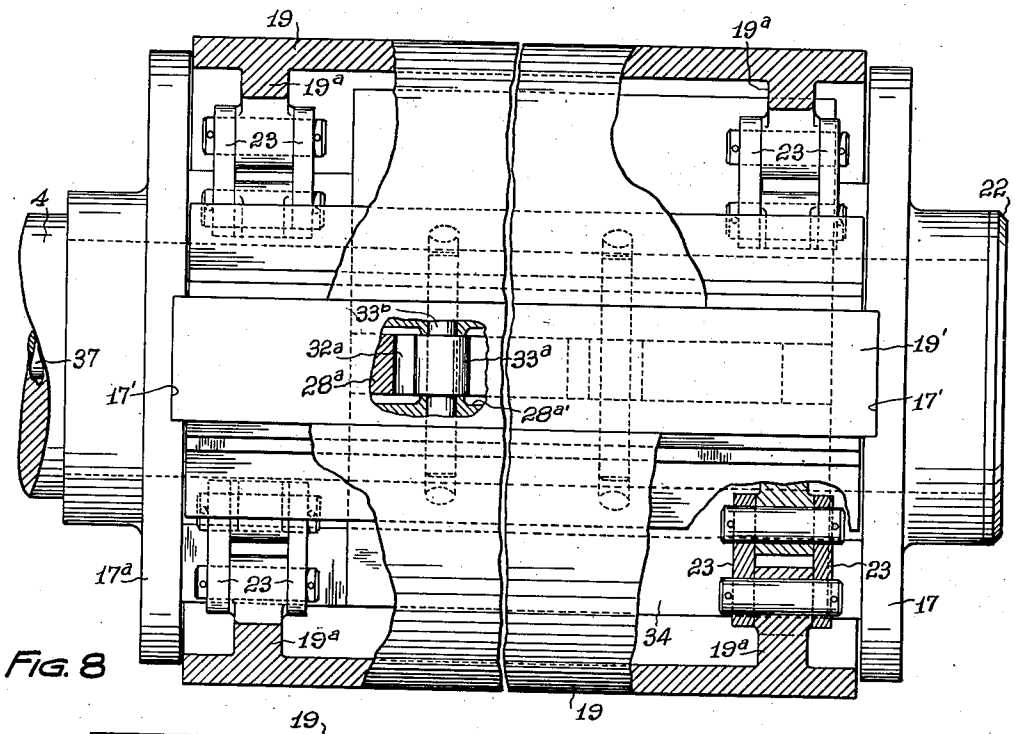


FIG. 8

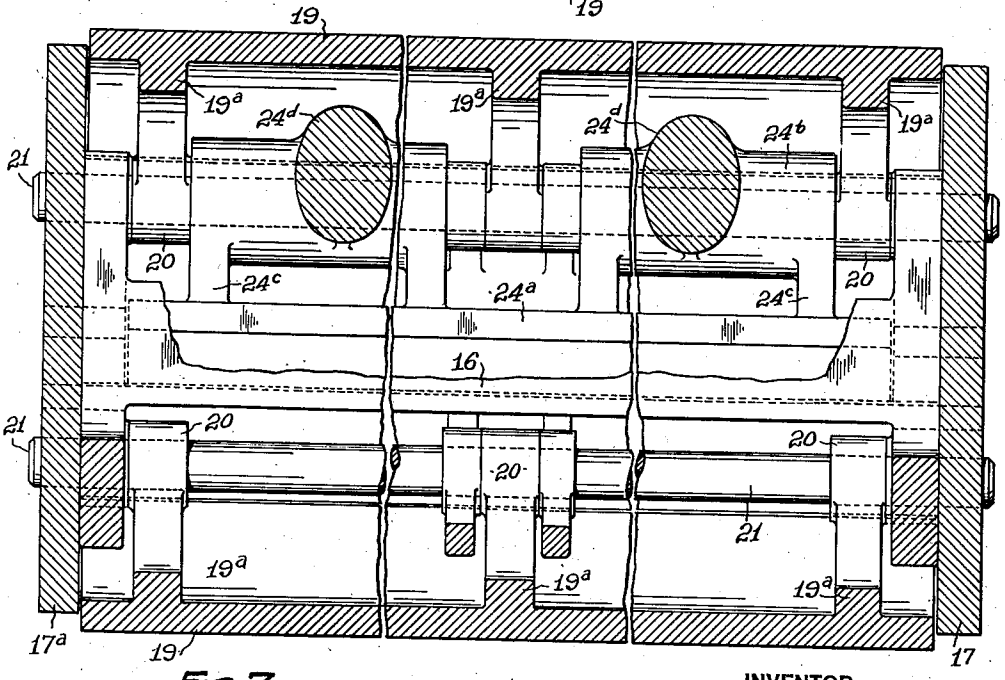


FIG. 7

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UNITED STATES PATENT OFFICE

2,352,042

APPARATUS FOR COILING SHEET MATERIAL

Egbert Vander Linde, Cleveland, Ohio, assignor to The Yoder Company, Cleveland, Ohio, a corporation of Ohio

Application March 31, 1941, Serial No. 386,072

10 Claims. (Cl. 242—72)

This invention relates to an apparatus or a mechanism for coiling sheet material. The mechanism herein disclosed is adapted to coil or re-coil sheet metal that has been hot or cold rolled. The herein disclosed mechanism includes a drum, on which the material is coiled or wound, having one or more collapsible sections movable inwardly, whereby the coiled material may be readily removed.

One object of the invention is to provide, in mechanism of this type, improved means for securing the material to the drum, operated by a fluid under pressure, whereby the elements which engage the material are automatically effective to secure to the drum material of different thicknesses.

Another object of the invention is to provide an improved mechanism of this character wherein provision is made for substantially simultaneously moving the collapsible sections of the drum into operating position and for clamping the free end of the material to the drum ready for coiling.

Another object of the invention is to provide an improved collapsible drum for coiling sheet material, in which the devices for operating the collapsible sections of the drum and for gripping of the material to connect it to the drum are connected for substantially simultaneous operation but related to move the sections into operating positions in advance of the gripping of the material.

Another object of the invention is to provide in mechanism of this character, having a collapsible drum, improved fluid operated means for moving the collapsible sections of the drum into operating position and simultaneously securing the free end of the material to the drum.

Another object of the invention is to provide in mechanism of this character having a collapsible drum and a device for connecting the material thereto, improved means for simultaneously moving the collapsible sections into operating position and the connecting device into engagement with the material and simultaneously moving the sections and connecting device into in-operative positions.

A further object of the invention is to provide an improved mechanism of this character in which the means for operating the collapsible sections of the drum and securing the material thereto are positively operated in either direction.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings, wherein

Fig. 1 is a plan view of a mechanism embodying my invention.

Fig. 2 is a side elevation.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Figs. 4 and 4*a* together constitute a sectional view on the line 4—4 of Fig. 1 (enlarged).

Fig. 5 is a section on the line 5—5 of Fig. 4*a* and showing a portion of the material wound on the drum.

Fig. 6 is a view similar to Fig. 5, but showing the drum sections in collapsed position.

Figs. 7 and 8 are sections on the line 7—7 and 8—8, respectively, of Fig. 5.

Fig. 9 is a fragmentary view on the line 9—9 of Fig. 5.

In the drawings, 1 indicates a base or bed on which is mounted a standard 2 arranged to provide spaced bearings 3, 3, preferably of the anti-friction type. The bearings 3, 3, support a shaft 4, one end portion of which outwardly of the standard 2, carries a drum, indicated as an entirety at 5. Intermediate the bearings 3, 3, the shaft 4 is provided with a gear 6, in mesh with a pinion 7, which is drivingly connected through a suitable reducing gear mechanism within a housing 2', to a shaft 8, the latter in turn being driven by a suitable motor 9. 10 indicates a magnetic brake operable to stop the motor when current thereto is shut off. The sheet material A is supplied to the drum 5 for coiling thereon from any suitable source (not shown). The drum 5 is supported above a pit 11 having a track for a suitable truck 12, which may be positioned below the coiled material A, the truck 12 having an elevatable section 12*a* which is adapted to be raised into engagement with the coil (see Fig. 2) and thereafter, by means of a plunger 13 connected to a piston within a cylinder 14 (the latter in turn being connected with a source of fluid supply under pressure), the coil A may be moved away from the drum 5 for transfer to a platform 15. The truck 12 and means for moving it form no part of the present invention, for which reason more details of construction thereof are omitted.

The drum 5 comprises a main section 16, to which front and rear heads 17, 17*a*, are secured by cap screws 18, and collapsible sections 19, 19, 19'. Each of the drum sections 19, 19, on its inner wall and adjacent its opposite ends and intermediate thereof, is provided with webs 19*a* terminating at that end adjacent to the main section 16 in alined hollow bosses 20, through which a rod or shaft 21 extends to pivotally support the

adjacent collapsible section 19 on the main section 16; the opposite ends of the adjacent rod 21 being mounted on the drum heads 17, 17a (see Fig. 7) and secured against endwise movement in any suitable manner. As shown in Fig. 4a, the heads 17, 17a, are keyed to the shaft 4 for rotation therewith. 22 indicates a cap secured by cap screws 22a to the outer end of the shaft 4, which is formed with a through opening 4a for a purpose later set forth.

The drum section 19' is arranged intermediate the free ends of the sections 19, 19, its opposite lateral portions being connected to the sections by pairs of links 23, by means of which the section 19' is supported on the sections 19, 19, but free to move radially of the drum 5. The opposite ends of the drum section 19' slidably fit radially disposed recesses 17' formed in the heads 17, 17a (see Fig. 8). The side walls of the drum section 19' are inclined downwardly and outwardly and serve as cams for engagement with the free ends of the sections 19, 19, so that when the section 19' is moved outwardly radially, by the mechanism hereinafter referred to, it swings the sections 19, 19, outwardly, whereby the sections 19, 19, 19', are positioned to form with the main section 16 a cylindrical wall (see Fig. 5) on which the material may be coiled. In the movement of the drum section 19' inwardly, it operates through the links 23 to swing the sections 19 into their collapsed position.

24 indicates a device for securing the free end of the sheet material to the drum section 16, mounted thereon and provided with a material engaging member 24a. As shown in Figs. 5 and 6, the wall of the drum section 16 is formed with a slot or opening 16x which extends from end to end of the drum section, to receive the outer or free end of the material, and the wall of the section is formed with a recess, in connected relation to the opening 16x; the bottom wall of the recess forming an abutment 16x' in opposed relation to the material engaging member 24a, so that when the latter is operated, as later set forth, the material A is clamped or gripped between the abutment 16x' and member 24a. The device 24 comprises a rocker preferably shaped to provide two spaced sleeves 24b rotatably fitting that rod 21 remote from the abutment 16x', each sleeve having (a) integral arms 24c preferably integrally connected to the material engaging member 24a and (b) a separate, operating arm 24d. Each arm 24d is recessed inwardly from its outer end, as shown at 24d', the wall of the recess being threaded to receive a pin 25, the outer end portion of which forms a shaft for a roller 26. The roller 26 is held in position on the shaft by a nut 26a. The peripheries of the rollers 26 are rounded in cross section for a reason which will later be apparent. The purpose of the arms 24d will later appear.

27 indicates as an entirety means for operating the drum sections 19, 19, 19' and device 24. Of the means 27, 28 indicates a sleeve slidably fitting the shaft 4 within the drum 5 for movement thereon in opposite directions by a fluid operated means, indicated as an entirety at 28'. The sleeve 28 is provided on its upper side with a radially extending wall 28a arranged to project into a recess 28a' formed in the drum section 19'. As shown in Figs. 4a, 5 and 6, the recess 28a' permits the drum section 19' to move upwardly and downwardly relative to the wall 28a for reasons later apparent. The wall 28a, adjacent its opposite ends is cut away to form horizontal walls 29 and inclined slots 30 and its upper end is provided with strips 31, each related to the adjacent cut away and slot to form a guide having an inclined portion and a horizontal portion forming therewith slot sections 32, 32a. 33, 33 indicate a pair of operating devices mounted in the walls of the drum section 19' and engaged by the walls of the slot sections 32, 32a, to move the drum section 19' outwardly and inwardly. Each of the devices 33 comprise a roller 33a arranged to engage the walls of the adjacent slot sections 32, 32a, and oppositely extending shafts 33b rotatably fitting openings 33c formed in the side portions of the drum section 19'. As the devices 33 are supported on the drum section 19', it will be seen that when the sleeve 28 is moved toward the right, as viewed in Fig. 4a, the drum section 19' will be moved outwardly and it in turn will swing the sections 19, 19, outwardly; and when the sleeve 28 is moved in the opposite direction, the drum section 19' will be moved inwardly and it in turn through the links 23 will swing the sections 19 inwardly. The sleeve 28 is also provided with a laterally extending wall 34 formed with elongated slots 35 (one being shown in Fig. 9) inclined to the axis of the drum 5 to form cams for the rollers 26. As shown in Fig. 9, the adjacent roller 26 engages the walls of the slot, the effect of which, upon movement of the sleeve 28 toward the right as viewed in Fig. 4a (downwardly as viewed in Fig. 9), is to operate the rocker 24; that is, to swing the arm 24d outwardly and the material engaging member 24a in the opposite direction. Accordingly, if the free end of the material A has been inserted in the opening 16x, the member 24a will engage and grip the material against the abutment 16x'; and upon movement of the sleeve in the opposite direction, the walls of the slot 35 will operate the rocker 24 in the opposite direction to release the material. From the foregoing description it will be seen that the movement of the sleeve 28 in either direction serves to operate the drum sections and the rocker 24. It will be understood that in the operation of the sleeve 28 toward the right, the drum sections are moved into their expanded position as the rollers 33a reach the upper end of the inclined slot sections 32 and are maintained in this position as the rollers 33a move through the slot sections 32a.

It will be noted that in the movement of the sleeve 28 to effect a translation of the wall 28a relative to the rollers 33a, the sleeve 28 is also, through the engagement of the walls of the guide slots 35 with the rolls 26, simultaneously operating the rocker 24 to move the material engaging member 24a toward the abutment 16x'; however, as the slots 35 have a predetermined relation, as to length and inclination to the axis of the drum 5, the material engaging member 24a engages with the material A to grip it against the abutment 16x' at or following the entrance of the rollers 33a in the slot sections 32a. That is, as the rollers 33a traverse the slot sections 32 from the position a to the position b (Fig. 4a) to move the drum sections 19, 19, 19', into their expanded or coiling position, the rollers 26 traverse the slots 35 from the position a' to the position b' (Fig. 9), this movement serving to move the material engaging member 24a toward the material; and as the rollers 33a traverse the slot sections 32a, the rollers 26 move from the position b' to the position shown in full lines (Fig. 9), this latter movement of the rollers 26 serving to move the member 24a into clamping

engagement with the material. In this arrangement, the movable drum sections 19, 19, 19', are moved into their final position in advance of the gripping of the material and thereafter the pressure of the fluid operated means 28' operates to force the material engaging member 24a into engagement with the material A to thus secure the latter against the abutment 16x'. In the final movement of the rocker 24, it is directly connected to the fluid operating means 28'. This arrangement and operation permits the material engaging member 24a to readily and effectively clamp material of different thicknesses against the abutment 16x' so that the provision of adjustable devices for the member 24a or between the sleeve 28 and rocker 24, within certain limits as to the thicknesses of the material, are eliminated. The sleeve 28 is provided on that side opposite to the wall 34 with a flange 34a arranged to engage a portion of the main drum section 16 (for example, an upwardly extending wall 16'') to resist any torque effect on the sleeve 28 due to the co-action between the rollers 26 and side walls of the guide slots 35 in the movement of the member 24a to secure the material to the abutment 16x'.

The fluid operated means 28' is arranged, as later set forth, to move the sleeve 28 inwardly, so that in such movement, the material engagement member 24a is positively disengaged from the material A in advance of the movement of the drum sections 19, 19, 19', inwardly, since the rollers 33a must traverse the slot sections 32a before they enter and traverse the slot sections 32. 37 indicates a rod extending through the opening 4a in the shaft 4 and serving as an operating connection between the piston 38 of the fluid operating means 28' and the sleeve 28. At its outer end, the rod 37 is provided with screw threads threaded into a head 37a, the outer portion of the shaft opening 4a being enlarged to accommodate the head; and the head 37a in turn is provided with a diametrically disposed pin 39 the opposite ends of which extend through diametrically related, elongated slots 40 formed in the shaft 4 and fit into recesses 40a formed in the sleeve 28 so as to connect the rod 37 to the sleeve. The slots 40 are elongated to permit movement of the pin 39 by the rod 37 in either direction to operate the sleeve 28. By threading the head 37a on the outer end of the rod 37, the rod may be rotated, the effect of which is to adjust the head endwise of the rod, such adjustment through the pin 39 and sleeve 28 serving to adjust the slot sections 32 relative to the rollers 33 and slots 35 relative to the rollers 26. As shown in Fig. 4, the rod 37 extends beyond the inner end of the shaft 4 for connection with the piston 38, which reciprocates within a cylinder 38'. The cylinder 38' consists of a side wall 38a and inner and outer heads 38b, 38c, the inner head 38b being rigidly connected by a collar 41 (through which the rod 37 extends) to the inner end of the shaft 4, whereby the latter rotates the cylinder. The outer cylinder head 38c is suitably bolted to the outer end of the cylinder side wall 38a and formed with an opening, which is axially related to the shaft 4 and forms the seat for the inner flanged end of a conduit member 42. The member 42 extends outwardly from the head 38c, a ring nut 42a threaded thereon and tightened against the head 38c serving to secure the member 42 thereto for rotation with the cylinder 38'. The conduit member 42 extends into and through a casing 43 for rotation therein to provide for the supply of the fluid, such as oil or air under pressure, to the cylinder 38' and its discharge therefrom through stationary pipes 44, 44a, dependent upon the position of the valve element of a valve indicated as an entirety at 45. The pipe 44 is connected to an opening leading through the side wall of the casing 43 into an annular recess 46 formed in its inner wall and connected to one end of a conduit 46a formed in the conduit member 42, the opposite end of the conduit 46a leading into the outer end of the cylinder 38', so that when the fluid is supplied from the pipe 44 to the conduit 46a it will move the piston 38 inwardly (to the right as viewed in Fig. 4) and through the rod 37 operate the sleeve 28 outwardly. The pipe 44a is connected to an opening leading through the side wall of the casing 43 into an annular recess 47 formed in its inner wall and connected to one end of a conduit 47a formed in the conduit member 42, the opposite end of the conduit 47a being connected to one end of a duct 48 formed in the cylinder head 38c and side wall 38a of the cylinder 38'. As shown in Fig. 4, the opposite end of the duct 48 leads through the cylinder head 38b, so that when the fluid is supplied from the pipe 44a to the conduit 47a and duct 48, it will move the piston 38 outwardly (to the left as viewed in Fig. 4) and through the rod 37 move the sleeve 28 inwardly.

The valve 45 serves simultaneously to connect either pipe 44, 44a, with a fluid supply pipe 44' and the other pipe with a discharge pipe 44a', dependent upon the position of the valve element 45a of the valve 45. As shown in Fig. 4, the valve element 45a is provided with passages 45b, 45c and 45d. In the position shown, the passage 45c connects the supply pipe 44' to the pipe 44 and the passage 45b connects the pipe 44a to the discharge pipe 44a'. Upon movement of the valve element 45a by a rod 49 to the right (as viewed in Fig. 4), the passage 45c will connect the supply pipe 44' to the pipe 44a and passage 45d will connect the pipe 44 to the discharge pipe 44a'. The end walls of the valve casing are preferably utilized to limit the movement of the valve element in either direction with the passages therein in registry with the pipes in either operated position. Accordingly, in either position of the valve element 45a, the fluid will be supplied through one pipe to one side of the piston 38 and the fluid on the other side thereof will be discharged from the cylinder 38' through the other pipe.

The casing 43 is mounted on the conduit member 42 between a shoulder thereon and the head of a screw 43' threaded into the outer end of the conduit member. The casing 43 consists of a substantially annular side wall and inner and outer end walls 43a, the side wall being lined with packing material in which the conduit member 42 rotates.

In operation, the free end of the material A is inserted in the slot 16x and then fluid is admitted to the outer side of the piston 38, the movement of which toward the right as viewed in Fig. 4 serves to effect an expansion of the drum sections 19, 19, 19' and then a gripping of the material. The motor 9 is then operated to coil the material on the drum 5. To remove the coil, the piston 38 is operated in the opposite direction, to disengage the member 24a from the material and collapse the drum sections. The truck 12 is then moved on the rails to position its platform below the coiled material. The platform is then raised into engagement with the coil, fol-

lowing which the plunger 13 engages the truck and coil and moves the coil beyond the drum 5 for transfer to the platform 15.

To those skilled in the art to which my invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. My disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In apparatus of the class described, the combination with a support, of a shaft thereon, formed with an axial opening extending inwardly from one end thereof, means for rotating said shaft, a drum on which sheet material is adapted to be coiled drivingly connected to said shaft, said drum comprising a plurality of relatively movable sections, one of said sections having a longitudinally extending opening into which the free end portion of the material is adapted to be inserted and an abutment adjacent said opening, a member movably mounted in said drum and arranged to engage the end portion of the material and secure it to said abutment, said abutment and said member extending substantially from end to end of said opening, a device connected to said member intermediate its ends, fluid operated means, a rod connected to and operated by said fluid operated means and extending into the opening in said shaft, operating elements, one of which slides on said shaft, between said rod and certain of the drum sections for effecting relative movement of said sections, and operating connections within said drum between said rod and said device for operating the latter to move said member into engagement with the material to secure it to said abutment.

2. In apparatus of the class described, the combination with a support, of a shaft thereon, formed with an axial opening extending inwardly from one end thereof, means for rotating said shaft, a drum on which sheet material is adapted to be coiled drivingly connected to said shaft, said drum having an opening into which the free end portion of the material is adapted to be inserted and an abutment adjacent said opening, a device movably mounted in said drum and provided with a member arranged to engage the material and secure it to said abutment, fluid operated means mounted exteriorly of said drum, a rod connected to and operated by said fluid operated means and extending into the opening in said shaft, and operating connections within said drum between said rod and said device for operating the latter into engagement with the material to secure it to said abutment, said connections comprising a sleeve slidably mounted on said shaft and operatively connected to said device and a pin on said rod projecting laterally through said shaft and operatively connected to said sleeve.

3. In apparatus of the class described, the combination with a support, of a shaft thereon, means for rotating said shaft, a drum on which sheet material is adapted to be coiled, mounted on and drivingly connected to said shaft, said shaft being formed with an axial opening extending inwardly from one end thereof at least to a point within said drum and the side wall of said shaft being formed with a slot connected to said axial opening, a longitudinally disposed abutment within and substantially co-extensive with said drum, the wall of said drum being formed with a longitudinally extending opening arranged to permit the insertion of the free end portion of the material into opposed relation to said abutment, a rocker fulcrumed within said drum, one arm of said rocker being provided with a member arranged to engage the material and secure it against said abutment, a sleeve slidably mounted on said shaft within said drum, a rod extending into said shaft and movable endwise relative thereto and provided with a laterally extending member extending through said slot and operatively connected to said sleeve for moving it on said shaft, and operative connections between said sleeve and the other arm of said rocker for swinging the latter about its fulcrum to operate said member into engagement with the material.

4. In apparatus of the class described, the combination with a support, of a drum on which sheet material is adapted to be coiled, rotatably mounted on said support, means for rotating said drum, said drum comprising a main section, sections pivoted to the opposite sides of said main section and a section intermediate said pivoted sections arranged to move radially outwardly and inwardly, said intermediate section being connected to said pivoted sections to move the latter inwardly and having sliding engagement with said sections to move them outwardly, a member slidably mounted within said drum, connections between said member and said intermediate section for moving the latter outwardly and inwardly, means for operating said member, devices, one of which is movable, on said drum for securing the free end portion of the material thereto, and connections between said member and said movable device for operating the latter.

5. In apparatus of the class described, the combination with a support, of a drum on which sheet material is adapted to be coiled, rotatably mounted on said support, means for rotating said drum, said drum comprising a main section, sections pivoted to the opposite sides of said main section and a section intermediate said pivoted sections arranged to move radially outwardly and inwardly, said intermediate section being connected to said pivoted sections to move the latter inwardly and having sliding engagement with said sections to move them outwardly, a member slidably mounted within said drum and provided with inclined and horizontal walls in contiguous relation, devices, one of which is movable, on said drum for securing the free end portion of the material thereto, a separate inclined wall on said member arranged to operate said movable device into engagement with the material, an element mounted on said intermediate section and arranged to traverse said inclined and horizontal walls during movement of said member, said inclined wall serving to move said intermediate section outwardly in advance of the engagement of said movable device with the material, and means for operating said member.

6. In apparatus of the class described, the combination with a support, of a drum on which sheet material is adapted to be coiled, rotatably mounted on said support, means for rotating said drum, said drum comprising a main section, sections pivoted to the opposite sides of said main section and a section intermediate said pivoted sections arranged to move radially outwardly and inwardly, said intermediate section being connected to said pivoted sections to move the latter inwardly into collapsed position and having sliding engagement with said sections to move them out-

wardly into their expanded position, a member slidably mounted within said drum, means for operating said member, devices, one of which is movable, on said drum for securing the free end portion of the material thereto, co-acting elements between said slidable member and said movable device for operating the latter into engagement with the material, and co-acting devices between said member and said intermediate section arranged during the initial movement of said member to move said section outwardly into expanded position in advance of the engagement of said movable device with the material.

7. In apparatus of the class described, the combination with a support, of a sectional drum on which sheet material is adapted to be coiled, rotatably mounted on said support, means for rotating said drum, said drum comprising a main section and movable sections certain of which are pivotally mounted on the opposite sides of said main section, to swing inwardly into a collapsed position, said main drum section between its opposite sides being formed with an inwardly extending opening one side wall of which forms an abutment, a member mounted to slide within and longitudinally of said drum, connections between said member and said movable sections for swinging them outwardly and inwardly, means for operating said member, a device swingably mounted on the pivot for one of said pivoted drum sections, for securing the free end portion of the material to said abutment, and connections between said member and said swingable device for operating the latter.

8. In apparatus of the class described, the combination with a support, of a shaft thereon, means for rotating said shaft, a drum on which material is adapted to be coiled, drivingly connected to said shaft, said drum comprising a main section, side sections pivotally mounted on said main section and a section mounted on said side sections to move radially of said drum and having sliding engagement with said side sections to swing them outwardly into expanded position, a member slidably mounted on said shaft, a movable clamping device within said drum arranged to engage the end portion of the material to secure it to said main drum section, cam operated devices between said radially movable section and said slidable member for operating said section, cam operated devices between said clamping device and said slidable member for operating said device, and means extending through said shaft for operating said slidable member.

9. In apparatus of the class described, the combination with a support, of a drum on which sheet material is adapted to be coiled, rotatably mounted on said support, said drum comprising a main section and a plurality of relatively movable sections one of which is pivotally connected to said main section, means connected to said main section for rotating said drum, and means for securing one end portion of the material to the drum, said securing means comprising an abutment, a movable member between which and said abutment the end portion of the material is adapted to be positioned, pivotally mounted on the pivot for said pivoted drum section, and fluid operated means for operating said member toward said abutment.

10. In apparatus of the class described, the combination with a support, of a shaft mounted at one end on said support, means for rotating said shaft, a drum on which sheet metal is adapted to be coiled, mounted on and drivingly connected to the other end of said shaft, said drum comprising a main section, side sections pivotally mounted on the opposite sides of said main section to swing outwardly and inwardly and a radially movable section between said side sections, a reciprocatable member movable in a direction endwise of said shaft, means for reciprocating said member, means controlled by the movement of said member for operating said pivoted and radially movable sections outwardly and inwardly, said main section being formed with a longitudinally extending opening arranged to receive the free end of the material, one wall of said opening serving as an abutment, a gripping element related to said abutment and arranged to detachably secure the material to said abutment, and cam means between said member and said element for positively operating the latter into and out of engagement with the material.

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