Nov. 18, 1924. 1,515,728

D. A. CLARK

WINDING DRUM

Filed June 21, 1923 4 Sheets-Sheet 1

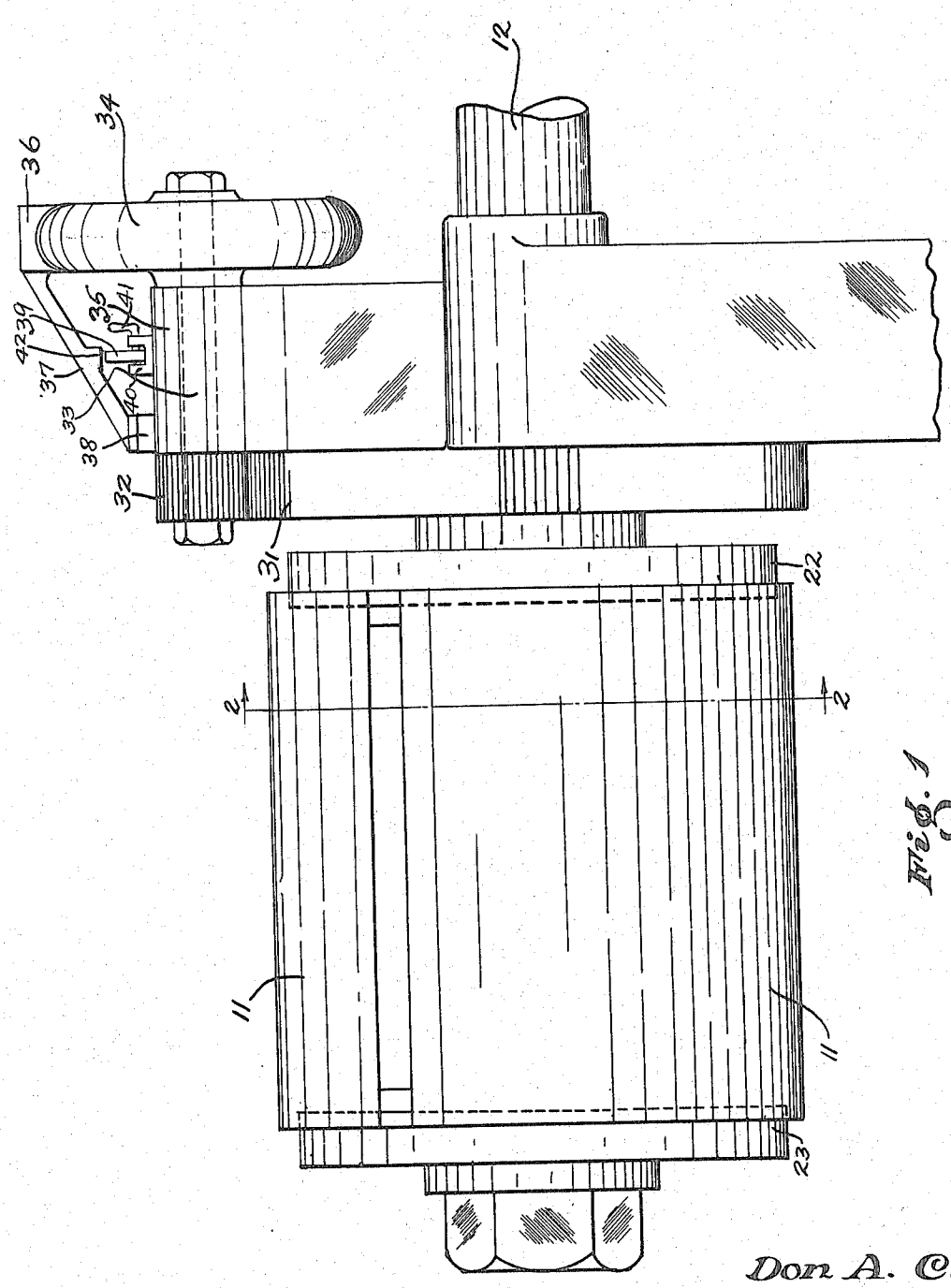

Fig. 1

Don A. Clark
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By Dunlap and Freeman
ATTORNEYS

Nov. 18, 1924. 1,515,728

D. A. CLARK

WINDING DRUM

Filed June 21, 1923 4 Sheets-Sheet 2

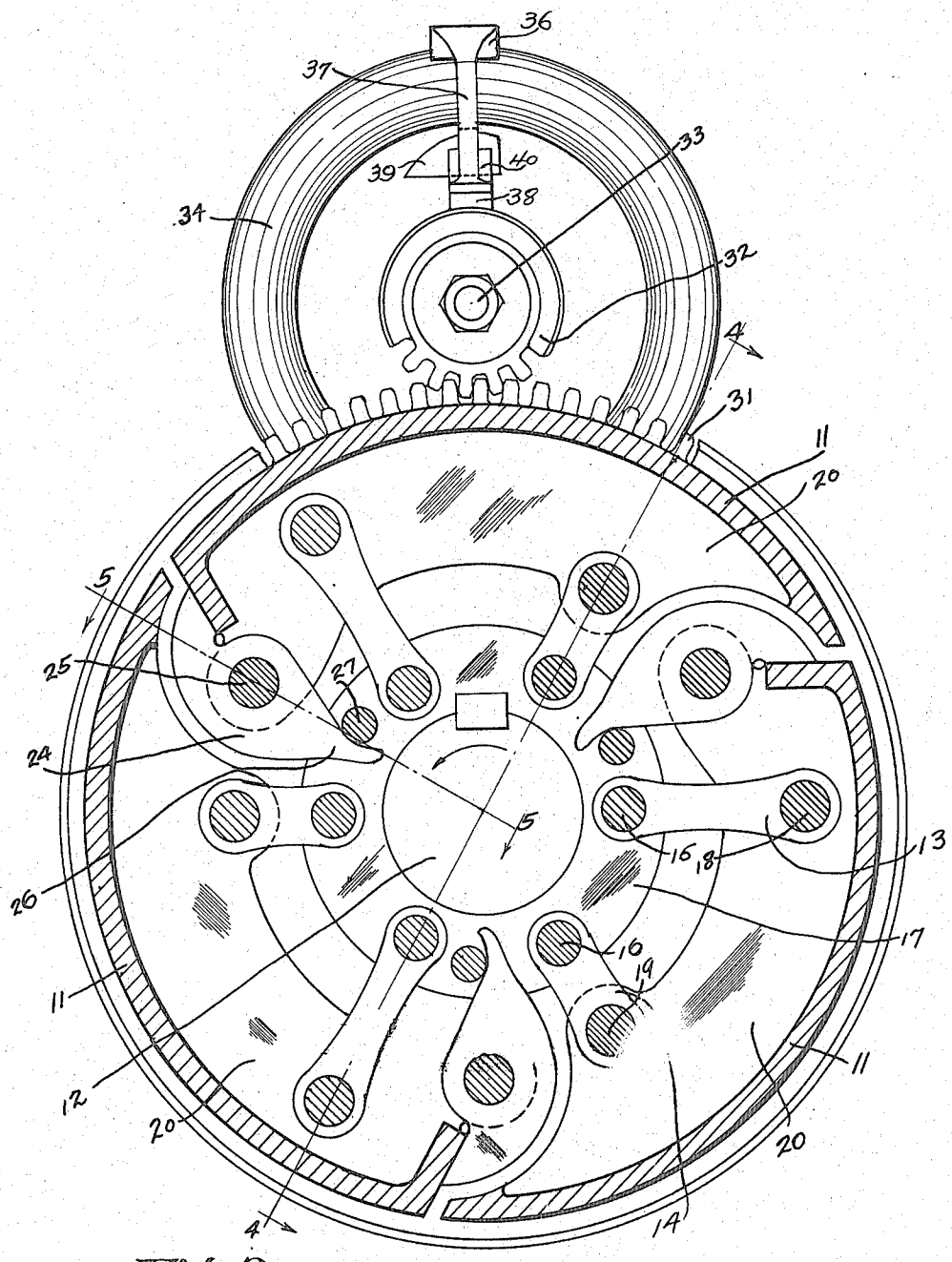

Fig. 2

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D. A. CLARK

WINDING DRUM

Filed June 21, 1923 4 Sheets-Sheet 3

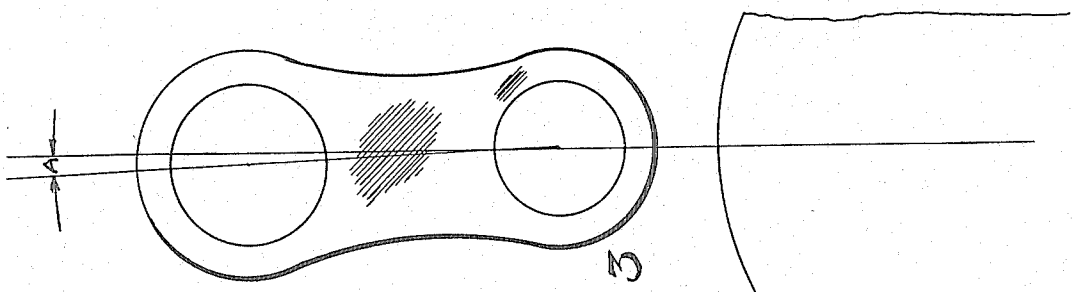

Fig. 3

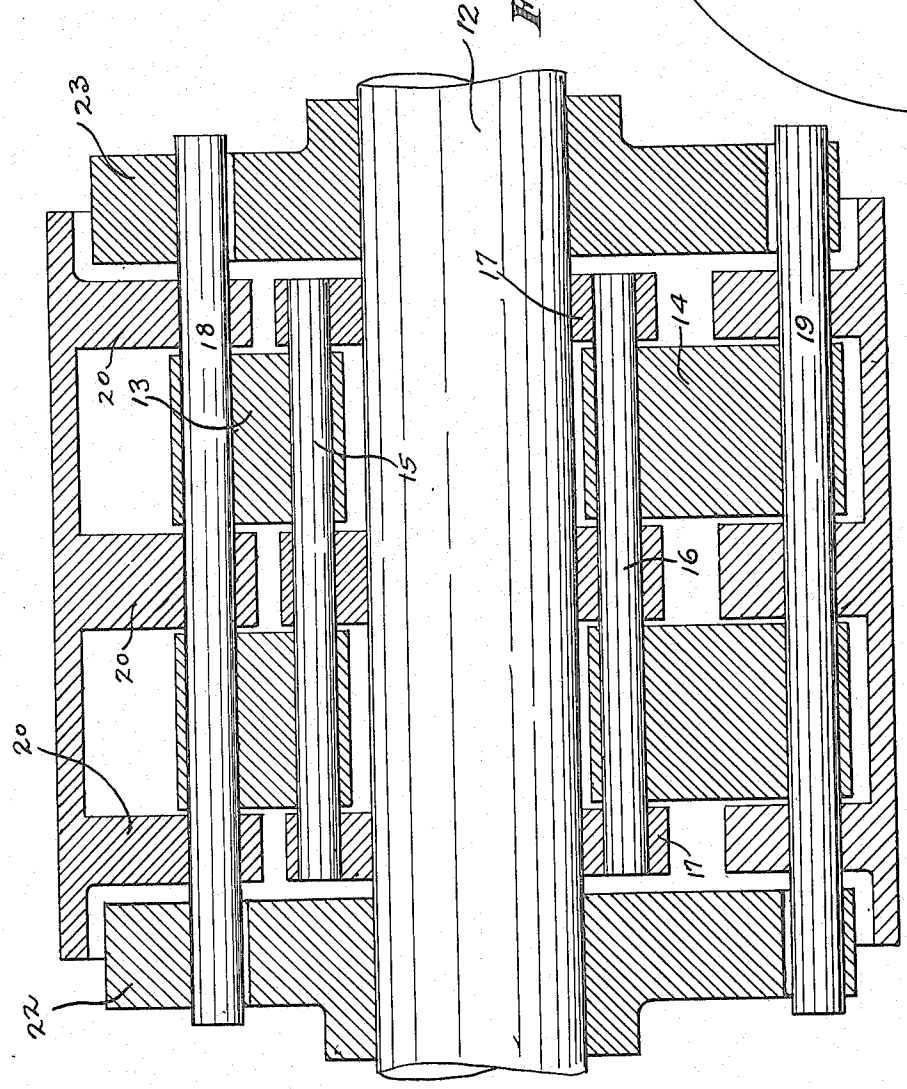

Fig. 4

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Nov. 18, 1924. 1,515,728

D. A. CLARK

WINDING DRUM

Filed June 21, 1923 4 Sheets-Sheet 4

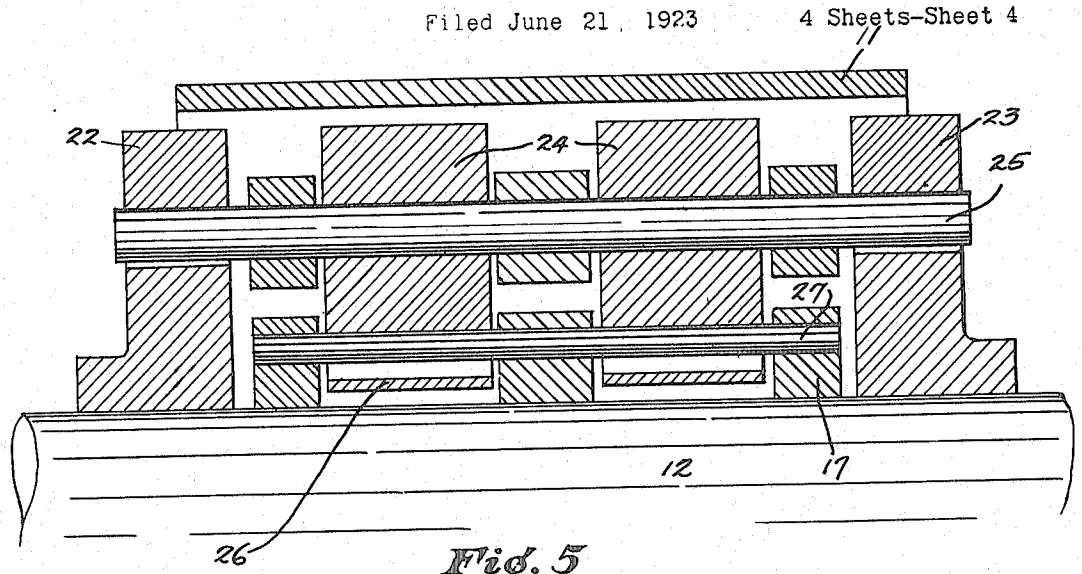

Fig. 5

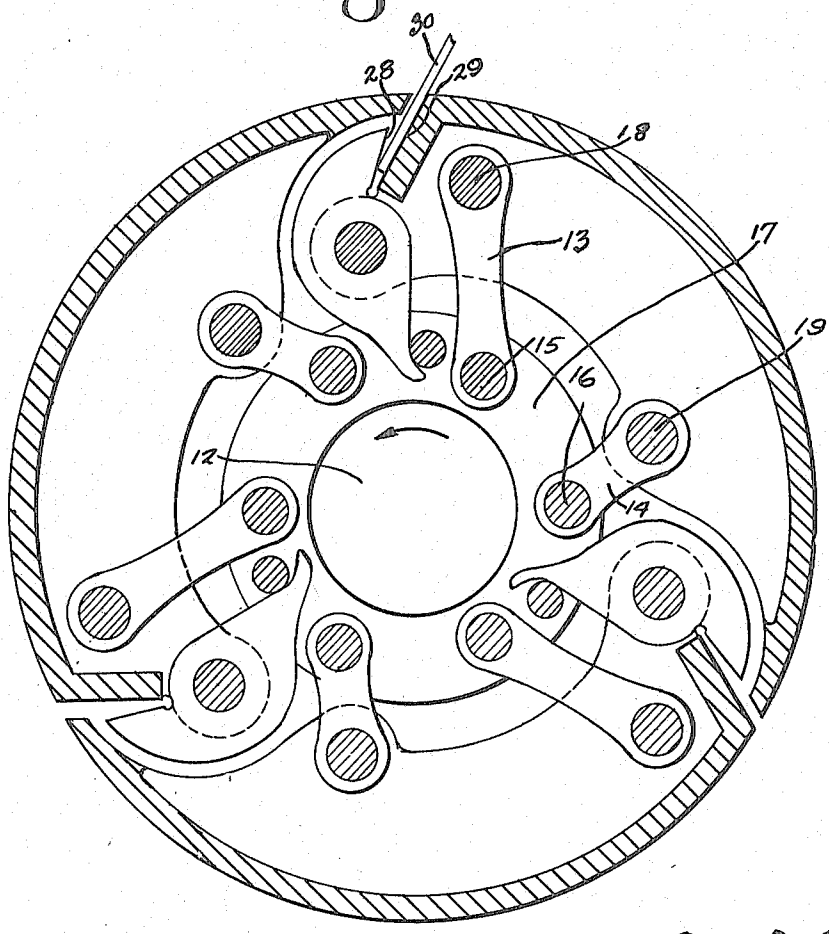

Fig. 6

Don A. Clark
Inventor
By Dewitt Hauff Freeman
Attorneys

Patented Nov. 18, 1924. 1,515,728

UNITED STATES PATENT OFFICE.

DON A. CLARK, OF CLEVELAND, OHIO, ASSIGNOR TO THE DUSTON AND CLARK ENGINEERING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

WINDING DRUM.

Application filed June 21, 1923. Serial No. 646,940.

To all whom it may concern:

Be it known that I, DON A. CLARK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Winding Drums, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

In rolling mills producing metal strips it is customary, in order to reduce as far as possible the amount of space required by the finished goods, to form into coils those strips whose thickness does not prohibit. At the present time various machines are being employed to accomplish this result and these various machines are utilizing various types of winding drums but so far as I am aware none of the drums now in use are satisfactory particularly because none of the drums satisfactorily grip, collapse, and operate. My invention provides a drum which overcomes the difficulties heretofore existing and satisfactorily coils the strips. In the drawings accompanying this specification and forming a part thereof I have shown, for purposes of illustration, one physical embodiment which my inventive concept may assume. In these drawings:

Figure 1 is a side elevation of this illustrative embodiment of my invention,

Figure 2 is a section on the line 2—2 of Figure 1,

Figure 3 is an enlarged detail of a portion of the machine shown in Figure 2,

Figure 4 is a section on the line 4—4 of Figure 2,

Figure 5 is a section on the line 5—5 of Figure 2, while

Figure 6 is a view similar to Figure 2 showing the drum in collapsed position.

The drum herein disclosed may be supported in any suitable manner and driven by any suitable mechanism but I prefer to support the drum on a shaft such as the shaft 12 herein illustrated and to operate this shaft 12 by means of the mechanism disclosed in my co-pending application executed September 19, 1924, filed September 22, 1924, bearing Serial Number 739,148, and entitled "Drumming mechanism."

The drum herein shown comprises a plurality of face sections 11, herein shown as three in number, each supported from the shaft 12 by means of a pair of links 13 and 14 pivoted at their inner ends upon pivot rods 15 and 16 carried by rings 17 keyed to the shaft 12 and pivoted at their outer ends upon pivot rods 18 and 19 carried by ribs 20 projecting inwardly from each face section 11. Because of the pivotal support of the sections 11 from the shaft 12 it will be obvious that these sections may be moved relative to the shaft 12 and it will further be obvious that with the sections initially in the position shown in Figure 2 with the links 13 and 14 substantially radial any such movement of the sections 11 relative to the shaft 12, while it may result in moving some part of the sections further from the shaft 12 during the initial steps of the relative movement, will nevertheless at all times result in the section as a whole moving closer to the shaft 12. In the drum herein shown I have, however, so proportioned the links 13 and 14 that upon movement of the sections 11 relative to the shaft 12 each section 11 will partake of a substantially translatory movement in which the entire face of the section will at the end of the movement be substantially parallel to the position which it previously occupied and accordingly in the drum herein shown such movement of the sections 11 relative to the shaft 12 produces a substantially uniform decrease in diameter of the drum. Of course this decrease in diameter of the drum necessarily decreases the circumference thereof and in order to provide for this decrease each of the sections 11 is made somewhat shorter than its proportion of the entire circumference so that with the drum expanded gaps 21 exist between the adjacent sections.

In a drum of this type it is desirable that the sections 11 move simultaneously between expanded and collapsed position and derive their collapsing and expanding motion from a single operating instrumentality. Accordingly, in the drum herein illustrated I have extended the pivot rods 18 and 19 through apertures in a pair of end plates 22 and 23 loosely mounted upon the shaft 12 whereby movement of any one of the sections 11 must act, through its pivot rods 18 and 19, the plates 22 and 23, and the pivot rods 18 and 19 of the other sections, to impart to the other sections a simultaneous movement and

whereby movement of either of the plates 22 or 23 will act through all of the pivot rods 18 and 19 to impart to all of the sections simultaneous collapsing or expanding movement.

In the drum herein shown means are also provided for gripping the end of the strip to be coiled and in addition this gripping means is so arranged and connected as to be automatically operated upon collapse or expansion of the drum. The particular gripping means herein illustrated comprises dogs 24 pivoted upon pivot rods 25 carried by the ribs 20 of the face plates 11 and each provided with a tail 26 arranged to be engaged by a bar 27 mounted in the rings 17 carried by the main shaft 12. The location of the pivot rods 25 and the bars 27 and the contour of the dogs 24 are so corelated that movement of the sections 11 relative to the shaft 12 to move the sections from collapsed to expanded position will swing the dogs 24 about their pivot rods 25 to cause each gripping face 28 to clamp tightly between itself and the gripping face 29 of that particular face section 11 any strip 30 which has been inserted between the faces 28 and 29 and similarly so that collapsing movement of the sections 11 will permit the dogs 24 to swing in the reverse direction to release any strip which has been clamped. In the drum herein illustrated I have shown the pivot rods 25 carrying these dogs 24 as also extending through the side plates 22 and 23 and under certain circumstances, particularly in large machines, I find this desirable, but it will be understood that while I have shown the pivot rods 18 and 19 and 23 as all extending through the side plates 22 and 23 under many circumstances it is only necessary that one rod from each face plate section 11 extend through these side plates 23 and 22 and that under some conditions it may be sufficient to merely extend this rod or rods through one of the side plates 22 or 23.

The drum herein shown may be actuated between collapsed and expanded positions and the dogs 24 between released and gripping positions by movement of the connected side plate or plates 22 or 23 in any suitable manner but I prefer to make this actuation automatic and I have therefore embodied in the drum herein shown an automatic means for effecting this operation in both directions. This means comprises a gear 31 secured to the end plate 22, freely rotatable with it upon the shaft 12, and meshing with a pinion 32 carried by a shaft 33 which carries on its other end a high inertia fly-wheel 34 and is supported in a bearing 35 shown as supported by the main frame of the mechanism utilized for rotating the winding drum. The inertia of the fly-wheel 34 and its connection to the end plate 22 are such that it will tend to cause the end plate 22, and with it the sections 11, to lag behind the shaft 12 both in starting and stopping and the collapsing and expanding movement of these sections 11 is in such direction (as shown in Figure 6) that this lag of the end plate 22 and sections 11 will cause the sections 11 to expand as rotation of the shaft 12 is initiated and to collapse as rotation of the shaft 12 is terminated. In addition, because of their inter-relation with the sections 11 and the collapsing and expanding movement thereof, this lag of the end plates 22 and sections 11 will simultaneously automatically cause the dogs 24 to swing into gripping position as rotation of the shaft 12 begins and to swing away from gripping position as rotation of the shaft 12 is terminated.

In operating the sections 11 and the dogs 24 automatically upon beginning and terminating the rotation of the shaft 12 it is probably necessary that the sections and dogs operate easily and it is therefore at least desirable that in the expanding movement of the sections the links 13 and 14 shall not move beyond the radial position or in fact even to the radial position and I therefore proportion the parts in such manner that the gripping faces 28 of the dogs 24 will engage the cooperating gripping faces 29 of the sections 11 before the links 13 and 14 have quite reached radial position and of course with the parts so designed the gripping face 28 of the particular dog involved will engage the stock 30 while the links 13 and 14 are still a somewhat greater distance from radial. In order to clearly indicate this feature I have shown in Figure 3 the relative position of the shaft 12 and the link 13 and have indicated by the letter "A" the angle between the axis of the link 13 and a radial line through the shaft 12 and pivot rod 15.

With the parts arranged in this manner, elimination of tension upon the strip permits the strip to shift upon the drum 11 in such manner as to act to collapse the drum. This reduction of tension may occur normally by the emergence of the end of the strip 11 from the mill or abnormally through various causes such as the stoppage of the drum driving mechanism, abnormal operation of the mill, or abnormal condition of the strip. Inasmuch as the tension on the strip is the only force acting to maintain the drum expanded after the flywheel 34 has reached operating speed I find it desirable to equip the herein described mechanism with a means adapted to either continually or momentarily impart a drum expanding impulse sufficient to maintain the drum expanded during such abnormal conditions and I have therefore shown the within described mechanism as provided with a brake shoe 36 arranged to engage the fly-wheel 34 and support by a resilient arm 37 which is

carried by a boss 38 rising from the main frame and which is of sufficient strength to impart the desired pressure to the brake shoe 36.

Under certain conditions and with certain relations of the parts the drum collapsing action of the strip, as the end of the strip emerges from the mill, may be of sufficient strength to collapse the drum 11 without assistance from the fly-wheel 34 and in such case it is obvious that the brake shoe 36 may be maintained in constant engagement with the fly-wheel 34. However, even with the parts so proportioned, I prefer to construct this brake mechanism in such manner that the brake shoe 36 may be readily retracted from its engagement with the fly-wheel 34 and I have therefore provided the mechanism herein disclosed with a cam member 39 pivoted in a clevis 40 rising from the main frame of the machine and arranged when actuated by a suitable handle 41 to engage a shoulder 42 on the arm 37 to move the arm 37 sufficiently to remove the brake shoe 36 from its engagement with the fly-wheel 34.

Under certain circumstances it may be desirable to maintain the brake shoe 36 in engagement with the fly-wheel 34 during the entire operation of the drum but remove the brake shoe 36 from engagement with the fly-wheel 34 as the rotation of the drum is terminated and in such case I may readily interconnect the handle 41 with the means which control the rotation of the drum.

It will be obvious to those skilled in the art that the winding drum herein shown is operative for the purposes for which it has been designed and in addition obviates the difficulties heretofore existing in drums constructed for the uses for which this drum is particularly adapted, and that the particular construction herein disclosed may be variously modified and altered without sacrificing the advantages or departing from the essentials of my inventive concept. Furthermore, it will be obvious to those skilled in various arts that the drum herein shown, or some modification thereof which is within my inventive concept, may be utilized for various purposes other than the one herein specifically considered and both within the art herein considered and within other arts. It will therefore be obvious that my invention is not limited to the specific physical embodiment herein disclosed and that this particular disclosure is illustrative only.

I claim:

1. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section in a plane perpendicular to the axis of said drum simultaneously circumferentially and radially of said core between collapsed and expanded positions, a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to oscillate said sections circumferentially of said drum to move said sections between collapsed and expanded positions, and inertia actuated means for operating said members.

2. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section simultaneously circumferentially and radially of said core between collapsed and expanded positions, a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to oscillate said sections circumferentially of said drum to move said sections between collapsed and expanded positions, and inertia actuated means for operating said member.

3. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to oscillate each said section in said plane between collapsed and expanded positions, a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to oscillate said links to thereby move said sections between collapsed and expanded positions, and inertia actuated means for operating said member.

4. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each face section from said core adapted when oscillated to impart to each said section translatory movement in a plane perpendicular to the axis of said drum between collapsed and expanded positions, a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to move said links to thereby move said sections between collapsed and expanded positions, and inertia actuated means for operating said member.

5. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to move said sections between collapsed and expanded positions, a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to oscillate said links to thereby

move said sections between collapsed and expanded positions, and inertia actuated means for operating said member.

6. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section in a plane perpendicular to the axis of said drum simultaneously circumferentially and radially of said core between collapsed and expanded positions, and inertia actuated means for operating said sections.

7. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section simultaneously circumferentially and radially of said core between collapsed and expanded positions, and inertia actuated means for operating said sections.

8. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each face section from said core adapted when oscillated to impart to each point in each said section substantially equal radial movement in a plane perpendicular to the axis of said drum between collapsed and expanded positions, and inertia actuated means for operating said links.

9. A winding drum comprising a core, a plurality of face sections, a plurality of links alone supporting each said section from said core and adapted when oscillated in a plane perpendicular to the axis of said drum to move said sections between collapsed and expanded positions, and inertia actuated means for operating said links to cause said links to operate said sections.

10. A winding drum comprising a plurality of face sections movable between collapsed and expanded positions, means rotatable in the plane of rotation of said drum but independently thereof and acting to operate said sections by rotation of itself relative to said drum, a gear carried thereby, a flywheel of large inertia, and a pinion connected to said flywheel and meshing with said gear.

11. A winding drum comprising a plurality of face sections movable between collapsed and expanded positions, means rotatable in the plane of rotation of said drum but independently thereof and acting to operate said sections by rotation of itself relative to said drum, a flywheel of large inertia, and connections connecting said flywheel to said means in such manner as to multiply the inertial effect of said flywheel upon said means.

12. A winding drum comprising a core, a plurality of face sections, means supporting each said section from said core in such manner as to permit translatory movement of each said section in a plane perpendicular to the axis of said drum simultaneously circumferentially and radially of said drum between collapsed and expanded positions, a dog arranged to cooperate with said sections to clamp a strip, and a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to operate said dog and to also oscillate said sections circumferentially of said drum to move them between collapsed and expanded positions.

13. A winding drum comprising a core, a plurality of face sections, means supporting each said section from said core in such manner as to permit translatory movement of each said section simultaneously circumferentially and radially of said drum between collapsed and expanded positions, a dog arranged to cooperate with said sections to clamp a strip, and a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to operate said dog and to also oscillate said sections circumferentially of said drum to move them between collapsed and expanded positions.

14. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to oscillate each said section in said plane between collapsed and expanded positions, a dog arranged to cooperate with said sections to clamp a strip, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to operate said dog and to also oscillate said links to thereby move said sections between collapsed and expanded positions.

15. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each face section from said core adapted when oscillated to impart to each said section translatory movement in a plane perpendicular to the axis of said drum between collapsed and expanded positions, a dog arranged to cooperate with said sections to clamp a strip, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to operate said dog and to also move said links to thereby move said sections between collapsed and expanded positions.

16. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane per-

pendicular to the axis of said drum to move said sections between collapsed and expanded positions, a dog arranged to cooperate with said sections to clamp a strip, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to operate said dog and to also oscillate said links to thereby move said sections between collapsed and expanded positions.

17. A winding drum comprising a core, a plurality of face sections movable between collapsed and expanded positions, a dog pivoted on one of said sections arranged to cooperate therewith to clamp a strip and movable between unclamping and clamping positions, and means for simultaneously moving said sections and said dog.

18. A winding drum comprising a core, a plurality of face sections movable between collapsed and expanded positions, a dog movable independently of said sections arranged to cooperate with one of said sections to clamp a strip and movable between unclamping and clamping positions, and means for simultaneously moving said sections and said dog.

19. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section in a plane perpendicular to the axis of said drum simultaneously circumferentially and radially of said core between collapsed and expanded positions, and a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to oscillate said sections circumferentially of said drum to move said sections between collapsed and expanded positions.

20. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section simultaneously circumferentially and radially of said core between collapsed and expanded positions, and a member rotatable with respect to said core connected to said sections to operate by rotation of itself relative to said core to oscillate said sections circumferentially of said drum to move said sections between collapsed and expanded positions.

21. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to oscillate each said section in said plane between collapsed and expanded positions, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to oscillate said links to thereby move said sections between collapsed and expanded positions.

22. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said face section from said core adapted when oscillated to impart to each said section translatory movement in a plane perpendicular to the axis of said drum between collapsed and expanded positions, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to move said links to thereby move said sections between collapsed and expanded positions.

23. A winding drum comprising a core, a plurality of face sections, a plurality of links supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to move said sections between collapsed and expanded positions, and a member rotatable with respect to said core connected to said links and adapted by rotation of itself relative to said core to oscillate said links to thereby move said sections between collapsed and expanded positions.

24. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, and means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section in a plane perpendicular to the axis of said drum simultaneously circumferentially and radially of said core between collapsed and expanded positions.

25. A winding drum comprising a core, a plurality of face sections forming a substantially complete cylinder about said core, and means supporting each said section from said core in such manner as to permit substantially equal radial movement of each point in each said section simultaneously circumferentially and radially of said core between collapsed and expanded positions.

26. A winding drum comprising a core, a plurality of face sections, and a plurality of links alone supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to oscillate each said section in said plane between collapsed and expanded positions.

27. A winding drum comprising a core, a plurality of face sections, and a plurality of links supporting each face section from said core adapted when oscillated to impart to each point in each said section substantially equal radial movement in a plane perpendicular to the axis of said drum between collapsed and expanded positions.

28. A winding drum comprising a core, a plurality of face sections, and a plurality of

links alone supporting each said section from said core adapted when oscillated in a plane perpendicular to the axis of said drum to move said sections between collapsed and expanded positions.

29. A winding drum comprising a plurality of face sections movable between collapsed and expanded positions, means acting to operate said sections by rotation of itself relative to said drum and of large inertia whereby rotation of itself relative to said drum will automatically result in whenever the speed of said drum is changed, and means arranged to retard the rotation of said section operating means.

In testimony whereof, I hereunto affix my signature.

DON A. CLARK.