

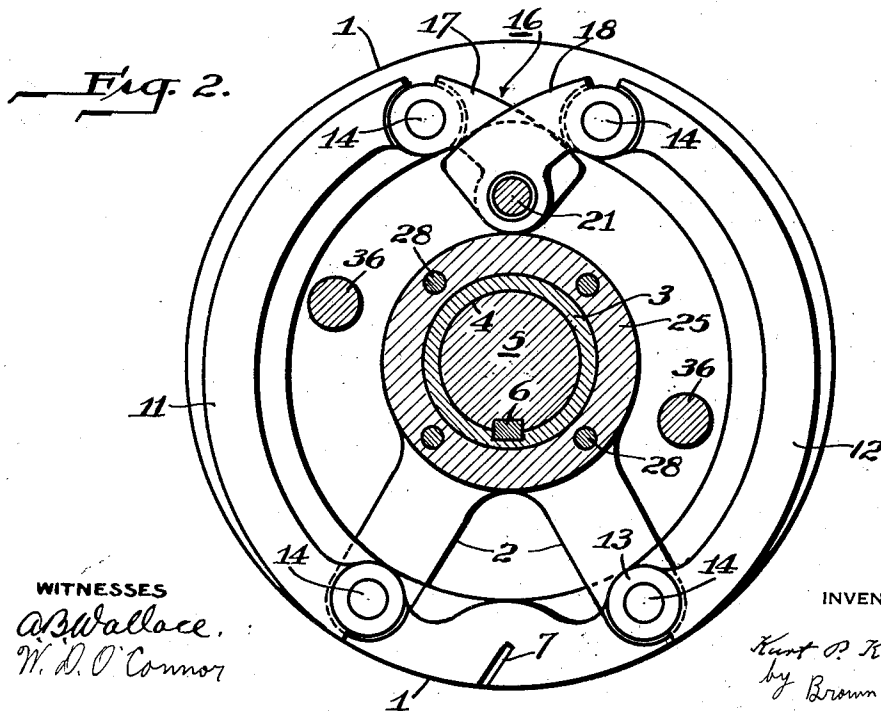
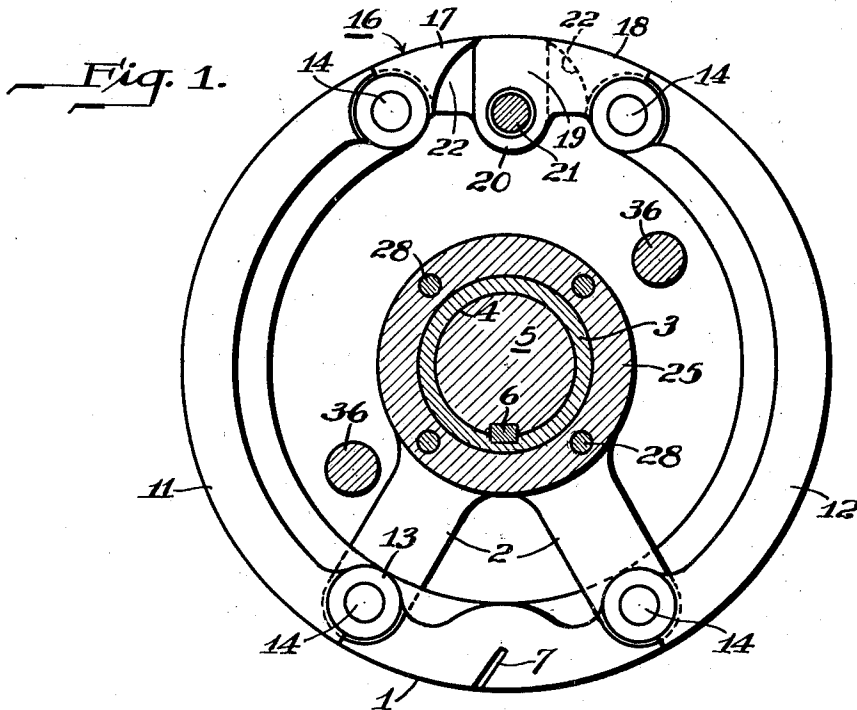
April 25, 1933.

K. P. KOHLER
COLLAPSIBLE REEL

1,905,178

Filed Sept. 13, 1930

3 Sheets-Sheet 1



WITNESSES

A. B. Wallace,
W. D. O'Connor

INVENTOR

Kurt P. Kohler
by Brown & Critchlow
his attorneys

April 25, 1933.

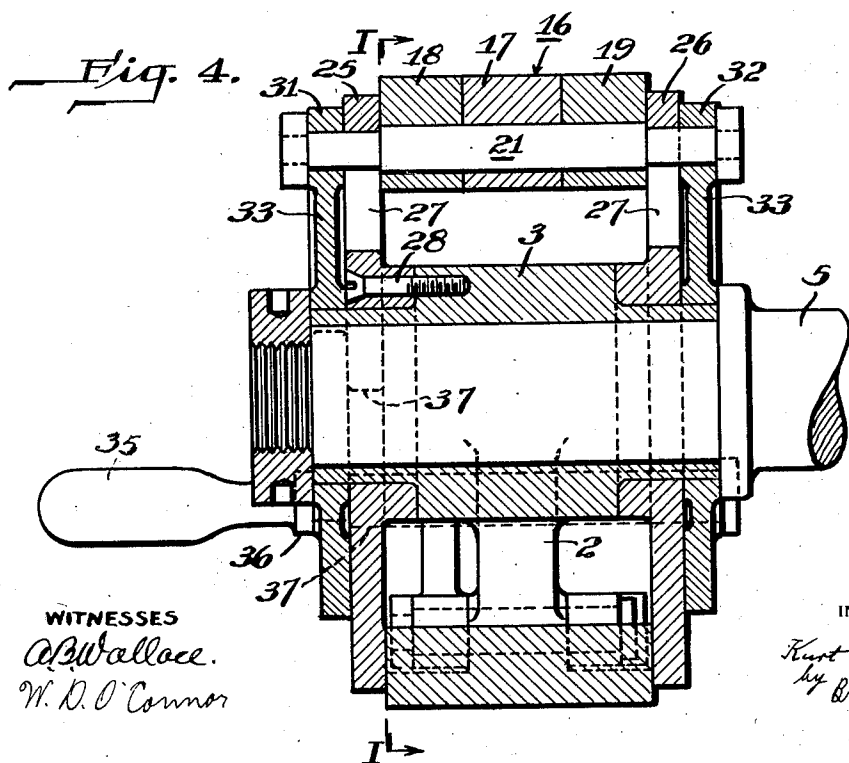
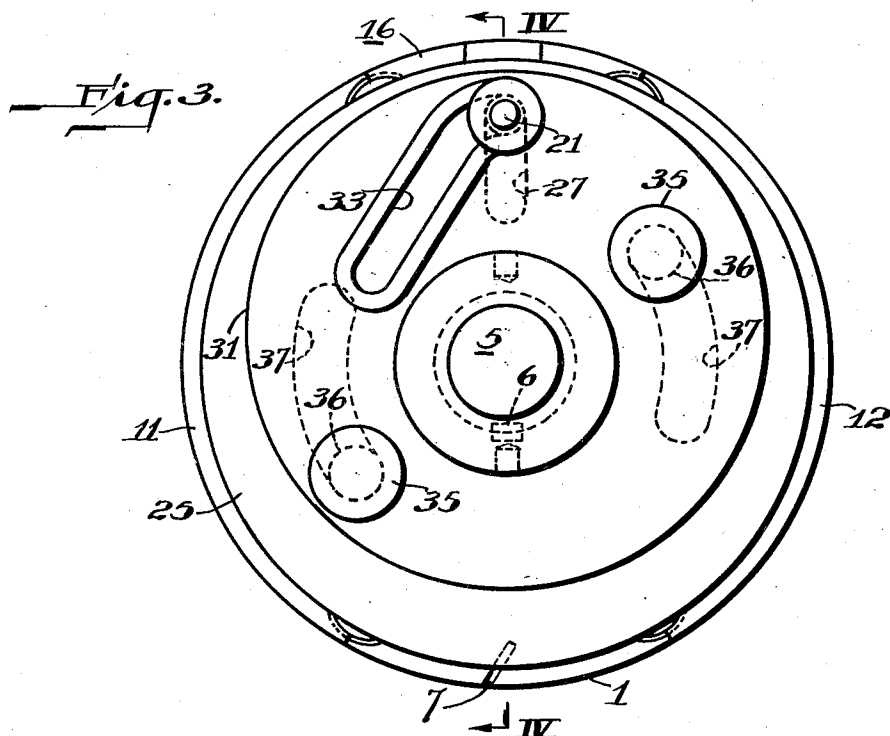
K. P. KOHLER

1,905,178

COLLAPSIBLE REEL

Filed Sept. 13, 1930

3 Sheets-Sheet 2



WITNESSES

A. Wallace.
W. D. O'Connor

INVENTOR

Kurt P. Kohler
by Brown & Crichtlow
his attorneys

April 25, 1933.

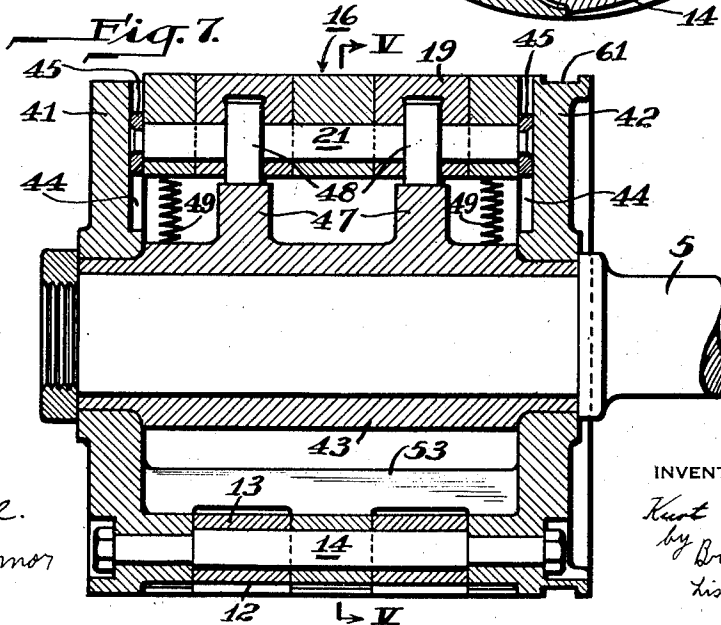
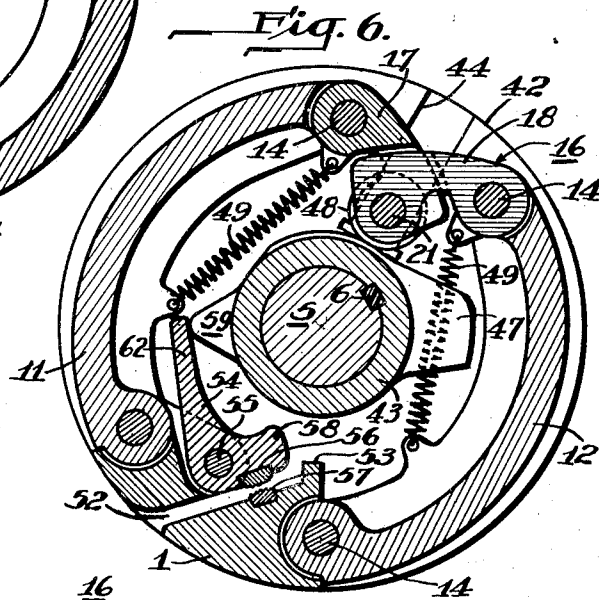
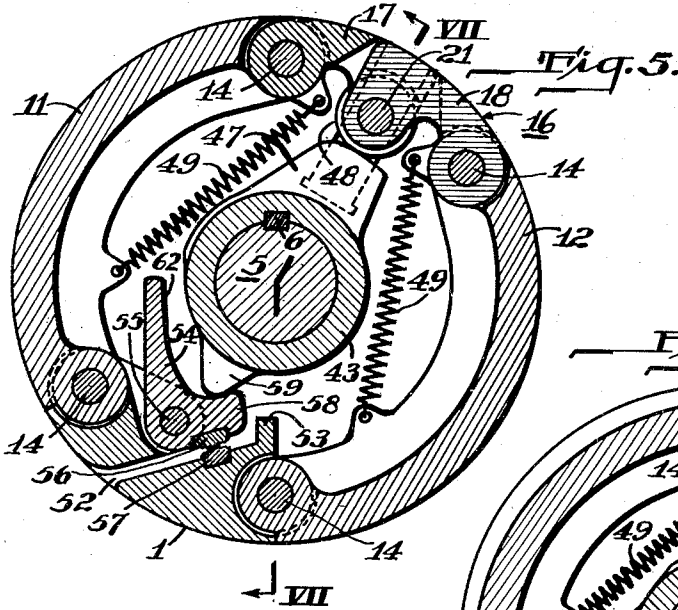
K. P. KOHLER

1,905,178

COLLAPSIBLE REEL

Filed Sept. 13, 1930

3 Sheets-Sheet 3



WITNESSES
W. D. O'Connor

INVENTOR
Kurt P. Kohler
by *Brown & Critchfield*
his attorneys

UNITED STATES PATENT OFFICE

KURT P. KOHLER, OF SALEM, OHIO, ASSIGNOR TO UNITED ENGINEERING & FOUNDRY COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

COLLAPSIBLE REEL

Application filed September 13, 1930. Serial No. 481,703.

My invention relates generally to improvements in reels and particularly to reels of the collapsible type which are utilized in mills for coiling sheet metal.

5 In rolling mills for rolling sheet metal, such as steel strip, reels are utilized for receiving the strips of metal as they come from the last rolls of the mills and for winding them into coils of such size as to be convenient
10 for shipping or further working or treatment. After a coil of steel strip has been formed on a reel, the labor of removing it is greatly reduced if the reel is so constructed that it may be collapsed in such manner that it does
15 not engage the inner surface of the coil tightly.

In the prior art the collapsible reels which have been utilized for winding steel strip have been found to be objectionable in several particular-
20 s. For instance, some of the prior art reels in collapsing change their shapes in such way that, although the length of their peripheries may be substantially reduced, their maximum diameters remain the same along
25 one or more diametrically disposed lines. In reels of this type the coil of strip material is not freely removable when the reel is collapsed, but binds and resists being pulled from the reel because of the frictional engage-
30 ment between the inner surface of the coil and the portions of the reel which have not been reduced in diameter when the reel was collapsed.

Another objection to the reels of the prior
35 art is that, when in the expanded or operating position, gaps occur between the sections which make up the carrying surface of the reel, and which are separated in the expanding operation. These gaps permit the strip
40 material to assume a chordal position when it is wound on the reel, and sharp bends or kinks are formed across the material along the lines where it changes from arcuate to chordal shape. It will be readily appreciated that
45 these kinks are found to be objectionable when the material is subsequently utilized in the formation of products, such as stamped metal articles.

It is, therefore, an object of my invention
50 to provide a reel for winding strip material,

which reel may be collapsed for removing the coiled material in such manner that its dimensions are reduced along all of its diameters.

Another object of my invention is to provide a collapsible reel having a working surface which is cylindrical and continuous when the reel is expanded to its operating position.

A further object of my invention is to provide a collapsible reel that is designed to be operated by rotation of a portion of the reel relative to the shaft on which it is mounted.

By the present invention I have provided a reel of the collapsible type in which hinged segments are connected by a toggle mechanism which permits the reel to be collapsed in such manner that all of its diametrical dimensions are reduced. In the structure which embodies my invention the toggle mechanism is so constructed that when in the expanded position it constitutes a portion of the carrying surface of the reel, and, together with the hinged segments, presents a continuous cylindrical surface for receiving the material to be coiled.

The foregoing and other objects of my invention, which will become apparent upon reading the following detailed description thereof, may be attained by means of the structure shown in the accompanying drawings which constitute a part of this specification and in which Fig. 1 is a view in cross section taken on a plane indicated by the line I—I of Fig. 4, showing a reel embodying my invention in the expanded position; Fig. 2 is a view corresponding to Fig. 1 showing the reel in the collapsed position and illustrating the manner in which the toggle mechanism functions; Fig. 3 is a view in end elevation of the reel showing the mechanism for collapsing and expanding it; Fig. 4 is a view in longitudinal section of the reel taken on the plane indicated by the line IV—IV of Fig. 3; Fig. 5 is a view in cross section of a modified embodiment of my invention taken on the plane indicated by the line V—V of Fig. 7; Fig. 6 is a view corresponding to Fig. 5 showing the reel which embodies the modification of my invention in the collapsed position; and Fig. 7 is a

view in longitudinal section of the modified reel taken on the plane indicated by the line VII—VII of Fig. 5.

By referring to Fig. 1 of the drawing it may be readily seen that the reel or block which embodies my invention, and which is there shown in the expanded position, presents a cylindrical carrying surface for receiving material to be coiled, which surface is continuous and free from discontinuities of such nature as might cause kinks in the material being wound thereon. Upon referring to Fig. 2 it will be observed that, when the reel is in the collapsed position, the carrying surface has been withdrawn along all of its diameters from the cylindrical or expanded position, and it is obvious that when it is thus collapsed a coil of strip material will hang loosely upon it, touching only at that portion which happens to be uppermost.

As shown, the carrying surface of the reel comprises a fixed segmental member 1 supported by means of spokes or arms 2 upon a hub or spider 3. The hub 3 is provided with an internal bore 4 for receiving a suitable shaft 5 to which it is secured by means of a key 6. A narrow slot 7 is disposed in the outer surface of the fixed segments 1, and extends parallel to the axis of the reel for receiving the end of a strip of metal to be wound on the reel in a well known manner. The major portion of the carrying surface of the reel is formed by two movable or hinged segments 11 and 12, each of which has one end pivotally connected to one end of the fixed segment 1. The engaging edges of the fixed segment 1 and of the movable segments 11 and 12 are provided with interlocking hinge lugs 13 drilled to receive hinge bolts or pivot pins 14 to constitute hinged joints. The joints are so constructed as to permit the hinged segments 11 and 12 to be moved inwardly and to prevent them from being moved outwardly past a cylindrical surface which constitutes the working surface of the reel.

To complete the working surface of the reel, a toggle mechanism 16 is provided between the movable ends of the hinged segments 11 and 12, and, when in the expanded position, the toggle mechanism 16 constitutes a segment of the carrying surface which is similar in extent to, and diametrically disposed from, the carrying surface presented by the fixed segment 1. As shown, the toggle mechanism comprises two segmental links 17 and 18 hinged to the free ends of the movable carrying plates 11 and 12, respectively, by means of hinged joints similar to those which connect the movable carrying plates to the fixed segments 1. The adjacent edges of the links 17 and 18 are provided with alternate interlocking projections 19 having hinge bosses 20 for receiving a pivot pin 21 disposed

with its center on a line with the centers of the hinge pins 14 at the movable ends of the carrying plates 11 and 12, to thereby constitute a toggle joint. Arcuate clearance spaces 22 are provided between the projections 19 on links 17 and 18 for permitting the complementary projections on the mating link to swing inwardly in such manner that the pivot pin 21 may be moved towards the shaft 5 and the toggle broken as shown in Fig. 2.

For restricting the toggle pin 21 to move along a radial line, the reel is provided with end plates 25 and 26, which are shown in Figs. 3 and 4, and which are provided with radially disposed guide slots 27 for receiving the ends of the toggle pin 21. As shown in Fig. 4 the end plates 25 and 26 are carried on cylindrical ends of the hub 3, and are secured to the hub by means of suitable screws 28. For operating the toggles 16, cam plates 31 and 32 are provided at each end of the reel and are journaled on the cylindrical ends of the hub 3 outside of the corresponding end plates 25 and 26. As shown in Fig. 3 the cam plates 31 and 32 are each provided with a cam slot 33 which engages the end of toggle pin 21. It may be readily understood that when cam plates 31 and 32 are turned clockwise, as seen in Fig. 3, relative to the toggle pin 21, the pin 21 will be caused to move inwardly along the radial line defined by the guide slots 27 to the position shown in Fig. 2 wherein the toggle joint is shown in the broken position and the reel is collapsed for removing coiled material. To facilitate the operation of the collapsing mechanism a pair of handles 35 are provided at diametrically disposed positions on the cam plate 31. Each of the handles 35 constitutes the end of an operating rod 36, which rods extend through arcuate slots 37 in the end plates 25 and 26, and are secured to the cam plate 32. In this manner the cam plates 31 and 32 may be operated simultaneously and equal pressure brought to bear by the cam slots 33 upon each end of the toggle pin 21.

In the modification of my invention shown in Figs. 5, 6 and 7, the carrying surface of the reel is similar to that already described in that it comprises fixed segment 1 to which is hinged a pair of movable segments 11 and 12 joined at their free ends by means of a toggle mechanism 16. However, instead of being rigidly mounted on the shaft 5, the fixed segment 1 is carried by end plates 41 and 42 journaled on cylindrical portions at the ends of a hub or spider member 43 rigidly mounted on shaft 5 by means of a key 6. For guiding the toggle pin 21 along a radial line, the inner surfaces of the plates 41 and 42 are provided with guide slots 44 disposed to receive rectangular slippers 45 journaled on the ends of the toggle pin 21. The reel which embodies this modification of my

invention is designed to be operated in response to relative motion between the reel and its supporting hub 43. For this purpose the hub 43 is provided with radially projecting cams 47 which are disposed to engage suitable cam rollers 48 journaled on the toggle pin 21.

Referring first to Fig. 6, it may be readily seen that when the hub 43 is turned counterclockwise relative to the remainder of the reel to the position shown in Fig. 5, the cam rollers 48 will be forced outwardly by the cams 47 and toggle pin 21 will move to its expanded position along the radial line defined by the guide slots 44. If now the carrying plates of the reel are turned counterclockwise relative to the hub 43, the cam rollers 48 will be moved from the top of the cams 47, and the toggle mechanism 16 will be drawn inwardly, by means of suitable springs 49, to the collapsed position.

This modification of the invention is further provided with an automatic gripping mechanism for securing the end of the material to be wound. As shown, the fixed segment 1 is provided with a transversely disposed slot 52 for receiving the end of a strip of material. At the inner end of the slot, a stop member 53 is provided for engaging the end of the material to properly position it. For clamping the end of a strip of material a movable gripping member 54 is pivotally mounted, by means of a pin 55, to the inner surface of the fixed segment 1. The gripping member 54 is provided with a movable gripping jaw 56 disposed to cooperate with a stationary jaw 57 mounted in one side of the slot 52 and adjacent the stop member 53. As clearly shown in Fig. 5, the gripping member 54 is provided with an operating lug 58 which extends inwardly from the pivot pin 55 and is disposed to be engaged by a cam 59 on the hub member 43. When the shaft 5 is turned counterclockwise relative to the carrying surface of the reel, as illustrated in Figs. 5 and 6, the cam 59 on the hub 43 engages the lug 58 on the gripping member 54 and causes it to pivot about the pivot pin 55 in such manner that the movable jaw 56 is forced with great pressure towards the stationary jaw 57, thereby effectively gripping such material as may be inserted between them. It will be noted that the lug 58 and the cam 59 also constitute a stop mechanism which limits the rotation of the shaft 5 relative to the reel and serves to drive the reel with the shaft in the counter-clockwise direction after it has been expanded to its operating position and the gripping member 54 closed.

In the normal operation of this reel the end of a strip of material to be coiled is placed in the slot 52 when the reel is in the position shown in Fig. 6. A brake of any suitable type, such as a contracting band

brake (not shown), may then be applied to a brake drum 61 on the periphery of the end plate 42 for restraining the reel against rotation. Power may then be applied to the shaft 5 to rotate it in the counterclockwise direction in such manner that the cam 47 will move the toggle pin 21 to its expanded position and the cam 59 will cause the gripping jaws 56 and 57 to securely hold the end of the strip of material. As soon as the reel has been expanded to its operating position by the relative rotation of the hub 43 within it, the brake on the drum 61 may be released, thereby permitting the reel to turn and perform the winding operation. During the time the strip is being wound on the reel the tension exerted by the strip is sufficient to maintain the reel in its expanded position. When the coil of strip material has been completed the resistance offered by the strip will be removed, and, if the shaft 5 is then stopped, the momentum of the reel and the coiled strip will be sufficient to turn it counterclockwise relative to the hub 43 to the position shown in Fig. 6, whereupon the springs 49 will draw the toggle mechanism 16 inwardly and collapse the reel. Simultaneously the cam 59 on the hub 43 will become disengaged from the lug 58 and will engage a lever 62 on the gripping member 54 in such manner as to turn it to open the jaws 56 and 57 and release the end of a strip of material.

From this explanation of my invention it may be readily seen that I have provided a reel for winding sheet material which presents a continuous cylindrical working surface to the material to be wound, and which may be collapsed for removing the coiled material in such manner that its dimensions along all the diametrical lines are reduced. Further, in the modification of my invention described in the latter part of this specification, I have provided a reel having these features combined with other features which enable it to be operated automatically and in an efficient and positive manner.

Although I have shown and described only two embodiments of my invention, it will be apparent to others skilled in the art to which this invention relates that various changes may be made in the proportions and in the arrangement of the parts of the reels herein described without departing from the spirit and scope of my invention as defined in the appended claims.

I claim:

1. In a reel for winding sheet material, in combination, a hub portion and a collapsible cylindrical rim portion, said rim portion comprising a segment fixed to the hub, two segments pivoted respectively at each end of the fixed segment, a pair of segments one of which is pivoted to the movable end of each of said first named segments and which are

pivoted to each other to constitute a toggle joint, and means for operating said toggle joint to collapse the reel.

2. In a collapsible reel for winding strip material, in combination, a hub, two segmental members constituting portions of the working surface of the reel pivoted to the hub, and a toggle mechanism connecting the free ends of the segmental members, said toggle mechanism being so shaped that when in the expanded position its outer surface constitutes a portion of a continuous cylindrical working surface of curvature equal to that of the segmental members.

3. In a reel for winding strip material, in combination, a hub portion and a rim portion carried by the hub portion, said rim portion comprising a segment fixed to the hub portion, two movable segments pivoted to the ends of the fixed segment, and a toggle mechanism constituting a collapsible segment joining the free ends of the movable segments.

4. A reel for winding sheet material comprising a hub, an arcuate carrying plate fixed to the hub, other arcuate carrying plates hinged to the ends of the fixed plate and disposed to swing inwardly, and arcuate links pivoted to the free ends of the hinged carrying plates and joined together by an interlocking break joint to constitute a toggle whereby, when in the expanded position, the reel presents a continuous cylindrical carrying surface.

5. A reel mechanism comprising a hub portion, a shaft for carrying the hub portion, two pivot pins carried by the hub, two arcuate members each pivoted at one end respectively to one of the pivot pins, pivot pins at the movable ends of the arcuate members, a toggle mechanism connected to the pivot pins at the ends of the arcuate members, said toggle mechanism being so formed that when in the expanded position its outer surface and the surfaces of the arcuate members lie in a true cylindrical surface, a member carried by the hub disposed to complete the cylindrical surface between the pivot pins and the hub, and means for drawing inwardly the toggle mechanism to collapse the reel.

6. A reel for winding sheet material comprising a hub, an arcuate carrying plate fixed to the hub, another arcuate carrying plate hinged to each end of the fixed plate and disposed to swing inwardly, and an arcuate link hinged to the free end of each of the hinged plates, said arcuate links being joined by a pivot connection to constitute an inwardly breaking toggle joint.

7. A reel for winding sheet material comprising a hub, an arcuate carrying plate fixed to the hub, another arcuate carrying plate hinged to each end of the fixed plate and disposed to swing inwardly, and an arcuate link

hinged to the free end of each of the hinged plates, said arcuate links being joined by a pivot pin to constitute an inwardly breaking toggle joint, a cam plate rotatably mounted on the hub and having a cam slot engaging said pivot pin, and means for turning the cam plate to expand or collapse the reel.

8. A reel for winding sheet material comprising end plates, an arcuate carrying plate fixed to the end plates, other arcuate carrying plates one of which is hinged to each end of the fixed plate and disposed to swing inwardly, arcuate links hinged to the free ends of the hinged plates, a pivot pin connecting the links to constitute an inwardly breaking toggle joint, cam rollers on the pivot pin, a shaft journaled in the end plates, and cams carried by the shaft for engaging the cam rollers on the pivot pin to expand or collapse the reel.

9. A reel for winding sheet material comprising a supporting shaft, a body portion journaled on the shaft, an arcuate carrying plate fixed to the body portion, other arcuate carrying plates, one of which is hinged to each end of the fixed plate in such manner that it is free to swing inwardly, arcuate links hinged to the free ends of the hinged plates, a pivot pin joining the hinged links to form a continuous cylindrical working surface and to constitute an inwardly breaking toggle, springs connected to the links and disposed to exert a force tending to break the toggle, cam rollers on the pivot pin, and cams carried by the shaft for engaging the cam rollers to expand the reel into winding position.

In testimony whereof, I sign my name.

KURT P. KOHLER.