

July 10, 1928.

1,676,956

J. M. LEAVER, JR
ROTARY BINDING MACHINE

Filed May 10, 1920

7 Sheets-Sheet 1

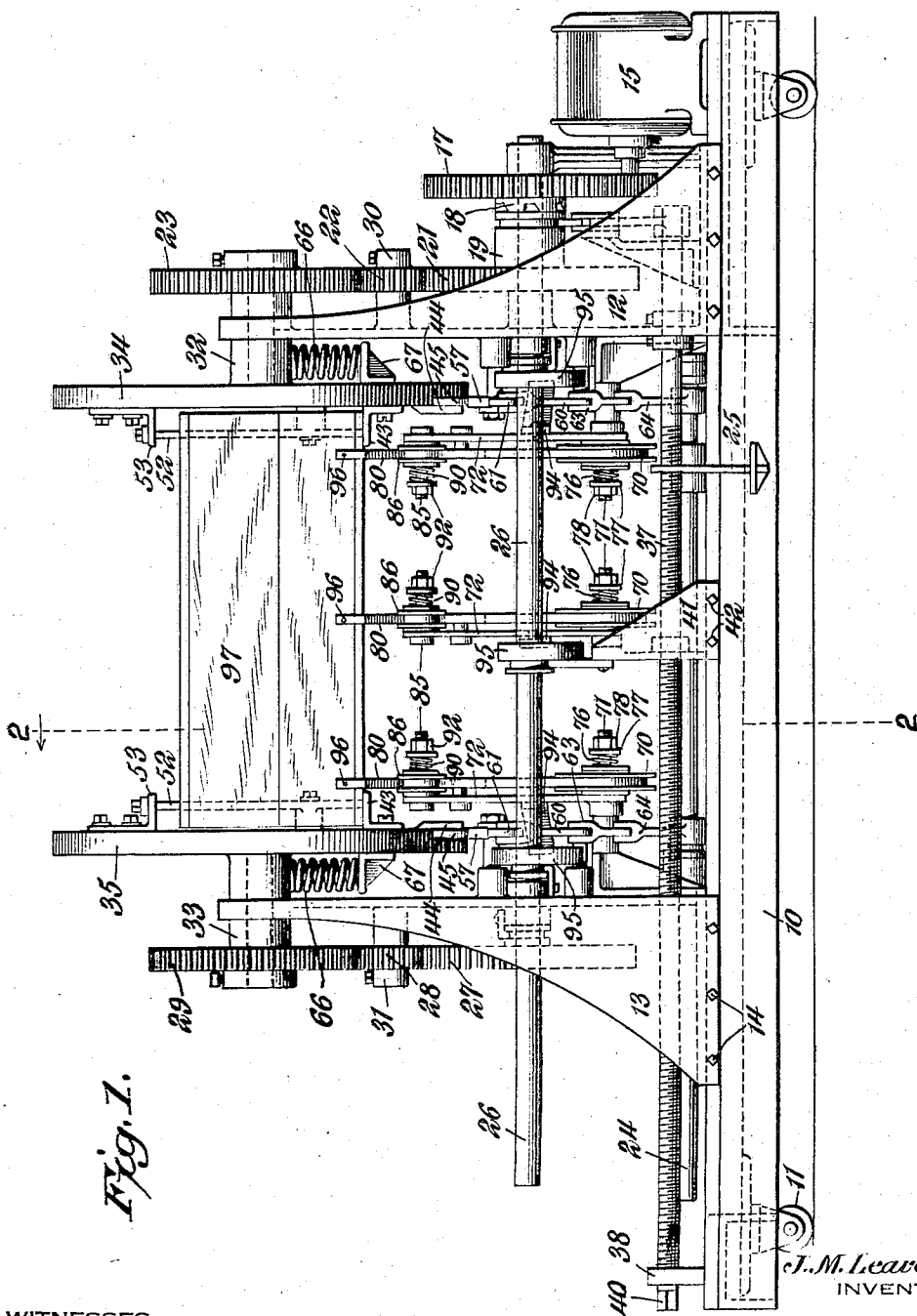


Fig. 1.

WITNESSES

Howard D. Orr.
Philip E. Siggers

BY

E. J. Siggers

ATTORNEY

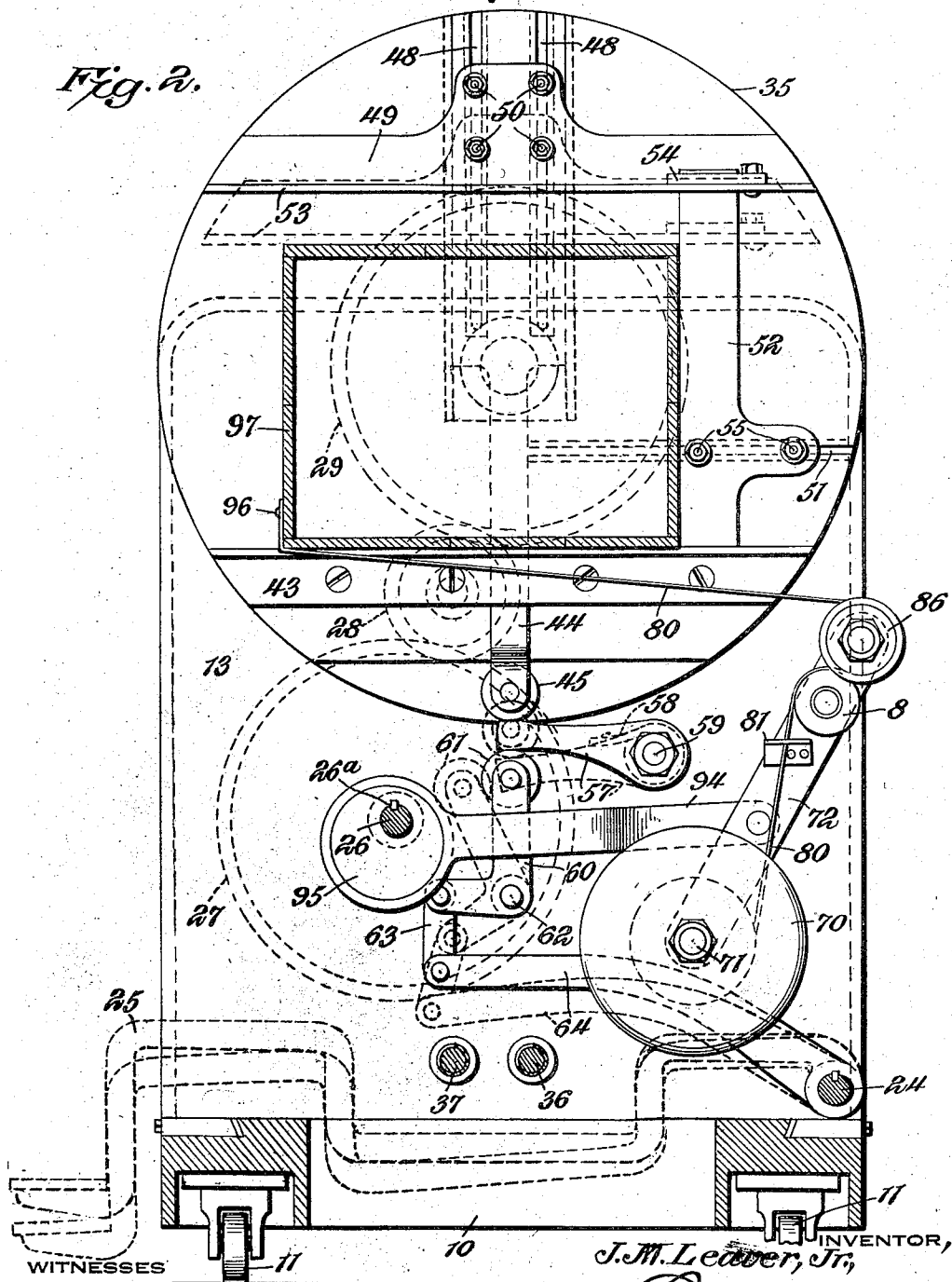
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WITNESSES

Howard D. Ott.
Philip E. Siggers

BY

J. M. Leaver, Jr.,
INVENTOR,
E. G. Siggers

ATTORNEY

July 10, 1928.

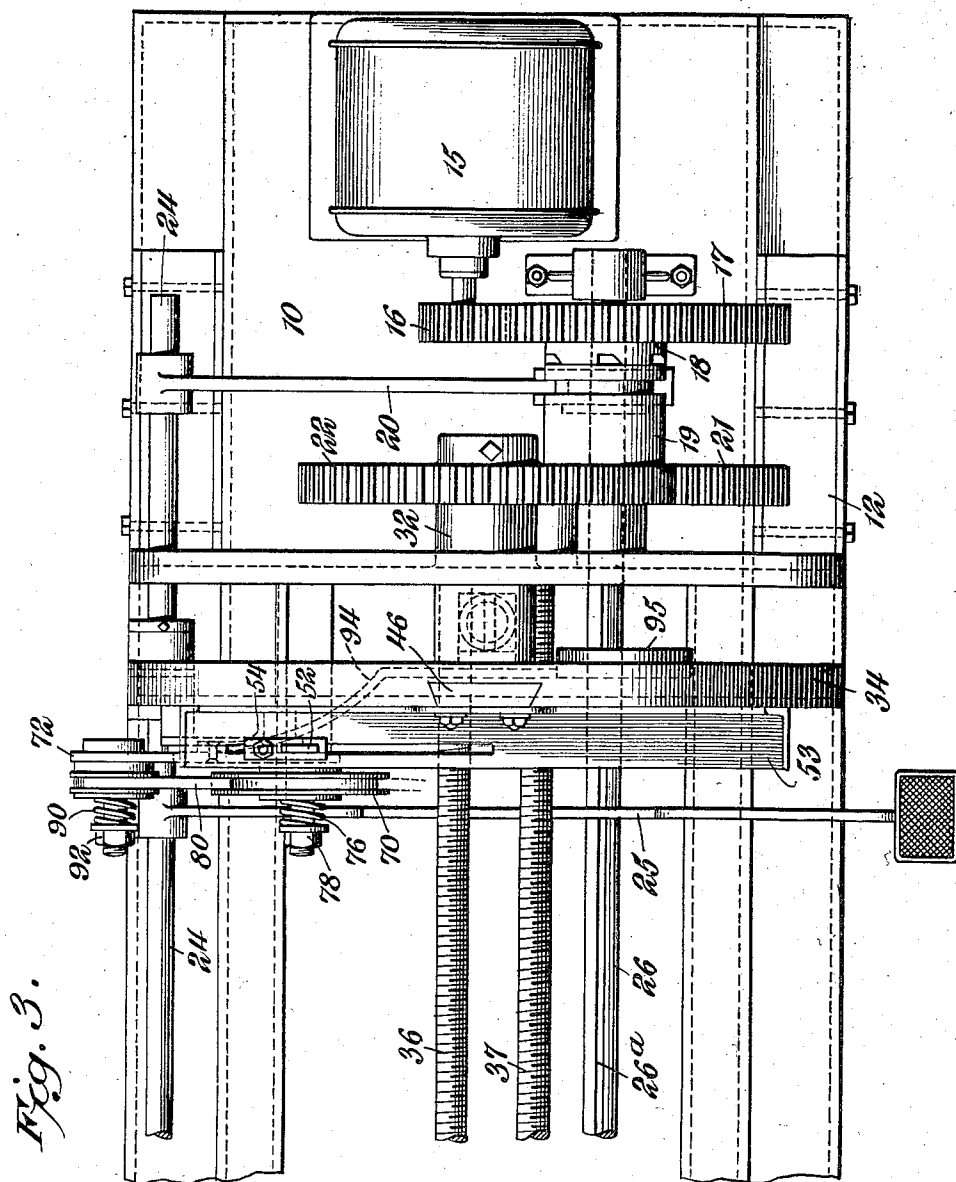
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J. M. LEAVER, JR

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J. M. Leaver, Jr.,
INVENTOR,

WITNESSES

Howard D. Orr,
Philip E. Siggers

BY

E. G. Siggers.

ATTORNEY

July 10, 1928.

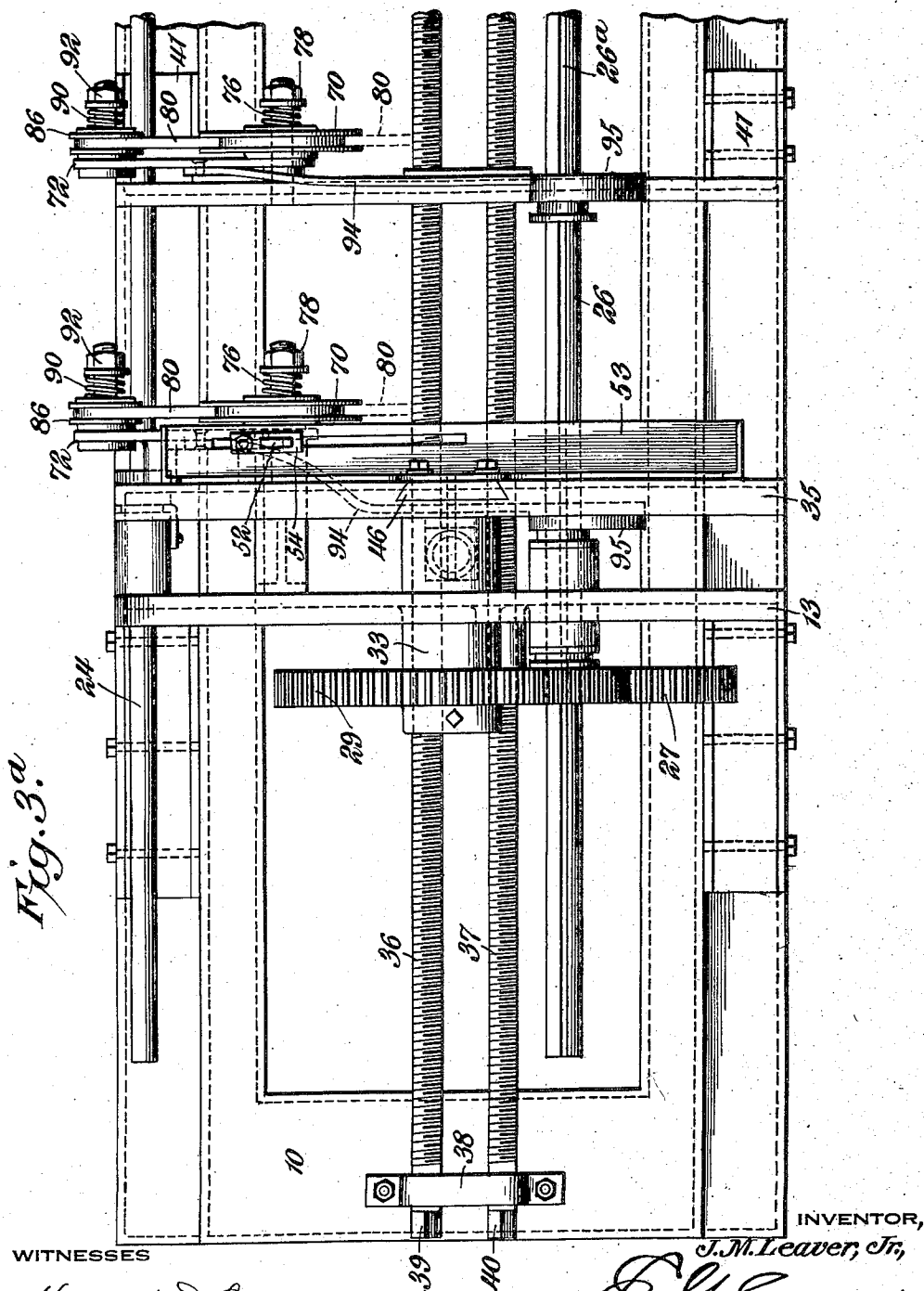
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J. M. LEAVER, JR

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WITNESSES

Howard R. Orr.

Philip E. Siggers

BY

J. M. Leaver, Jr.,
E. G. Siggers

ATTORNEY

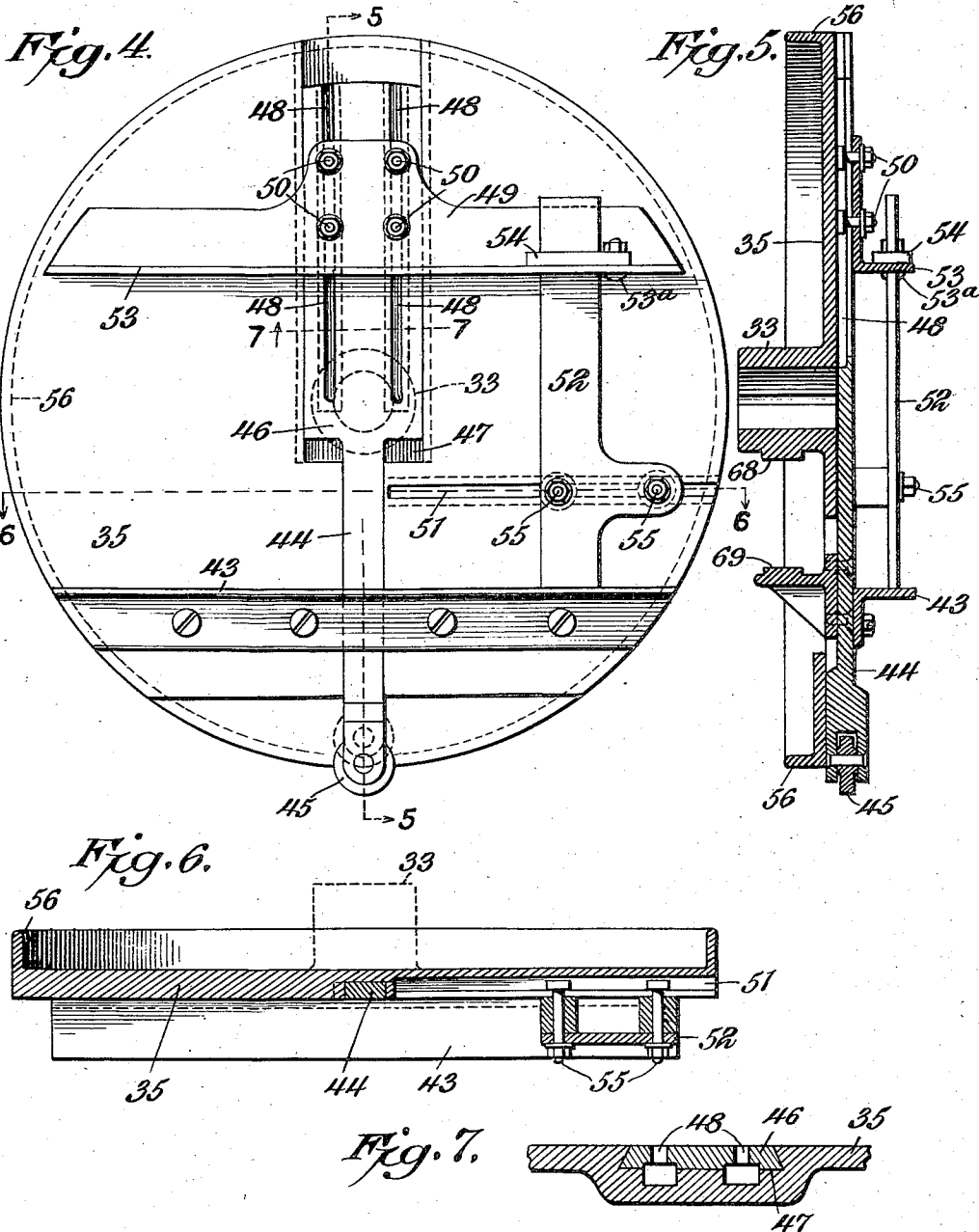
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J. M. LEAVER, JR
ROTARY BINDING MACHINE

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J. M. Leaver, Jr., INVENTOR,

WITNESSES

Howard D. Orr.

Philip E. Siggers

BY

P. E. Siggers

ATTORNEY

July 10, 1928.

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J. M. LEAVER, JR
ROTARY BINDING MACHINE

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Fig. 8.

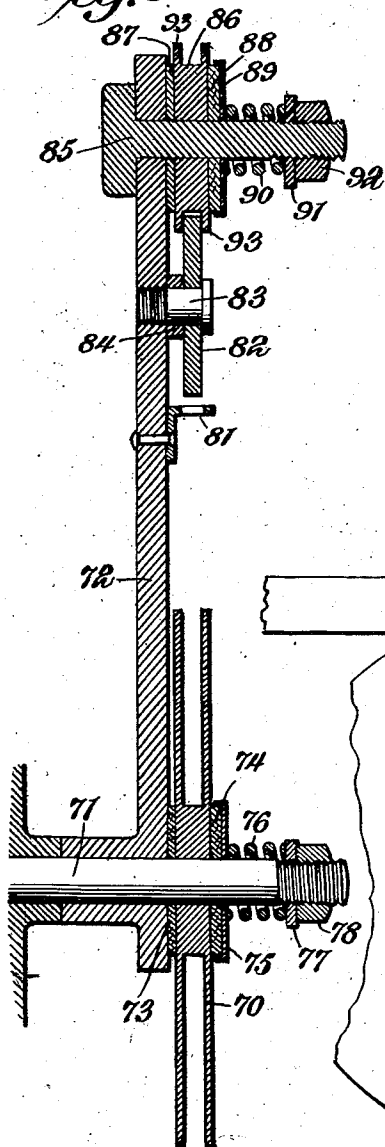
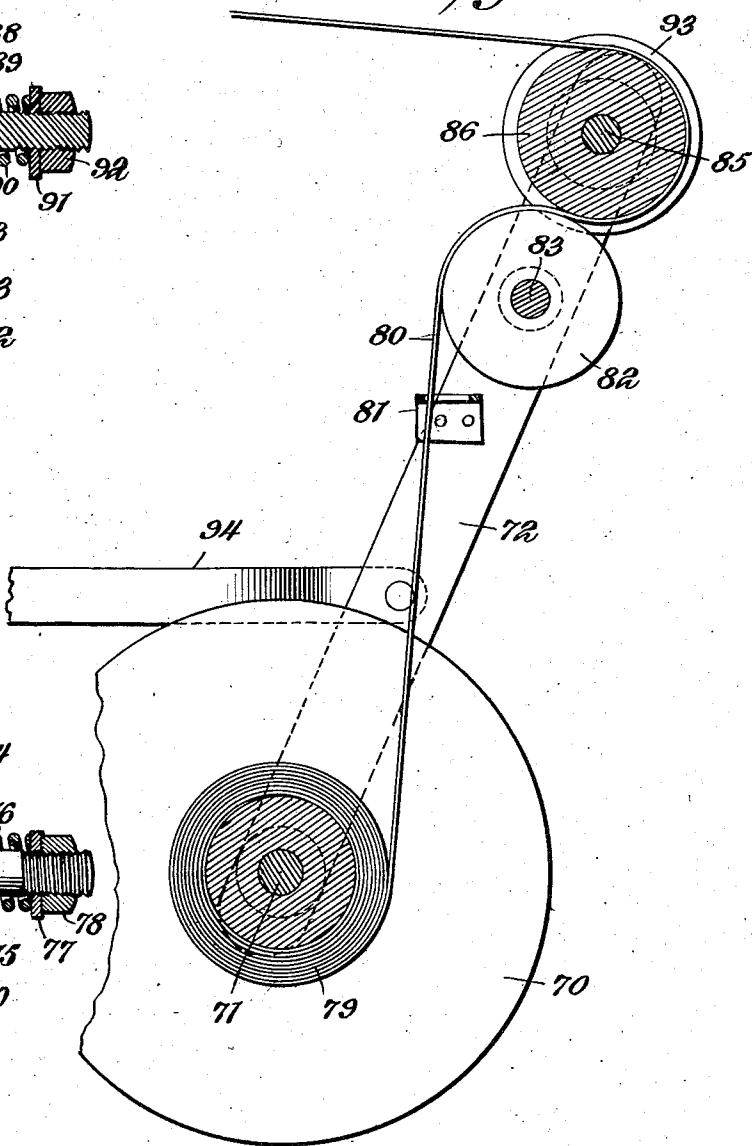


Fig. 9.



WITNESSES

Howard D. Orr.
Philip E. Siggers

J. M. Leaver, Jr., INVENTOR,

BY

E. G. Siggers

ATTORNEY

July 10, 1928.

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J. M. LEAVER, JR
ROTARY BINDING MACHINE

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Fig. 11.

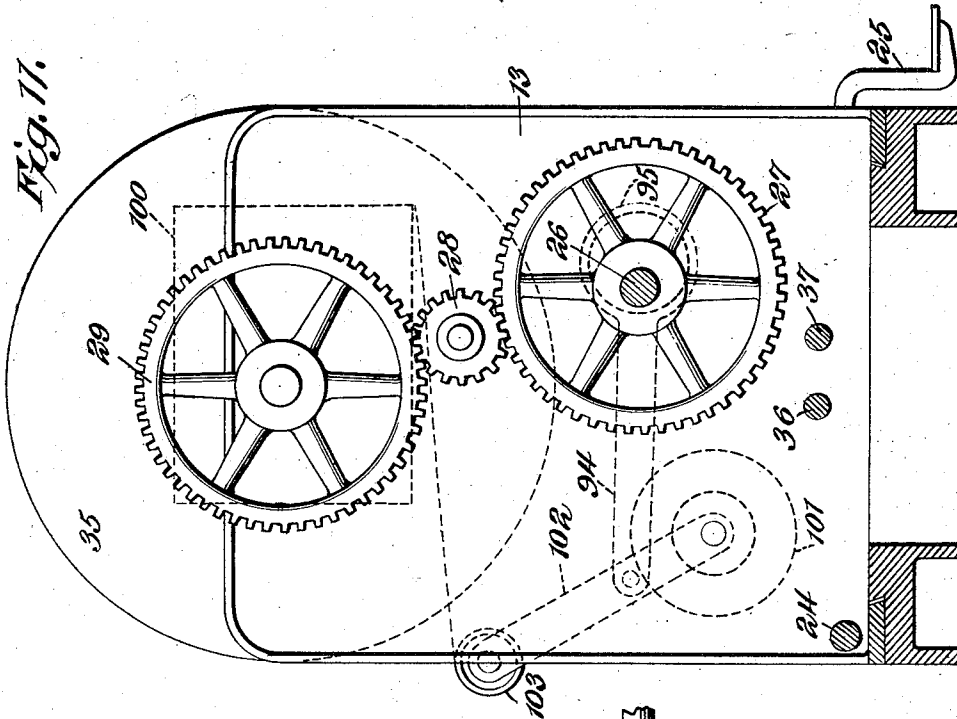
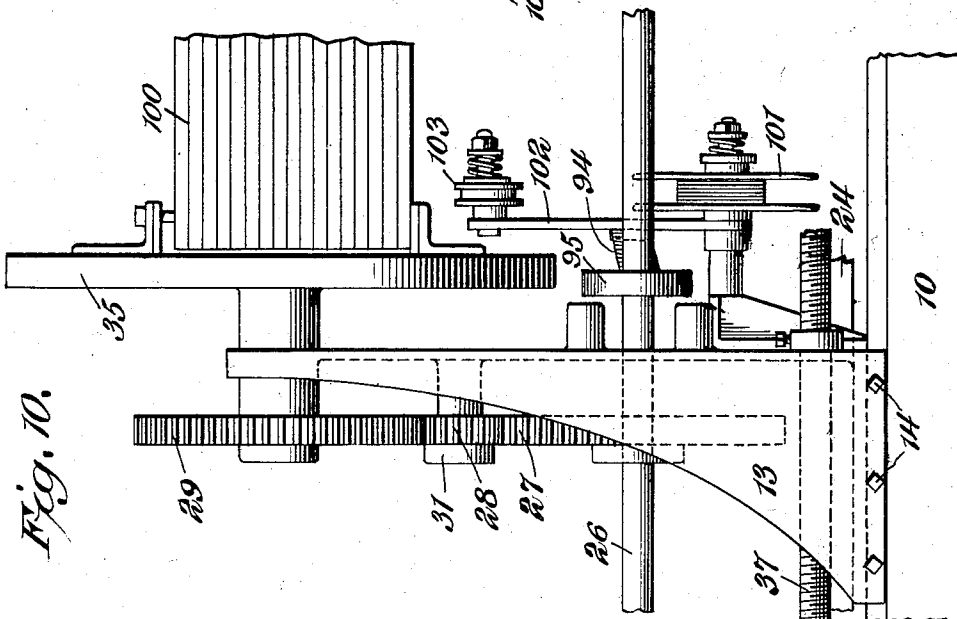


Fig. 10.



WITNESSES

Howard D. Orr.
Philip E. Siggers.

James M. Leaver, Jr., INVENTOR,

BY

P. E. Siggers

ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES MARSHALL LEAVER, JR., OF OAKLAND, CALIFORNIA.

ROTARY BINDING MACHINE.

Application filed May 10, 1920. Serial No. 380,376.

This invention relates to machines for binding bundles, boxes or the like with wires or other metallic bands. An object of the invention is to provide a machine which is capable of wrapping one or more bands at any desired point about a box or bundle whereupon the bands may be nailed or otherwise secured in place. Another object is to furnish a machine which will put a band under constant tension about a box or bundle regardless of the size of the same.

The invention may be understood by reference to one illustrative embodiment shown in the accompanying drawings, in which:

Fig. 1 is a front elevation of a machine for placing bands about bundles or boxes.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the right hand portion of the machine shown in Fig. 1.

Fig. 3^a is a similar view of the left hand portion of the machine.

Fig. 4 is an elevation of one of the clamping chucks.

Fig. 5 is a cross section on the line 5—5 of Fig. 4.

Fig. 6 is a cross section on the line 6—6 of Fig. 4.

Fig. 7 is a detail sectional view on the line 7—7 of Fig. 4.

Fig. 8 is a longitudinal cross section of one of the band carrying and tensioning devices.

Fig. 9 is an elevation of the same with parts in section.

Fig. 10 is a fragmentary front elevation of another form of a wire binding machine, omitting certain parts not essential to an understanding of the machine.

Fig. 11 is an end elevation of the machine of Fig. 10.

The base 10 of the machine is preferably supported by casters 11 so that the machine is portable. A standard 12 is fixed upon the base upon one end thereof and supports a rotary chuck with associated parts. A similar standard 13 is also mounted on the base, so as to be adjustable on the same toward and from the fixed standard 12, bolts 14 or the like being provided to clamp the standard 13 in any adjusted position. The adjustable standard 13 also supports a rotary chuck, the two rotary chucks comprising means whereby a box or similar article may

be clamped and rotated, for example about a horizontal axis.

Near the fixed standard 12 a motor 15 is shown, said motor having a driving pinion 16 meshing with a gear 17 which is secured to the driving portion 18 of a clutch, whose construction is not illustrated because it is not a part of this invention. The clutch also comprises the driven portion 19 which is secured upon the main driving shaft 26 of the machine. The gear 17 with the driving portion of the clutch is mounted loosely on the driving shaft and when the clutch is engaged it will be clear that the motor 15 will turn the driving shaft 26.

Also secured upon the shaft 26 is a gear 21 meshing with an idler 22 mounted upon a stub shaft 30 provided upon standard 12. The idler 22 in turn meshes with a gear 23 which is shown as of the same size as the gears 17 and 21, so that a single rotation of gear 17 will effect a single rotation of the gear 23. This arrangement is merely a matter of preference.

The driving shaft 26 has a key-way or a spline 26^a (see Figs. 3 and 3^a), whereby the gear 27 may rotate therewith and at the same time be adjustable along the same. The gear 27 meshes with an idler 28 supported upon the stub shaft 31 secured to the adjustable standard 13. A gear 29 of the same dimensions as gear 27 meshes with the idler 28. The gears 29 and 27 are entirely analogous to the gears 23 and 21 respectively, one set of gears being provided for each standard to rotate one of the chucks. The gear 23 is fixed upon a collar or sleeve 32 rotatably mounted at the upper end of standard 12 and fixed to the rotary chuck 34. The gear 29 in turn is fixed to a sleeve or collar 33 integral with the rotary chuck 35. The rotary chucks 34, 35 are exactly alike and have similar mechanisms associated therewith.

Extending longitudinally at the rear of the machine, at the base thereof, is a rock shaft 24. To this rock shaft is secured an operating lever 25 having a foot pedal at its outer end, as shown. Near the clutch end of the operating lever an arm 20 is fixed (see Fig. 3), which arm causes the clutch to engage when whereby simultaneous rotation of the chucks is effected. The preferred clutch is of that type which after a single

rotation automatically disengages itself, so when the foot-controlled lever is pressed, a single rotation of the chucks will take place and as the parts assume their initial position the clutch will be disengaged and the rotation will cease.

Also extending longitudinally of the machine are a pair of screw-threaded shafts 36, 37, one end of each of said shafts turning in a bearing 38 provided upon the base. The shafts 36, 37 have squared ends as indicated at 39 and 40 respectively (Fig. 3^a), whereby the shafts may be rotated, as with a wrench or similar tool. The shaft 36 engages with the adjustable standard 13 to move the same toward and from the fixed standard 12 so that the distance between the chucks may be varied to accommodate boxes of different lengths. An intermediate standard 41 is also adjustably mounted on the base having bolts 42 whereby it may be clamped in any adjusted position. The threaded shaft 37 engages with the standard 41 to change the position of the same independently of the adjustment of the standard 13 and associated parts. Thus it is seen that standard 41 may be shifted along the base toward either end chuck without changing the adjustment of standard 13.

Reference should now be made to Figs. 2 and 4 to 7 inclusive, wherein the construction of one of the end chucks 35 is shown. An angle bar 43 is fixed upon the inner face of this chuck to provide a convenient rest or fixed jaw upon which the box or similar article is supported. This fixed jaw co-operates with a movable clamping jaw to be described. An arm 44 is slidably mounted upon the chuck between the angle bar 43 and body of the chucks as seen in Figs. 4 and 5. This arm carries an enlarged head 46 which is made dovetailed in cross section as seen in Fig. 7. This dovetailed head 46 is slidably mounted in a similarly shaped slot 47 provided in the face of the chuck. The dovetailed head 46 is in turn slotted as indicated at 48 to receive bolts 50 or the like which bolts provide means whereby a clamping jaw 49 may be secured in adjustable positions along the head 46. The slots 48 extend approximately the entire length of the dovetailed head 46 as seen in Fig. 4 or for a length equal to the radius of the chuck. Thus the clamping jaw may be adjusted with respect to the fixed jaw 43. The lower end of the arm 44 carries a roller 45.

The clamping jaw 49 is shown provided by an angle bar with a flange 53 slotted as indicated at 53^a, Fig. 5, to receive the upper end of an adjustable chuck jaw 52. A slotted piece 54 is adjustably attached to the clamping jaw 49 to hold the adjustable jaw 52 in proper alignment. A T-head slot is provided in the face of the chuck and extends from the periphery thereof inward

for a distance nearly equal to the radius of the chuck. Bolts 55 adjustably secure the chuck jaw 52 along the slot 51. The chuck plate has an annular flange as indicated at 56.

The sleeve or collar 33 is provided with an offset boss or projection 68 and a similar projection 69 is provided on a bracket 67, fixed to the arm 44. A spring 66 is held upon said projections and exerts pressure upon the bracket to impart to the arm 44 a normal tendency to move into the position shown in Fig. 4. With the roller 45 extended beyond the periphery of the chuck and the clamping jaw 49 being fixed relatively to the arm 44, it is seen that the spring 66 also moves the clamping jaw into clamping or compressing position, whereby the box or similar article is held securely during the rotation of the chucks. The function of the adjustable chuck jaw 52 is to support the rear side of the box and hold the same in proper position upon the chuck.

The reason why the springs 66 are offset is because the knotter mechanism on each chuck is fixed and bundles having considerable width can only be supported to the rear of these knotter mechanisms which always form their knots substantially at the lower forward corner of the bundle. Since all bundles or other objects which are to be bound must have their corners in proper position relative to the knotter mechanisms, it will be clear that when very large bundles are being handled they will extend further to the rear of the chuck than forwardly thereof, and as the size of the bundles increases, the clamping action of the bar 99 becomes of greater importance. The offsetting of the springs causes the rear portion of large bundles to be clamped as firmly as the forward portion of such bundles. A further reason for offsetting the spring is to give the necessary clearance for operation of the knotter actuating parts (described in application Serial No. 380,375). This machine was designed to conform to commercial requirements, and these place a limitation upon dimensions.

Inasmuch as practically all boxes and packages are branded or labeled on ends, the sides, tops and bottom being subjected to wear, scratching and defacement due to handling and shifting during consignment, these machine chucks were especially designed to avoid such clamping devices as would tend to deface the ends of packages, boxes or bundles. The injury and consequent depreciation in value brought about by the use of end-penetrating securing devices is a serious matter and makes machines containing such devices commercially impracticable.

The means for moving the clamping jaw into and out of engagement with the box

will now be described. Reference should be made to Fig. 2 which shows the mechanism carried by the adjustable standard 13 for operating clamping jaw 49. This mechanism has its duplicate in a mechanism provided for the chuck mounted on the fixed standard 12. An engagement arm 57 is pivotally supported as at 59 upon the standard 13 and is normally urged in a downward direction by means of a spring 58. A bell crank lever 60 is also pivotally mounted as at 62 upon the standard 13 and carries a roller 61 at its upper end. The other end of the bell crank lever 60 is swingably connected with the link 63 in turn pivoted upon the end of an arm 64. The opposite end of the arm 64 is secured to the lever shaft 24. The normal position of these parts is shown in full lines in Fig. 2 when the arm 44 with its clamping jaw 49 is shown in raised position. When the operating lever 25 is depressed the parts will assume the position shown in dotted lines in this figure. The roller 61 moves out from under the engagement arm 57 whereupon the latter moves downwardly permitting the arm 44 to move outwardly under the influence of spring 66, whereupon the box is clamped by jaw 49.

As stated above the lever arm 25 also operates the clutch by means of the arm 20. The connection between the arm 20 and the clutch mechanism is such that the clutch is not engaged when the operating lever 25 is moved into the lower of the positions shown in Fig. 2, but is only engaged when the operating lever is depressed into a third position. The result of this arrangement is that when the operating lever is moved by the operator the box is first clamped, then a further movement of the operating lever causes rotation of the box a single turn. When the box assumes its original position the engagement arm 57 upheld by the vertical arm of the bell crank lever 60 forces the arm 44 inwardly whereupon the clamping jaw releases the box.

The described machine is well adapted to place flat metallic bands about boxes, bundles or other articles of a more or less rigid construction having a definite shape. The machine is so made that any number of these bands may be placed about a box and the spacing between them may be varied at will to suit all trade conditions. The two standards 12 and 13 each carry means for holding a supply of metallic bands and means for tensioning the same. The intermediate standard 41 carries similar means. The band holding and tensioning means of the three standards are exactly the same (see Figs. 2, 8 and 9).

As shown in the figures referred to, a reel 70 is rotatably mounted upon a pivotal element 71 secured to a standard. The pivotal element 71 carries a tension arm 72. Mount-

ed upon the pivotal element 71, between the reel 70 and the pivoted end of arm 72, is a friction disk 73. A similar disk 74 is also provided upon the reel support 71 to bear against the opposite face of the reel. A cap 75 fits over the friction disk 74. A spring 76 bears against the cap, a washer 77 and nut 78 being threaded upon the outer end of the pivotal element 71 to adjust the tension of spring 76. Obviously the spring causes the friction disks 73 and 74 to press against the sides of the reel 70 with a sufficient force to restrain free rotation of the same.

The width of the reel 70 is shown to be equal to the width of the metallic band 80 which it is designed to carry. Obviously by substituting a wire reel, wire bands may be used to bind the boxes or bundles. A coil 79 of a flat band is shown in Fig. 9. The band 80 passes up from the coil 79 through a band guide 81 fixed upon the tension arm 72 immediately below the crowding wheel 82. The band guide 81 directs the band over the periphery of the crowding wheel which is nothing more than a roller whose width is about that of the band. The crowding wheel 82 is rotatably mounted upon a pin 83 secured to the tension arm 72, a washer 84 spacing the crowding wheel off from the tension arm.

The upper end of the tension arm carries a tension wheel 86 rotatably upon a bolt 85. Friction disks 87 and 88 and a cap 89 and the spring 90, washer 91 and tension adjusting nut 92 are provided for the tension wheel 86, all of said parts being the same as the corresponding parts described in connection with the reel 70. The tension wheel has annular flanges 93 between which the crowding wheel 82 is received. The periphery of the crowding wheel is separated from the periphery of the tension wheel a distance about equal to the thickness of the band. Inasmuch as free rotation of the reel is prevented by the friction blocks and since rotation of the tension wheel is likewise retarded while the crowding wheel holds the band tightly pressed against the tension wheel it will be clear that a considerable tension may be exerted upon the band, which tension moreover is variable by adjustment of the nuts 78 and 92.

As shown in Fig. 2, the band 80 is carried upwardly from the tension wheel 86 to the lower outside corner of a box to be bound. When the box is first placed in the machine the end of the band will be secured near the stated corner of the box by means of a nail 96 or the like. If the machine is used to place wires around bundles or boxes, the ends of each wire will be secured by staples. When the box 97 is rotated, the band 80 will be wrapped about the same and when the parts assume their original position, after a single rotation, the tensioned band will overlap that end which is secured to the

box at 96 whereupon a second nail may be driven through the band into the box, which will securely bind the box with the band under permanent tension.

5 It has been found when binding boxes of small dimensions that at a certain point in the rotation thereof the band ceases to be drawn out against the resistance of the tensioning means. In other words there is a
10 neutral point which causes a certain slack to form in the band. To insure the maintenance of the working length of the band in the necessary taut condition, the tension arm 72 is constructed and arranged to have a compensating action, or in other words to yield
15 and retract a portion of the working length of the band during the wrapping of the box. Conveniently, the band yielding and retracting action of the arm 72 is obtained by oscillation of said arm toward and from the box,
20 during rotation by the chucks. The arm oscillating means consists of an eccentric 95 mounted upon the drive shaft 26 and adjustable along with its associated standard. An
25 arm 94 connects the eccentric to the tension arm so that rotation of the drive shaft is translated into oscillation of the tension arm. The drive gearing described causes a single rotation of the chucks, and consequently of
30 the clamped box, during each cycle of the machine. The tension arms are all oscillated simultaneously so that each of the several bands which are being placed about the box will have the same tension.

35 In the illustrative machine, the point at which the slack compensation is greatest is reached when the box has been rotated more than three quarters of a revolution, when the band has just encompassed the box, this is
40 the point at which said compensation is usually most needed to insure a tightly bound box.

In Figs. 10 and 11 is shown an embodiment of the present invention especially
45 adapted to wrap wire or similar binding means about bundles of material such as lumber. The machine of these figures supports a bundle 100 between two end chucks exactly like the end chucks described above, which
50 chucks are rotated in unison with the drive shaft 26 by means of the gears 27, 28, 29. An eccentric 95 is secured to the drive shaft 26 and has an arm 94 in pivotal engagement with a tensioning arm 102. The tensioning
55 arm 102 is mounted on the same pivot as the wire reel 101 so as to rock about that pivot, and carries at its upper end a tensioning wheel 103. This tensioning arm is oscillated precisely as is the arm 72 of the previously
60 described embodiment of the invention. A wire knotting means may be provided upon the rotary chuck so as to knot the wire when wrapped about the bundle ends. Such knotting mechanism may be of any preferred
65 form. One form of knotting mechanism

well adapted for a machine of this character is described and claimed in the generic application to which reference has been made above. Instead of knotting the wire, its ends may be secured by a staple or similar
70 element.

The machine shown in Figs. 10 and 11 is illustrated to show that a pair of end chucks and the associated parts may be employed without any intermediate chucks in
75 a wire binding machine. The first described type of machine in this case is especially adapted to place flat bands about boxes, while the type of machine shown in Figs. 10 and 11 handles wire.

80 The present application is related to an application filed of even date herewith, Serial No. 380,375. The chief difference between the machine of the present invention and the machine of the copending application is that
85 the present machine comprises in the main two end chucks and therefore is well adapted to place metallic bands or wires about bundles, boxes or similar articles of fixed form. The machine of Figs. 10 and 11, may however be used to wrap and then knot wire
90 about bundles of substantially non-compressible material, as lumber. Furthermore, the machine may wrap each band, if the band is a wire, any number of times about a box or
95 bundle, and when the wrapping is completed, the wire may be secured by a staple instead of a knot.

Among the advantages of the present machine are that it is adjustable to boxes or
100 bundles of any size, that it places a plurality of bands about the box wherever desired, and that the bands are maintained under constant tension whether the box be large or small. While only one intermediate standard
105 has been shown carrying band supporting and tensioning means, it will be obvious that the machine of the present invention may employ two or more standards similar to 41 whereby four or more tensioned bands
110 may be simultaneously placed about a box. It is within the scope of my invention to do away with the automatic slack compensating means and to employ tension arms similar to those described, but fixed upon
115 the standards. This construction is described and shown in the copending case. If boxes of a standard size are to be bound, it will be clear that the automatic take-up of the slack in the band will not be necessary.
120 Furthermore, it will be obvious that by pressing on the operating pedal after once enveloping an object, another envelopment will take place; thus permitting the binding of the object as securely as may be desired.

Obviously the present invention is not restricted to the particular embodiments thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly since they
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may be employed advantageously in various combinations and subcombinations as defined in the claims.

What is claimed is:

- 5 1. In a machine of the class described, a pair of rotary chucks arranged to turn about a common horizontal axis, each chuck being adapted to support the end of a bundle, means for wrapping a band about a bundle during the rotation of the chucks, said wrapping being completed before the completion of said rotation, and means for automatically releasing said bundle when it assumes its original position.
- 15 2. In a machine of the class described, means for rotating a bundle, means for holding the bundle during rotation, said holding means including a fixed jaw providing a rest, and a spring-actuated clamping jaw movable toward and from the rest, said spring being offset with respect to the axis of rotation.
- 25 3. In a machine of the class described, a rotary chuck having a fixed jaw, a clamping jaw slidably mounted on said chuck, an arm fixed to the clamping jaw and slidable therewith, said jaw being adjustable with respect to said arm, and means normally urging said clamping jaw toward said fixed jaw.
- 35 4. In a machine of the class described, a rotary chuck having a fixed jaw, a clamping jaw slidably mounted upon said chuck, an arm fixed to the clamping jaw and slidable therewith, said jaw being adjustable with respect to said arm, means for normally urging said clamping jaw toward said fixed jaw, and means for controlling movements of both the clamping jaw and the rotary chuck whereby the bundle is first clamped, then rotated and finally released.
- 45 5. In a machine of the class described, a rotary chuck, a guiding slot provided on the chuck, an arm slidable in said slot and extending beyond the edge of said chuck, a clamping jaw secured to the arm, and means for engaging with the extended end of the arm to move the jaw at the completion of each revolution of the chuck.
- 55 6. In a machine of the class described, a rotary chuck, an arm slidably mounted on said chuck and extending beyond the edge of said chuck, a clamping jaw adjustably secured along said arm, and means for engaging with the extended end of the arm to move the jaw at the completion of a revolution of the chuck.
- 60 7. In a machine of the class described, a rotary chuck, a guiding slot provided on the chuck, an arm slidable in said slot and extending beyond the edge of said chuck, a clamping jaw secured to said arm within the confines of said chuck, and a swingable engagement arm adapted to encounter the extended end of the slidable arm to move the jaw once in each revolution of the chuck.

8. In a machine of the class described, a rotary chuck, a guiding slot provided on the chuck, an arm slidable in said slot to extend beyond the edge of said chuck, a clamping jaw secured to said arm, means for imparting a tendency to said arm to move into the position stated with the jaw in clamping position, and means engaging with the extended end of the arm to move the jaw against the resistance of the last-mentioned means at the completion of the revolution of the chuck.

9. In a machine of the class described, a rotary chuck, a guiding slot provided on the chuck, an arm slidable in such slot and extending beyond the edge of said chuck, a clamping jaw adjustably secured to said arm, means for maintaining said clamping jaw in clamping position during the revolution of said chuck, and operator-controlled means capable of engagement with the extended end of the arm to release the jaw at the end of each revolution of the chuck.

10. In a machine of the class described, a support, a rotary chuck mounted on the support, a clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support and normally supporting an engagement arm, said engagement arm being also pivoted upon the support and normally upholding the clamping jaw.

11. In a machine of the class described, a support, a rotary chuck mounted on the support, a clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support and normally upholding an engagement arm, said engagement arm being also pivoted upon the support and normally upholding the clamping jaw arm, and means for turning said lever whereby the engagement arm is allowed to move away from the clamping jaw arm to permit clamping action of said jaw.

12. In a machine of the class described, a support, a rotary chuck mounted on the support, a clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support, said lever mounting a roller at one end, an engagement arm riding upon said roller when the machine is at rest, said clamping jaw arm also having a roller, the engagement arm being pivoted upon the support and engaging the roller of the clamping jaw arm when the machine is at rest.

13. In a machine of the class described, a support, a rotary chuck mounted on the support, a clamping jaw provided on the rotary chuck and having an arm, said arm being provided at its outer end with a roller, means imparting to said arm a tendency to project its roller bearing end beyond the edge of the chuck, a lever pivoted upon the support and having a roller mounted at one end, an engagement arm supported by the

roller of said lever when the machine is at rest, said engagement arm being also pivoted upon the support and in engagement with the roller of the clamping jaw arm to
 5 release the clamping jaw when the machine is at rest, and means for causing swinging of said lever.

14. In a machine of the class described, a support, a rotary chuck mounted on the support, a spring-actuated clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support, said lever normally supporting an engagement arm, a spring for impelling said engagement
 15 arm against said lever, said engagement arm being also pivoted upon the support and normally upholding the clamping jaw arm.

15. In a machine of the class described, a support, a rotary chuck mounted on the support, a spring-actuated clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support, said lever normally supporting an engagement arm, a spring for impelling said engagement
 25 arm against said lever, said engagement arm being also pivoted upon the support and normally upholding the clamping jaw arm, and means for turning said lever whereby the engagement arm is permitted to
 30 move away from the clamping jaw arm to allow clamping motion of said jaw.

16. In a machine of the class described, a support, rotary chucks mounted on the support, means for rotating said chucks, a
 35 clamping jaw provided on the rotary chuck and having an arm, a lever pivoted upon the support and normally upholding an engagement arm, said engagement arm being also pivoted upon the support and normally upholding the clamping jaw arm, means for
 40 swinging said lever whereby the engagement arm is permitted to move away from the clamping jaw arm to allow clamping action of the jaw, the means for swinging said lever cooperating with the means for rotating the
 45 chucks so that the clamping jaw is actuated before the start of said rotation and is released at the completion thereof.

17. In a machine of the class described, a support, a rotary chuck mounted on the support, a slotted guide provided on said chuck, an arm slidable within said guide, a clamping jaw adjustable on said arm, a lever pivoted upon the support, an engagement
 55 arm normally upheld by said lever and also pivoted upon the support, said engagement arm normally upholding the clamping jaw arm.

18. In a machine of the class described, a support, a rotary chuck mounted on the support, an arm slidably mounted on said chuck, a clamping jaw lying at substantially right angles to said arm and adjustable longitudinally of the same, a lever pivoted upon
 60 the support, an engagement arm normally

supported by said lever and being also pivoted upon the support, said engagement arm normally upholding the clamping jaw arm.

19. In a machine of the class described, a drive shaft, power means for turning said shaft, a clutch interposed between the power means and the shaft, said clutch permitting a single rotation of the shaft at one time, rotatable means for supporting an article, means interposed between said supporting means and the drive shaft whereby the supporting means is rotated once on its axis during each cycle of the machine, means for wrapping a band about the article during
 80 said rotation, and means automatically yielding and retracting said band while being wrapped about the article.

20. In a machine of the class described, a power driven drive shaft, means permitting a single rotation of the drive shaft at one time, rotatable means for supporting an article, means interposed between said supporting means and the drive shaft whereby the supported article is rotated synchronously with the drive shaft, means for wrapping a band about the article during such rotation, and means for maintaining said band constantly tensioned during said rotation.

21. In a machine of the class described, a power driven drive shaft, means permitting a single rotation of the drive shaft at one time, rotatable means for supporting an article, means interposed between said supporting means and the drive shaft whereby the supporting means is rotated once synchronously with the drive shaft, means for wrapping a band about the article during said rotation, means for tensioning the band including an arm, and means for moving the tensioning means to compensate for any
 105 slack in the band.

22. A machine of the class described, comprising, in combination, means for rotating a bundle, means for wrapping a tensioned band about the bundle as it is rotated, and oscillatory power-actuated means for compensating for the variation in the tension in said band brought about by engagement of the band with the bundle during the rotation of the bundle.

23. In a machine of the class described, means for holding and rotating a bundle, means for placing a band under tension about the bundle during rotation, and automatically actuated means for maintaining a substantially constant tension in said band as it is wrapped about the bundle.

24. In a machine of the class described, means for placing a band under tension about a bundle, means for automatically maintaining the tension of said band as it is placed about the bundle, said means acting to compensate for slack formed in the band, the parts being so constructed and arranged that said compensation is small when the
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wrapping starts, increases to a maximum as the bundle is completely encompassed and decreases somewhat as the parts assume their original position.

25. In a machine of the class described, a rotary bundle support, means for placing a band under tension about a bundle during rotation thereof by said support, means arranged beneath the supported bundle for maintaining the tension of said band automatically as it is placed about the bundle, said means acting to compensate for slack formed in the band, the parts being so constructed and arranged that the compensation is at a minimum when the lower side of the bundle has been engaged by the band, increases to a maximum as the bundle is encompassed, and decreases slightly as the parts assume their original position.

26. In a machine of the class described, means for rotating a bundle, means for placing a band about the bundle as it is rotated, and means for compensating for variation of tension in the band caused by the rotation of the bundle, the parts being so constructed and arranged that said compensation increases to a maximum when the bundle has been rotated more than three-quarters of a revolution.

27. In a machine of the class described, means for rotating a bundle, means for wrapping a plurality of bands about the bundle as it is rotated, operator controlled means for adjusting the lateral spacing of the bands, and means cooperating with each band for compensating for variation in the tensions of said bands caused by the rotation of the bundle.

28. In a machine of the class described, a plurality of rotary chucks, each chuck having cooperating therewith means for supporting and clamping a bundle, means for wrapping a band about the bundle, means for placing the band under tension during the wrapping operation, and means for moving said tensioning means to compensate for the variation in band tension caused by the rotation of the bundle.

29. In a machine of the class described, a plurality of rotary chucks, means on each chuck for supporting and clamping a bundle, means to simultaneously rotate the chucks, means for controlling the two previously mentioned means, said last-named means operating to first cause clamping of the bundle, then rotation of the bundle, and finally releasing the bundle, means for placing a band about the bundle during the rotation, means for tensioning the band, and means for compensating for the variation of tension caused by the rotation of the bundle.

30. In a machine of the class described, means for rotating a bundle, means for placing a plurality of bands about the bundle as it is rotated, means for adjusting the spacing

of the bands relatively to each other, means for tensioning each band, means for adjusting said tensioning means, and means for compensating for the variation in the tensions of said bands caused by the rotation of the bundle.

31. In a machine of the class described, means for clamping a bundle, means for rotating the bundle when clamped, means for placing a band about the bundle as it is rotated, means for tensioning the band, means for compensating for the variation in tension of the band caused by the rotation of the bundle, and means for releasing the clamping means as the bundle assumes its original position.

32. In a machine of the class described, a plurality of rotary chucks mounted to turn about a common horizontal axis, each of said chucks having means for supporting and clamping a bundle, means for placing a band under tension about a bundle, means for maintaining the tension of said band automatically as it is placed about the bundle, and means for compensating for any slack formed in the band, said compensation being small when the wrapping starts, increasing to a maximum as three sides of the bundle are encompassed and decreasing again as the parts assume their original positions.

33. In a machine of the class described, a reel, a support for the same, means for retarding free rotation of the reel, an arm pivoted on the reel support, a tension wheel on said arm, means for restraining free rotation on said wheel, a band carried by the reel and passing up over the tension wheel, and means for swinging said arm to change the tension of said band.

34. A machine of the class described, comprising, in combination, a drive shaft, an eccentric arm mounted on said shaft, a support, a band tensioning arm pivoted upon the support, the eccentric arm being connected to the band tensioning arm, whereby the band tensioning arm is rocked to regulate the tension of bands carried upon the band tensioning arm.

35. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a support, a tension arm pivoted upon the support, the eccentric arm being connected to the tension arm, said tension arm carrying a band, means on the tension arm for regulating the tension in said band, the oscillations of the tension arm by the eccentric arm acting to take up the slack in said band.

36. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a tension arm pivoted upon a support, a reel mounted on said support for carrying a band, the eccentric arm being connected to the tension arm, said band hav-

ing its slack taken up by said tension arm when swung.

37. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a tension arm pivoted upon a support, a reel rotatable on the same support and carrying a band, the eccentric arm being connected to the tension arm, the support and the tension arm carrying means for creating a tension in said band, the eccentric arm swinging the tension arm.

38. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a tension arm pivoted upon a support, the eccentric arm being connected to the tension arm, a reel carrying a band rotatably mounted on the support, means for restraining free rotation of the reel whereby the band is put under tension, means on the tension arm for adding to the tension of the band, said tension arm being oscillated by the eccentric arm whereby slack is taken up in the tensioned band.

39. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a tension arm pivoted upon a support, the eccentric arm being connected to the tension arm, and a band having a tension imparted thereto by the tension arm, the tension arm being swung about its pivot whereby the tension is periodically increased and diminished.

40. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a support, a tension arm pivoted upon the support, a tension wheel mounted upon the free end of the tension arm, means for restraining free rotation of the tension wheel, the eccentric arm being connected to the tension arm, whereby the tension of a band is regulated by swinging of the tension arm.

41. In a machine of the class described, a drive shaft, an eccentric arm mounted upon said shaft, a support, a tension arm pivoted upon the support, the eccentric arm being connected with the tension arm, the latter arm carrying a tension wheel for engagement with a band, means for retarding free rotation of the tension wheel, a band carrying reel mounted on the support and means for restraining free rotation of the reel.

42. In a machine of the class described, a drive shaft, an eccentric arm mounted on said shaft, a support, a tension arm pivoted upon the support, a reel rotatably carried by said support, the eccentric arm being connected to the tension arm whereby each rotation of the drive shaft causes the tension arm to oscillate, a tension wheel mounted on the free end of the tension arm, means for restraining free rotation of the wheel, means for regulating said restraining means, said tension wheel being of such dimensions as to permit wrapping of a flat band carried

by the reel about the wheel less than one turn.

43. A machine of the class described comprising, in combination, a drive shaft, means for supporting an article, means interposed between the supporting means and the drive shaft whereby the article supporting means is rotated once on its axis at a time, means for clamping the bundle during said rotation and means for wrapping a band about the article during said rotation.

44. A machine of the class described comprising, in combination, a drive shaft, means for supporting an article of definite form and dimensions and substantially incompressible, means interposed between said supporting means and the drive shaft whereby the supporting means is rotated once on its axis during each binding operation, means for wrapping a band about the article during said rotation and means for maintaining said band under a substantially constant tension.

45. In a machine of the class described, a base, a pair of chucks mounted on the base, said chucks having means upon which an article may rest for support and positioning, one chuck being fixed, the other chuck being adjustable toward and from the first chuck to accommodate various lengths of articles, and means cooperating with each chuck for placing a band about an article supported between the chucks.

46. In a machine of the class described, a base, a pair of chucks mounted on the base, one chuck being fixed, the other chuck being adjustable on the base, each chuck having means upon which an article may rest for support and positioning, means cooperating with each chuck for placing a band about an article supported on the chucks, and means intermediate the chucks and adjustable along the base for placing a band about the article between the outer bands.

47. In a machine of the class described, a base, a pair of chucks mounted on the base, one chuck being fixed, the other chuck being adjustable on the base, each chuck having means to support an article, means cooperating with each chuck for placing a band about an article, and means intermediate the chucks and adjustable independently of the adjustable end chuck for placing a band about the article between the outer bands.

48. In a machine of the class described, a base, a pair of chucks supported upon the base, one chuck being fixed, the other chuck being adjustable on the base, each chuck having means to support an article, and means operatively cooperating with the rotation of each chuck for placing a band under substantially constant tension about an article supported on the chuck.

49. In a machine of the class described, a base, a pair of chucks mounted on the base,

said chucks being relatively adjustable, each chuck having means to support an article, means cooperating with each chuck for placing a band about the article, means intermediate the chucks and adjustable along the base for placing a band about the article between the outer bands, and means for maintaining each of the bands under a substantially constant tension during said placing.

50. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, means cooperating with each chuck for placing a band under substantially constant tension about the article, and means for compensating for the slack formed in said bands during the placing of the bands.

51. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, the two chucks being adjustable relatively to each other, means cooperating with each chuck for placing a band about an article, and means for automatically taking up slack formed in said bands.

52. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, means cooperating with each chuck for placing a band about an article supported on the chucks, means intermediate the chucks and adjustable along the base for placing a band about the article between the outer bands, and means for taking up slack formed in each band.

53. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, means cooperating with each chuck for placing a band about the article supported on the chucks, means intermediate the chucks for placing a band about the article between the outer bands, means for independently tensioning each of said bands, and means for taking up the slack in each band.

54. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, the two chucks being adjustable relatively to each other, means cooperating with each chuck for placing a band about an article, and a standard mounted on the base intermediate of the chucks and adjustable there-between, said standard carrying means for placing a band about the article.

55. In a machine of the class described, a base, a pair of chucks mounted on the base, each chuck having means to support an article, the chucks being adjustable relatively to each other, standards rotatably supporting the chucks, a standard intermediate the chuck supporting standards and mounted on the base below the article supported upon the end chucks, each of said standards car-

rying means whereby a band may be placed about the article when rotated.

56. In a machine of the class described, a base, a standard fixed upon the base, a second standard adjustable along the base, article-supporting chucks mounted upon each of said standards, a third standard intermediate the chuck supporting standards and independently adjustable, each of said standards carrying means for supporting a band and for imparting a constant tension to the same.

57. In a machine of the class described, a power-driven gear, a second gear of the same size as the power-driven gear and coaxial therewith, a clutch interposed between the two gears, a third gear of equal size with the other two gears and rotatable with the second gear, a rotary chuck turned by the third gear, said clutch permitting a single rotation of the three gears in unison and thereafter automatically disengaging itself whereby the chuck in turn is rotated once on its axis.

58. In a machine of the class described, an article support, means for wrapping a band about the article, means for tensioning said band, said tensioning means comprising a band reel, means for retarding free rotation of the reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm and a tension wheel adjacent the crowding wheel.

59. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm, a tension wheel adjacent the crowding wheel, the distance between the peripheries of the crowding wheel and the tension wheel being substantially equal to the thickness of said band.

60. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm, a tension wheel adjacent the crowding wheel and means for retarding free rotation of the tension wheel.

61. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, means for retarding free rotation of the reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm, a tension wheel adjacent the crowding wheel and means for restraining free rotation of the tension wheel.

62. A machine of the class described comprising, in combination, means constructed

and arranged to wrap a bundle with a tensioned band; and power-actuated means constructed and arranged to yield and retract the band during the bundle wrapping step, so that any uneven feeding of the band during the bundle wrapping is compensated for and a substantially uniformly-tensioned band is placed about the bundle.

63. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm, and a tension wheel adjacent the crowding wheel, said tension wheel having flanges between which the crowding wheel is received.

64. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, a tension arm, a crowding wheel on the tension arm, a tension wheel adjacent the crowding wheel, said tension wheel having flanges between which the crowding wheel is received, the distance between the peripheries of the crowding wheel and the tension wheel being substantially equal to the thickness of the band, and means for restraining free rotation of the tension wheel.

65. In a machine of the class described, means for wrapping a band about an article, means for tensioning said band, said tensioning means comprising a band reel, a tension arm, a crowding wheel on the tension arm, said crowding wheel having a width equal to that of the band, a band guide on the tension arm mounted immediately below the crowding wheel to hold the band on the periphery of said wheel, and a tension wheel adjacent the crowding wheel over which the band is led.

66. In a machine of the class described, means for wrapping a band about an article, means for tensioning the band, said tensioning means including a band reel, a tension arm, a band guide on the tension arm, a crowding wheel on the tension arm and a tension wheel adjacent the crowding wheel, the band being carried upon the reel and fed through the band guide, over the crowding

wheel, between the crowding wheel and the tension wheel, and over the tension wheel.

67. A machine of the class described, comprising, in combination, a rotary reel for holding a band supply; means for retarding feed of said band, including means for retarding free rotation of the reel, a tension arm mounted to swing about the axis of the band reel, means for retarding delivery of the band from the end of the tension arm; and means for rocking the tension arm to compensate for variance in the feeding, and hence in the tension, of the band.

68. A machine of the class described comprising, in combination, a rotary bundle support; means for holding a band supply in such relation to the bundle support that, upon rotation thereof, the band is wrapped about the bundle; means for retarding feed of the band; and means compensating for slack in the band and active to compensate to a maximum degree at a predetermined point in the rotation of the bundle support.

69. A machine of the class described comprising, in combination, a rotary bundle support; means for wrapping a band about the bundle during rotation thereof; and means compensating for uneven feeding of the band during the bundle wrapping and active to compensate to a maximum degree when the bundle is completely enveloped by the band.

70. A machine of the class described comprising, in combination, a pair of simultaneously rotatable bundle supports; means for holding a band under substantial tension and in position to be engaged by the bundle when rotated by its supports; an operator controlled means for readily adjusting at any time the relative position of such supports to accommodate bundles of different lengths; each of said bundle supports mechanically connected with a band holding means so that adjustment of the supports also adjusts the spacing of the wrapped bands.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

JAMES MARSHALL LEAVER, JR.