June 10, 1930. W. C. TYLER 1,763,023

HOISTING MECHANISM

Filed March 15, 1923 2 Sheets-Sheet 1

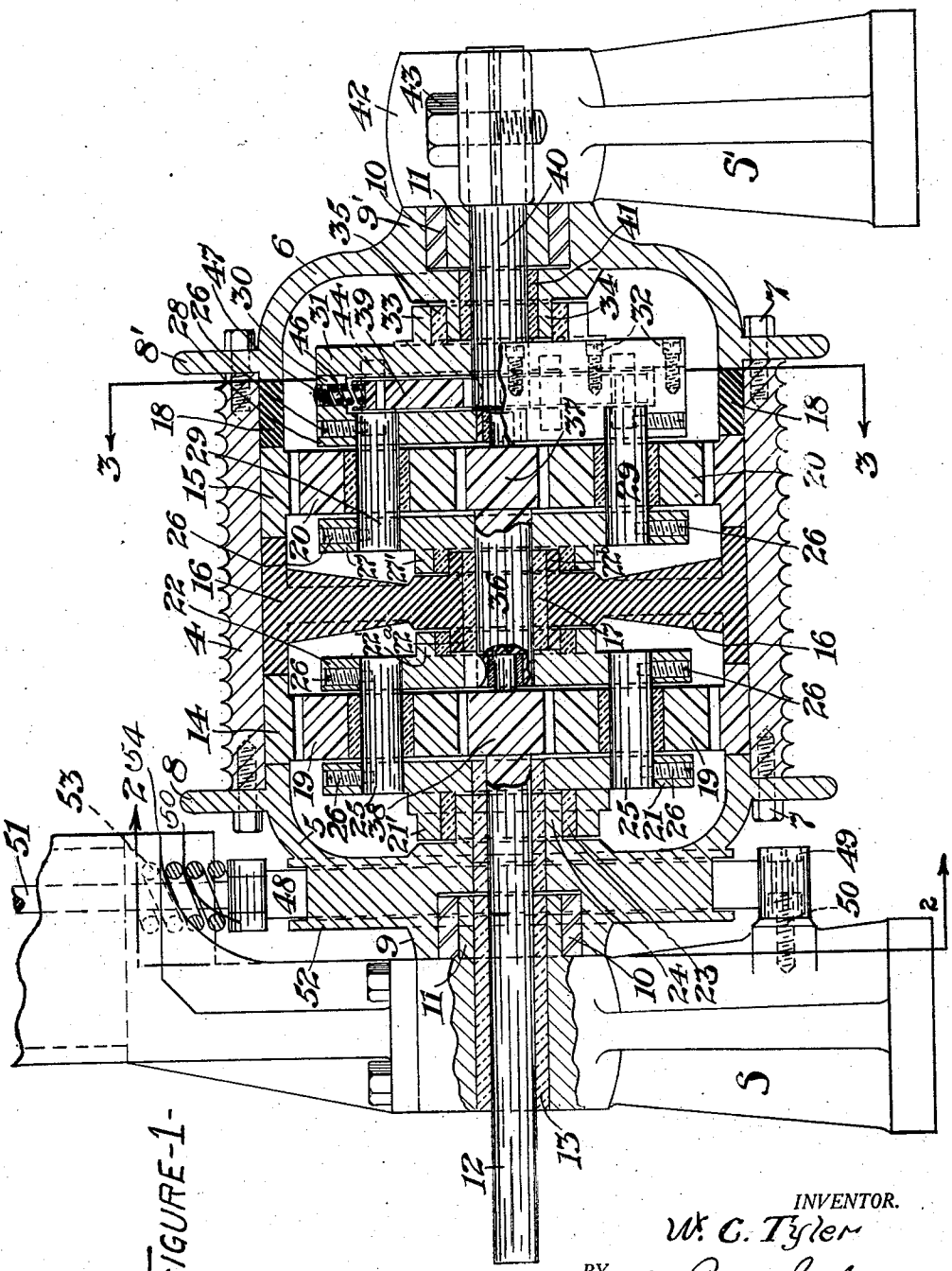


FIGURE-1-

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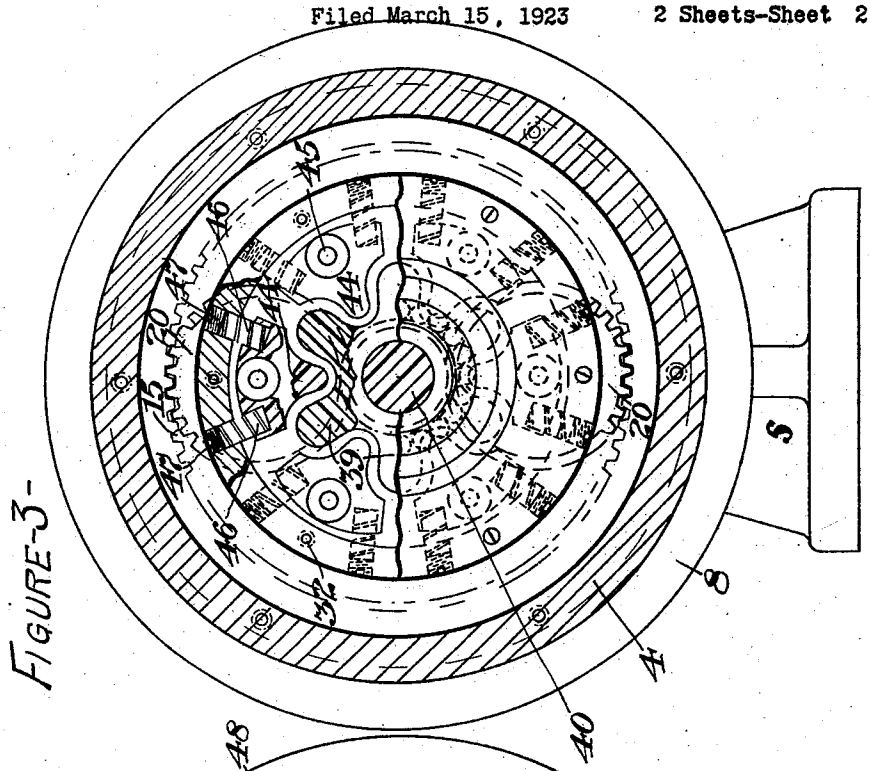


FIGURE-3-

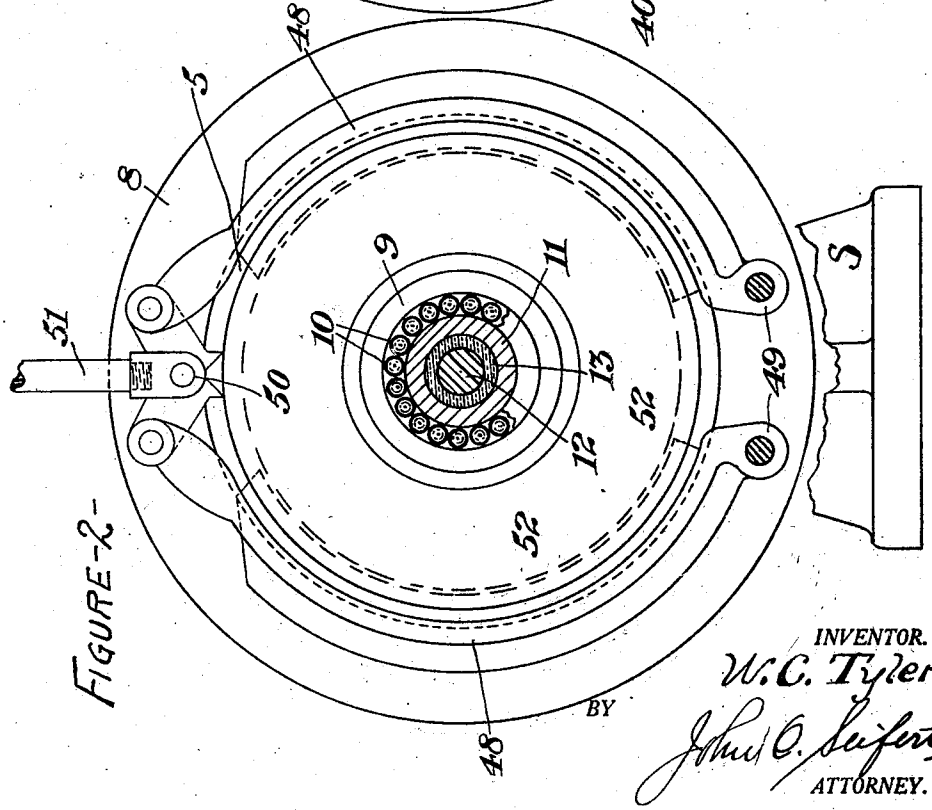


FIGURE-2-

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UNITED STATES PATENT OFFICE

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HOISTING MECHANISM

Application filed March 15, 1923. Serial No. 625,206.

This invention relates to hoisting mechanism or apparatus for lifting or lowering a load and utilizing a drum upon which to wind and unwind therefrom a lifting cable or rope with driving means operatively connected thereto and arranged to drive or revolve the drum at a reduced speed relative to said driving means, and it is the object of the invention to provide an improved construction and arrangement of winding drum together with speed reducing gearing built into and combined in a unitary structure with the drum, and to provide a combined hoisting drum and speed reducing gear which is novel, simple and cheap in structure and highly efficient in operation.

In hoisting drums utilizing a gear transmission to connect the drum with a source of power as heretofore constructed it has been the practice to connect a gear element to the drum and connect to the driving means a gear element to mesh directly with the gear element of the drum with the result that as the power is applied the stress and strains are directly applied to the teeth of the gear elements with a sudden jar or shock tending to fracture the teeth and often stripping the teeth from the gear elements, and it is a further object of the invention to provide a flexible and yielding means in the connection of the driving means and drum to absorb the shocks and jars to which the teeth of the gear elements are subjected as the power is applied to the drum, said means also operating to prevent chattering and backlash between the teeth of the gears.

A further object of the invention is to combine with a hoisting drum of this character brake mechanism to control the movement of the drum.

Other objects and advantages will hereinafter appear.

In the drawings accompanying and forming a part of this specification, Figure 1 is a longitudinal sectional view showing an embodiment of my improved construction and arrangement of hoisting drum.

Figure 2 is a cross sectional view taken substantially on the line 2—2 of Figure 1 looking in the direction of the arrow; and

Figure 3 is a cross sectional view taken substantially on the line 3—3 of Figure 1.

In the embodiment of the invention shown in the drawings I provide a drum comprising a cylinder 4 arranged with peripheral cable-engaging grooves, with heads 5 and 6 fixed to opposite ends of the cylinder by screws or bolts 7 passing through perforations in annular flanges 8, 8′ of the heads and threaded into the ends of the cylinder, the head flanges 8, 8′ being arranged to extend beyond the periphery of the cylinder to serve as guides for the cable as it is wound onto and unwound from the drum. The drum heads are arranged with axial laterally extending trunnions 9, 9′ whereby the drum is revolubly supported through suitable bearings, such as roller bearings 10 in lugs 11 projecting laterally from standards S and S′. A shaft 12 adapted to be connected to a source of power, such as an electric motor (not shown) is journaled independently of the drum in the standard S to extend through the drum trunnion 9 into one end of the drum by means of a bushing 13 also extending through the drum trunnion.

To drive the drum at a reduced speed relative to the speed of the drive shaft 12 the drum is operatively connected to the shaft through speed reducing gearing built into the drum comprising a pair of annular gears 14, 15 fixed to and extending around the inner circumference of the drum and to revolve therewith. The gear 14 abuts at one end against the head 5 and the gear 15 is maintained in spaced relation to the gear 14 by a spacing member 16 having a web extending transversely of the drum with an axial opening in which is mounted a bushing 17 for a purpose to be hereinafter described. The gear 15 is maintained in fixed relation to the spacing member 16 by fixed blocks 18 interposed between the one end of the gear 15 and the drum head 6.

Two sets of gears 19 and 20 are provided to mesh with the gears 14, 15, in the present instance there being two gears in each set although a greater number may be utilized. The gears are supported to rotate about their axes upon carriers loosely mounted concen-

tric of the drum. The carrier for the gears 19 comprises a pair of disks or heads 21, 22, the disk 21 having a hub portion 21′ whereby it is mounted by a bushing 23 upon a hub 24 extending inward from the drum head 5, and the disk 22 has a hub 22′ whereby it is mounted with an interposed bushing upon a hub 22^a extending laterally from the web of the spacing member 16. The disks 21, 22 are connected together in spaced relation at opposite ends of the gear 14 with the gears 19 rotatably mounted to have movement about their axes on studs 25 between the disks, said studs being fixed in the disks by set screws 26. The carrier for the gears 20 comprises a pair of disks or heads 27, 28 secured together in spaced relation at opposite ends of the gear 15 by studs 29 secured in openings in the disks by set screws 36 with the gears 20 mounted on the studs between the disks in a manner similar to securing the gear-carrying studs 25 in the disks 21, 22. The disk 27 has a laterally projecting portion 27′, whereby it is mounted with an interposed bushing upon a hub 22^b extending from the web of the spacer 16 opposite to the hub 22′. The disk 28 has an annular laterally extending flange 30 adjacent the periphery with a second disk or head 31 attached to said disk flange 30 by screws 32 providing a space or chamber between said disk 31 and disk 28 for a purpose to be hereinafter described, and the disk 31 has a hub portion 33 whereby it is mounted upon a hub 34, extending inward from the drum head 6 with a bushing 35 interposed.

A stud shaft 36 extends through disk 27 and is loosely mounted in the bushing 17 in the axial opening of the web 16. One end of the shaft 36 extends through the disk 22 and has a pilot bearing with shaft 12, (Figure 1) the disk 22 being fixed thereto as by keying or otherwise. The opposite end of the shaft 36 extends through the disk 28 and has a pilot bearing in shaft 40. A gear 37, either mounted on or integral with the shaft, engages between the disks 27, 28 and meshes with the intermediate gears 20 and is operatively connected thereby with the annular gear 15. The shaft 36 is operatively connected with the drive shaft 12 through a gear 38 fixed on shaft 12 meshing with the gears 19 and the connection of shaft 36 with the disk 22 of the carrier for said gears 19.

The gear carrier 27, 28 is held against rotation whereby as the drive shaft 12 is rotated the rotation of said shaft will be transmitted to the stud shaft 36 through the gear 38 on the drive shaft meshing with the gears 20 and the carrier for said latter gears due to the fixing or connecting of the disk 22 of said carrier to said shaft 36. The gear 37 on shaft 36 meshes with the gears 20, and as the carrier for the latter gear is held against rotation, the rotation of gears 20 is transmitted to the annular gear 15 rotatable with the drum, and the latter is thereby rotated at a reduced speed and in reverse direction to the drive shaft 12. The gears 19 while serving to couple the drive shaft through the carrier disk 22 with the stud shaft 36 also permit the rotation of the drum about said gears 19.

To hold the gear carrier and prevent the same from participating in the revolving movement of the drum a spider or toothed wheel 39 (Figure 3) is secured to a shaft 40 within the space between the disks 28, 31 of the gear carrier, said shaft being fixed in the standard S′ and projecting into the drum through the drum head 6, said drum having a bearing upon said shaft with an interposed bushing 41 and in which shaft 36 has a pilot bearing. To mount the shaft 40 in fixed position the end of the shaft engaging the standard is square in cross section, the standard S′ being in the nature of a pillow block with a cap 42 engaging over the shaft and clamped thereto by screws or bolts 43. The spider 39 is connected with the gear carrier 27, 28 by rockers 44 pivotally mounted upon pins 45 supported at opposite ends in the disks 28, 31 whereby said rockers are circumferentially disposed about said disks and the spider. These rockers are in the nature of toothed sectors arranged with the teeth to engage the spaces between the teeth or projections of the spider, but are of less cross sectional dimension than the spaces between the teeth of the spider to leave a clearance between the teeth of the spider and the teeth of the sectors, as clearly shown in Figure 3. The rockers are adapted to have rocking movement on their pivot supports 45, and are yieldingly urged to position of equilibrium by springs 46, there being a pair of such springs for each rocker. One end of each of said springs is seated in recesses in the rockers at opposite sides of their pivotal supports, and the opposite ends of the springs engage in perforations in the annular flange of the disk 28 of the carrier and are retained therein by threaded plugs 47. By this arrangement as the drive shaft is rotated the gear carrier 27, 28 will have a slight movement therewith until the tooth of the sectors or rockers 44 engage the spider, this being a yielding engagement due to the arrangement of the rocker springs 46, said springs absorbing any shocks to which the teeth of the reducing gearing may be subjected and thereby preventing any sudden jars or shocks with the possibility of fracturing and stripping of the teeth of said reducing gearing; these springs also serving to prevent backlash between the gearing.

To retard and stop the movement of the drum braking mechanism is provided comprising a pair of sectors or curved arms 48 having perforated ears at one end whereby they are pivotally supported, as at 49, upon

the standard S, said arms being arranged to embrace a circular projecting portion 52 of the drum head 5 (Figures 1 and 2), the opposite ends 49 of the arms 48 having a toggle connection 50 with actuating rod 51 normally positioned by a spring 53 with the arms in operative relation with the drum to hold the latter against movement, as shown in Figure 2, said spring being coiled about the rod and confined between the toggle link connection of the arms 48 and an overhanging portion of a bracket 54 fixed upon the standard S.

By the arrangement as described it will be obvious that the drum serves as an enclosing housing for the operating mechanism of the drum. Furthermore, in assembling the drum it is filled with a suitable lubricant, such as grease, the drum also serving as a lubricant carrying housing for the reducing gearing.

Variations may be resorted to within the scope of the invention and portions thereof may be used without others.

Having thus described my invention, I claim:

1. The combination of a drum having heads arranged with hollow trunnions to rotatably support the same, a drive shaft extending into the drum through and rotatable in one of the trunnions, a gear fixed to and rotatable with said shaft within the drum, an annular gear disposed about the inner circumference of the drum concentric with the shaft gear on the drive shaft, intermediate gears to mesh with said annular gear and gear on the drive shaft, a carrier for said intermediate gears loosely mounted within the drum concentric of the drive shaft to permit of movement of the carrier and drum relative to each other, means within the drum having a part to extend through the drum trunnion opposite the drive shaft, means to hold said latter means against rotation, and flexible means carried by said gear carrier for the engagement of said fixed means to hold the carrier against rotation with the shaft and drum.

2. The combination of a pair of standards, a drum having heads arranged with hollow trunnions whereby the drum is rotatably supported by the standards, a drive shaft journalled in one of the standards and one of the drum trunnions and extending into the drum through said trunnion, a gear on the shaft within the drum, an annular gear extending around the inner circumference of and rotatable with the drum, gears to mesh with the shaft and annular gears, a carrier for said intermediate gears loosely supported by the drum, a stud fixedly mounted in the other standard and extended through the drum trunnion opposite to that through which the drive shaft extends, and means mounted on said stud within the drum to co-operate with the gear carrier to hold said carrier against rotation.

3. The combination of a pair of standards; a drum having heads arranged with hollow trunnions whereby the drum is rotatably supported in the standards; a drive shaft journalled in one of the standards and extending into the drum through one of the trunnions; a gear fixed on the shaft within the drum; an annular gear extending around the inner circumference of and rotatable with the drum; intermediate gears in mesh with said gears; a carrier for said annular gear and gear fixed on the shaft within and loosely supported by the drum; a shaft fixed in the other standard extending through the other drum trunnion in coaxial relation to the drive shaft; and a flexible coupling between said fixed shaft and the intermediate gear carrier to hold the latter against rotation.

4. In hoisting mechanism, a pair of standards; a drum having heads arranged with hollow trunnions whereby the drum is rotatably supported in the standards; a drive shaft journalled in one of the standards and extending into the drum through one of the trunnions; a gear driven by the shaft within the drum; an annular gear extending around the inner circumference of and rotatable with the drum; intermediate gears to mesh with the said gears; a carrier for said intermediate gears loosely supported by the drum; a shaft fixed in the other standard extending through the other trunnion in coaxial relation to the drive shaft; a toothed member fixed to said shaft within the drum; and spring influenced rockers pivotally supported by and circumferentially disposed around the carrier for the intermediate gears to co-operate with said toothed wheel to yieldingly hold said carrier against rotation with the drum and drive shaft.

5. In hoisting mechanism, a rotatably supported drum; a pair of shafts extending coaxially into the drum from opposite ends, one of which shafts is rotatable and the other shaft fixed; a gear driven by the rotatable shaft; an annular gear within the drum to rotate therewith; intermediate gears meshing with said gears; a carrier for said intermediate gears loosely mounted within the drum; a toothed wheel mounted on the fixed shaft within the drum; and means yieldingly mounted upon the carrier for said intermediate gears to co-operate with the toothed wheel to hold said carrier against movement.

6. The combination of a drum arranged to be rotatably supported; a shaft rotatably supported in one end of the drum and extending into the drum, an annular gear within and rotatable with the drum, a spur gear in the drum rotatable from the shaft, intermediate gears meshing with the spur and annular gears, a gear carrier in the drum in which the intermediate gears are mounted to rotate about their axes, stationary means within the drum having a part extending through

the end opposite to the shaft and held against rotation, and flexible means carried by the gear carrier for the engagement of said stationary means to hold the gear carrier against rotation whereby the intermediate gears are adapted to rotate about their axes without participating in the rotary movement of the drum or shaft and drive the drum from the shaft at a reduced speed and in reverse direction.

7. The combination of a rotatably supported drum, a drive shaft journalled in one of the drum supports and extending into one end of the drum and having a gear thereon within the drum, an idler shaft loosely mounted co-axially with the drive shaft, a gear fixed to said idler shaft, annular gears within and revoluble with the drum in concentric relation to the first two gears, intermediate gears meshing with said drive shaft gear and one of the annular gears, a carrier for said intermediate gears including a pair of heads loosely mounted in the drum at opposite ends of the intermediate gears and connected in spaced relation by studs on which the intermediate gears are mounted to rotate about their axes, said intermediate gears being adapted to rotate with said carrier about the drive shaft, means to connect said carrier with the idler shaft, intermediate gears to mesh with the gear on the idler shaft and the other annular gear, a carrier for said latter intermediate gears including a pair of heads loosely mounted in the drum at opposite ends of said gears and connected in spaced relation by studs on which the intermediate gears are mounted to rotate about their axes, and means to hold said latter gear carrier against rotation whereby to transmit the rotary movement of the drive shaft through the gearing to rotative movement of the drum in reverse direction and at reduced speed to the drive shaft.

8. Power transmission mechanism as claimed in claim 7, wherein the means to hold the one gear carrier against rotation comprises a shaft fixed in the drum support opposite to the support in which the drive shaft is journaled and extending into the drum, and yielding coupling means within the drum to connect said shaft with said gear carrier.

9. Power transmission mechanism as claimed in claim 7, wherein the means to hold the one gear carrier against rotation comprises a fixed shaft extending into the end of the drum opposite to that through which the drive shaft extends, a spider fixed to said shaft within the drum, and rockers circumferentially disposed around and yieldingly mounted upon said gear carrier to co-operate with the spider.

10. Power transmission mechanism as claimed in claim 7, wherein the means to hold the one gear carrier against rotation comprises a fixed shaft extending into the end of the drum opposite to that through which the drive shaft extends, a spider fixed to said shaft within the drum in contiguous relation to the carrier, pivotally supported rockers circumferentially disposed around said gear carrier to co-operate with the spider, and springs engaging the rockers at opposite sides of their pivotal support for the purpose specified.

11. In hoisting mechanism, a rotatably supported drum, an annular gear within and rotatable with the drum, a drive shaft rotatable in one end of and extended into the drum, a gear fixed to the drive shaft within the drum, intermediate gears to mesh with said latter gear and the annular gear, a carrier for said intermediate gears loosely carried by and within the drum concentrically of the drive shaft, and means within and rotatable with the drum to yieldingly hold said carrier against rotation and operatively couple the drum with the drive shaft to rotate the drum from the drive shaft at a reduced speed.

12. The combination of a rotatably supported drum, a drive shaft journalled in one end of and extending into the drum and having a gear thereon within the drum, a stud shaft rotatably carried in the drum coaxially with the drive shaft, a gear on said stud shaft, a pair of annular gears within and revoluble with the drum and arranged in concentric relation to the gears on the drive and stud shafts, intermediate gears meshing with the gear on the drive shaft and one of the annular gears, a carrier for said intermediate gears loosely supported in the drum concentric of the drive shaft, intermediate gears to mesh with the gear on the stud shaft and the other annular gear, a carrier for said latter intermediate gears loosely supported in the drum, and means for holding said latter carrier against rotation and thereby transmit the rotation of the drive shaft to the drum at a reduced speed and in reverse direction through the gears on the drive and stud shafts meshing with the intermediate gears and the latter gears meshing with the annular gears.

Signed at the city of New York, in the county of New York and State of New York, this 27th day of Feb., 1923.

WARREN C. TYLER.