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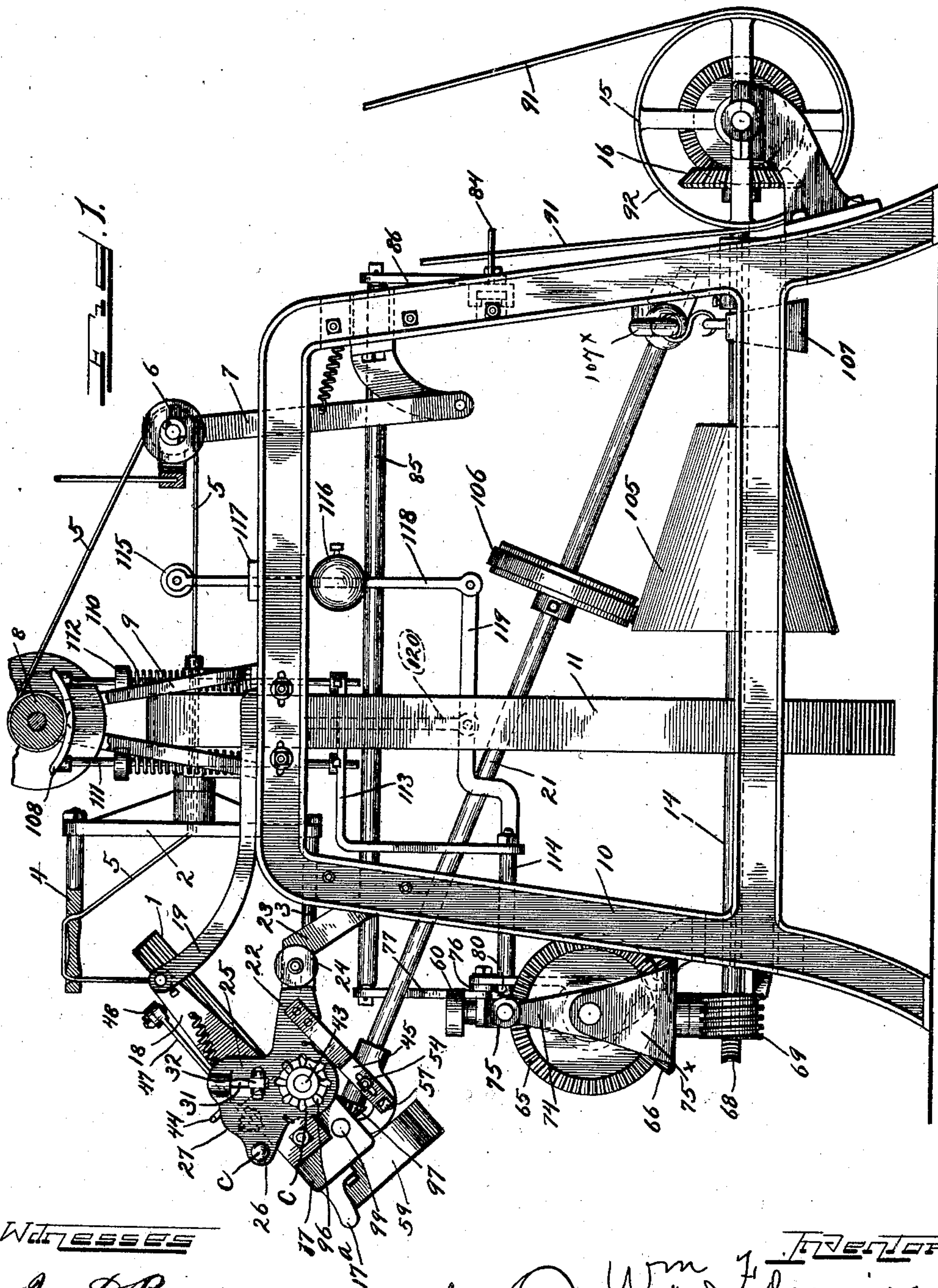
Patented Apr. 1, 1902.

W. FLEMING.
BALLING MACHINE.

(Application filed May 31, 1901.)

(No Model.)

7 Sheets—Sheet 1.



Witness

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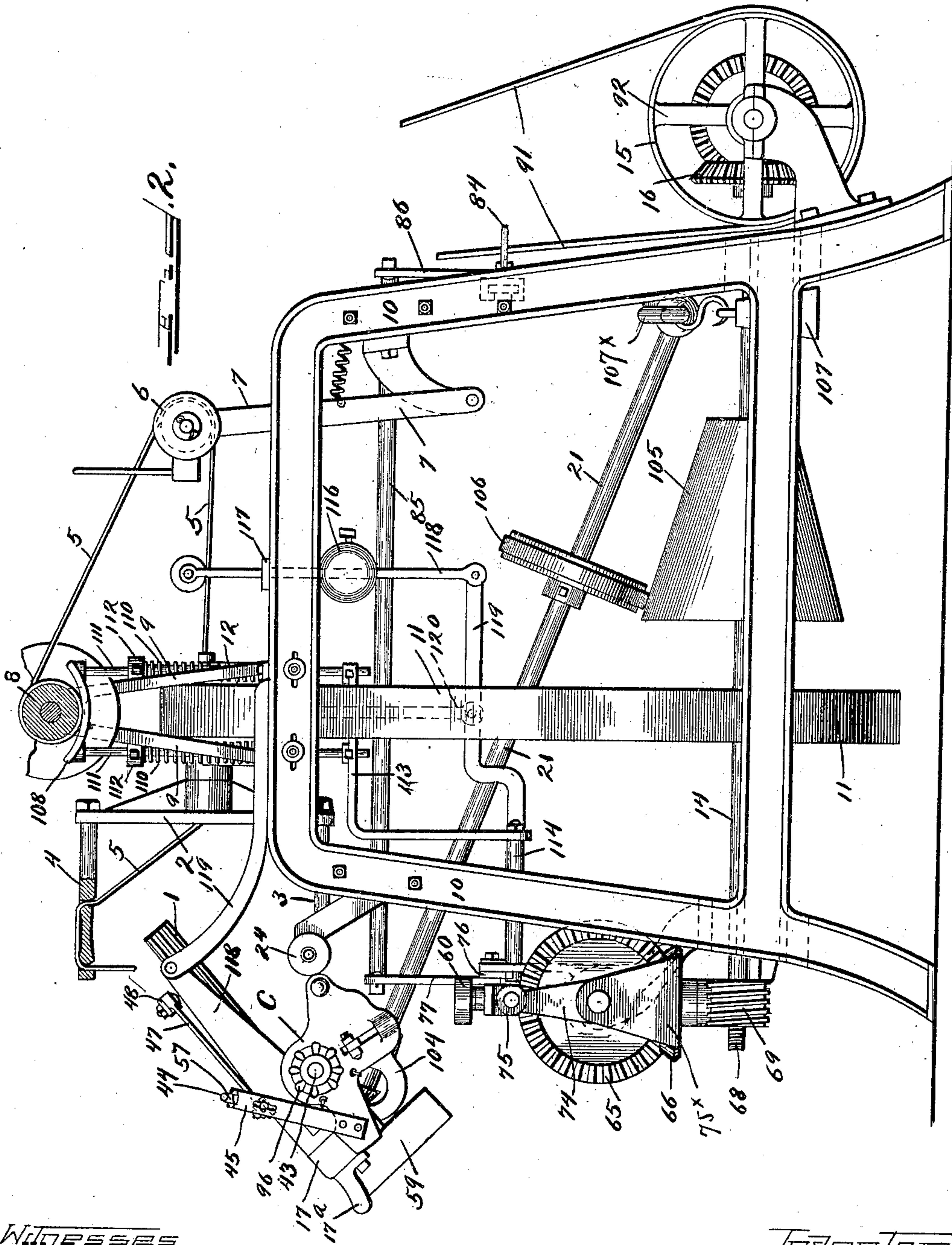
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7 Sheets—Sheet 2.



WITNESSES

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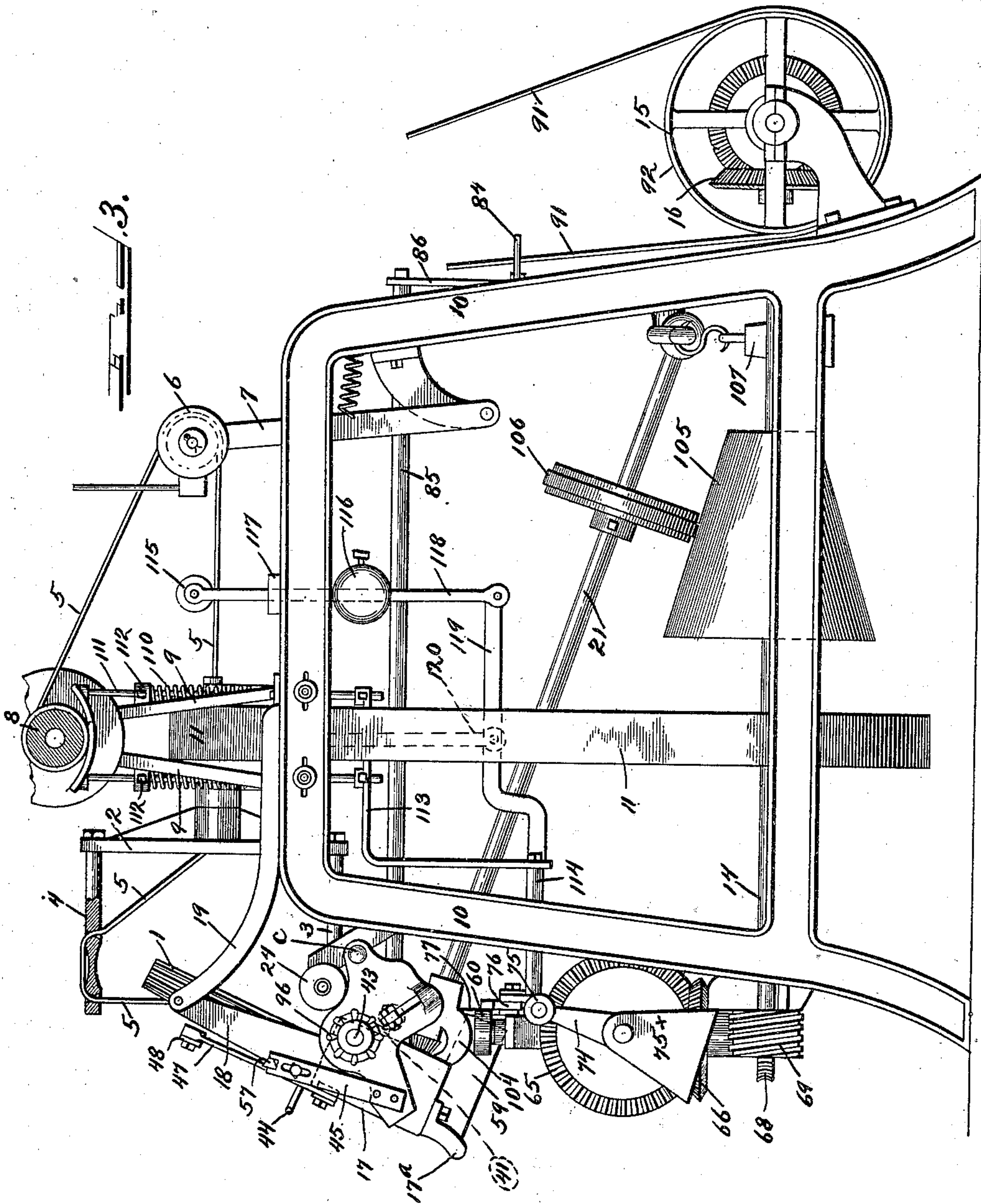
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7 Sheets—Sheet 3.



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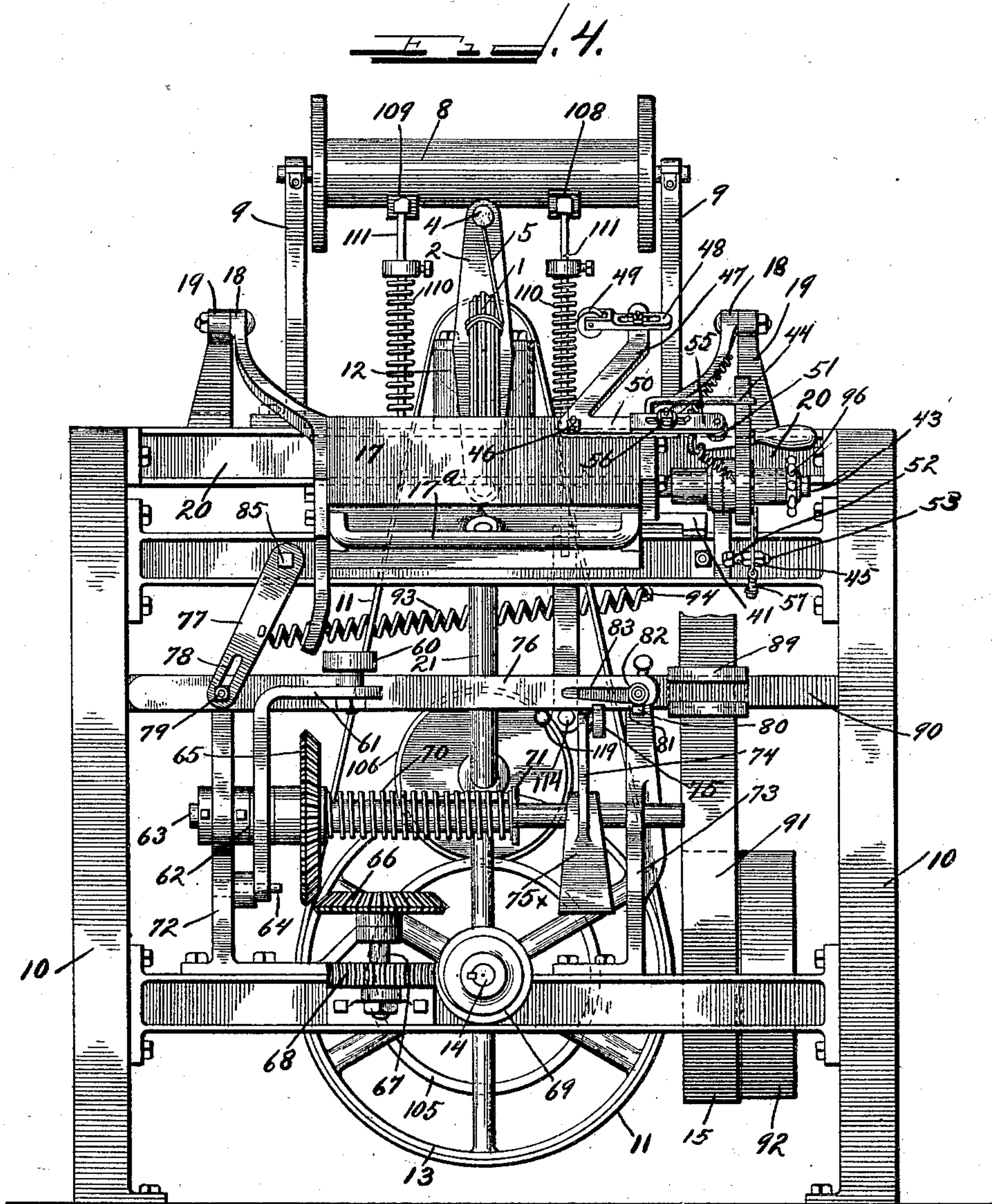
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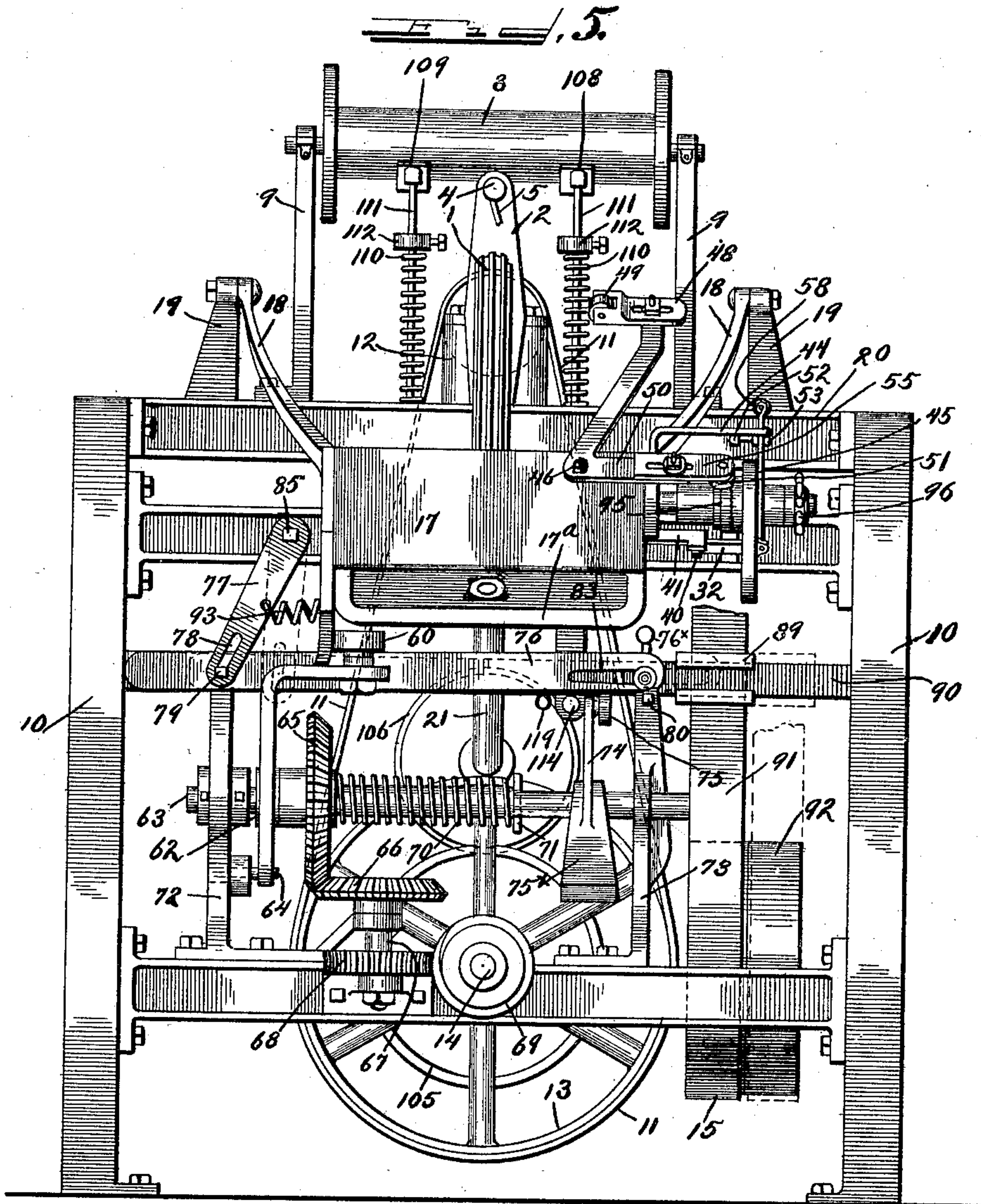
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7 Sheets—Sheet 5.



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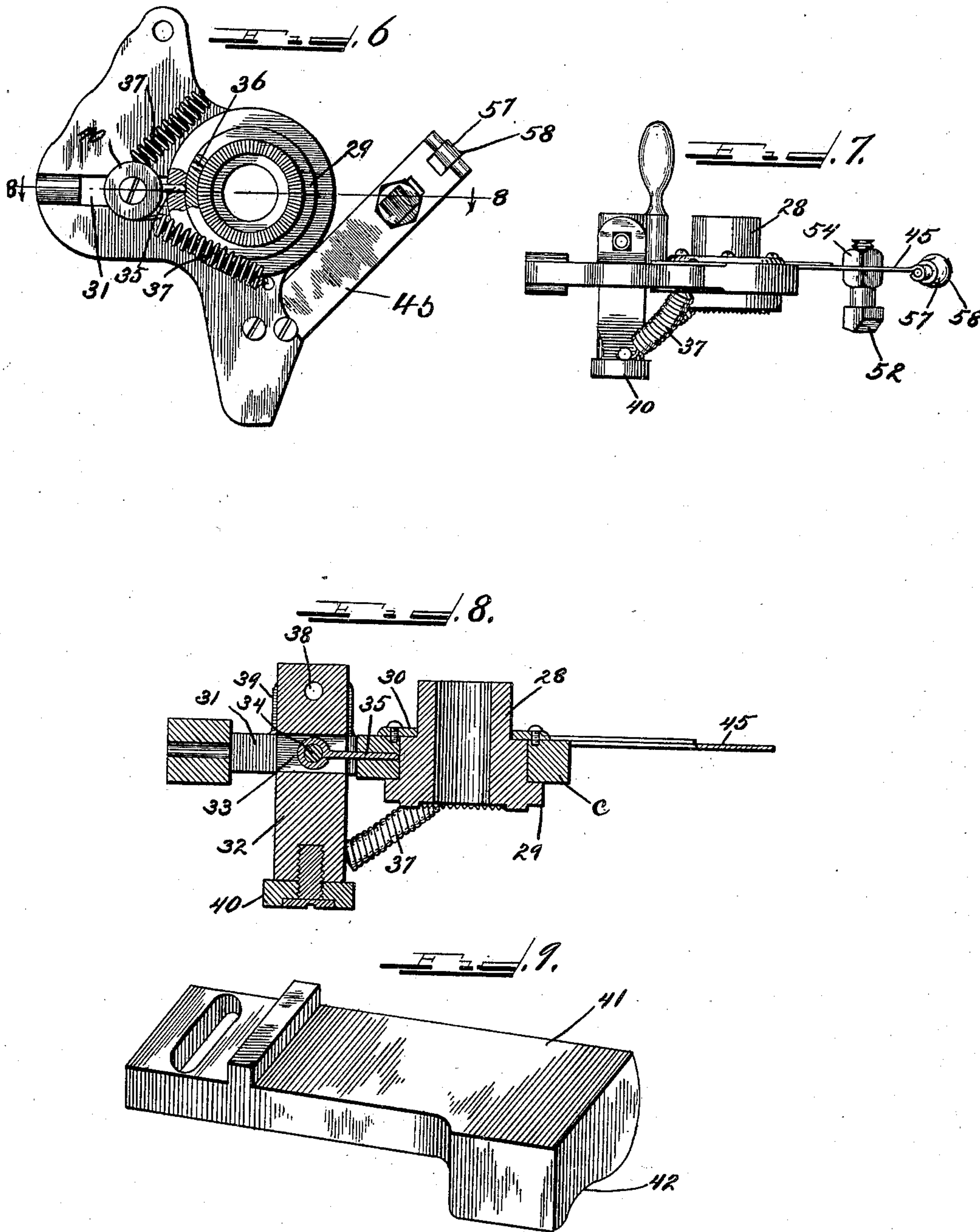
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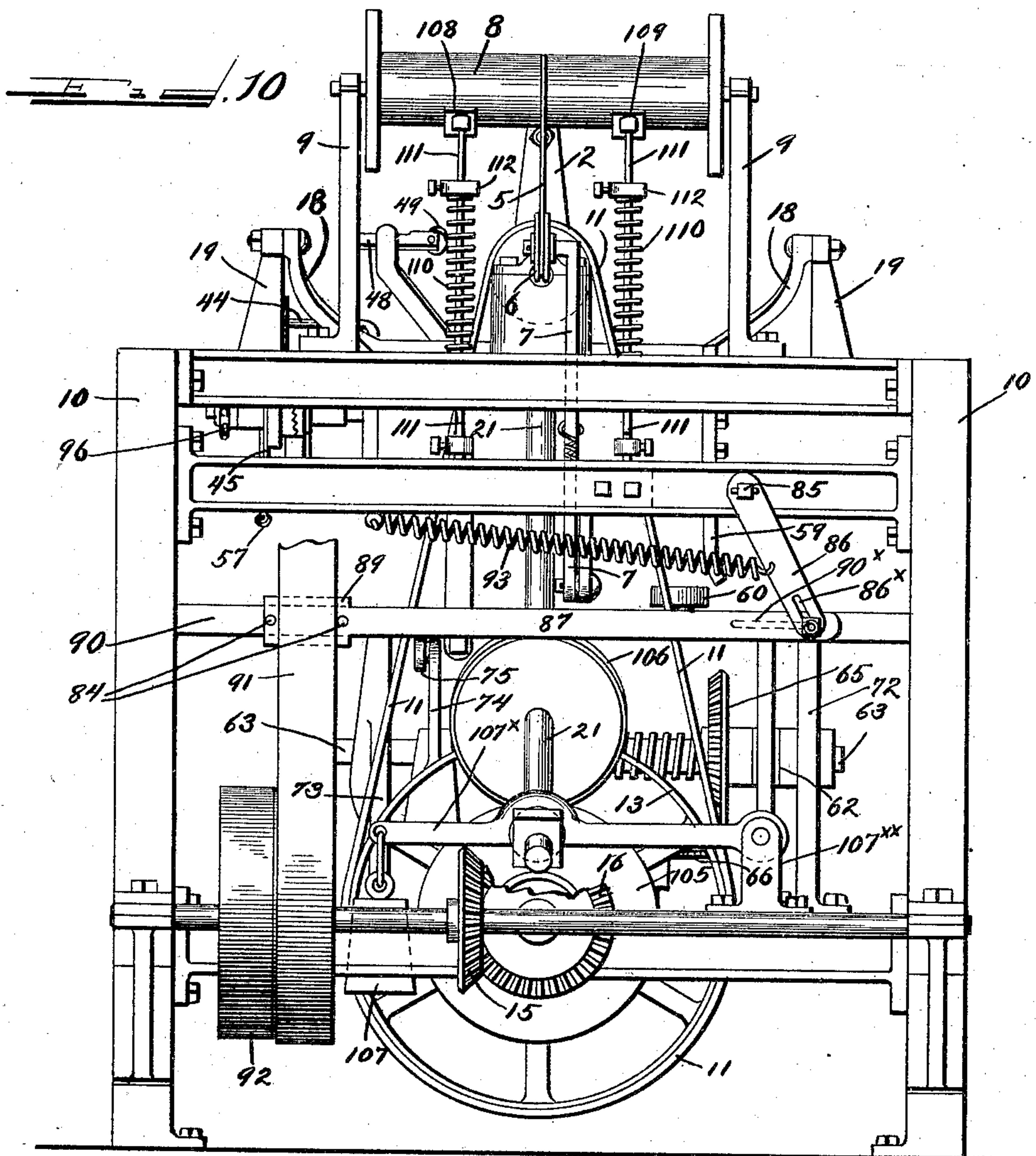
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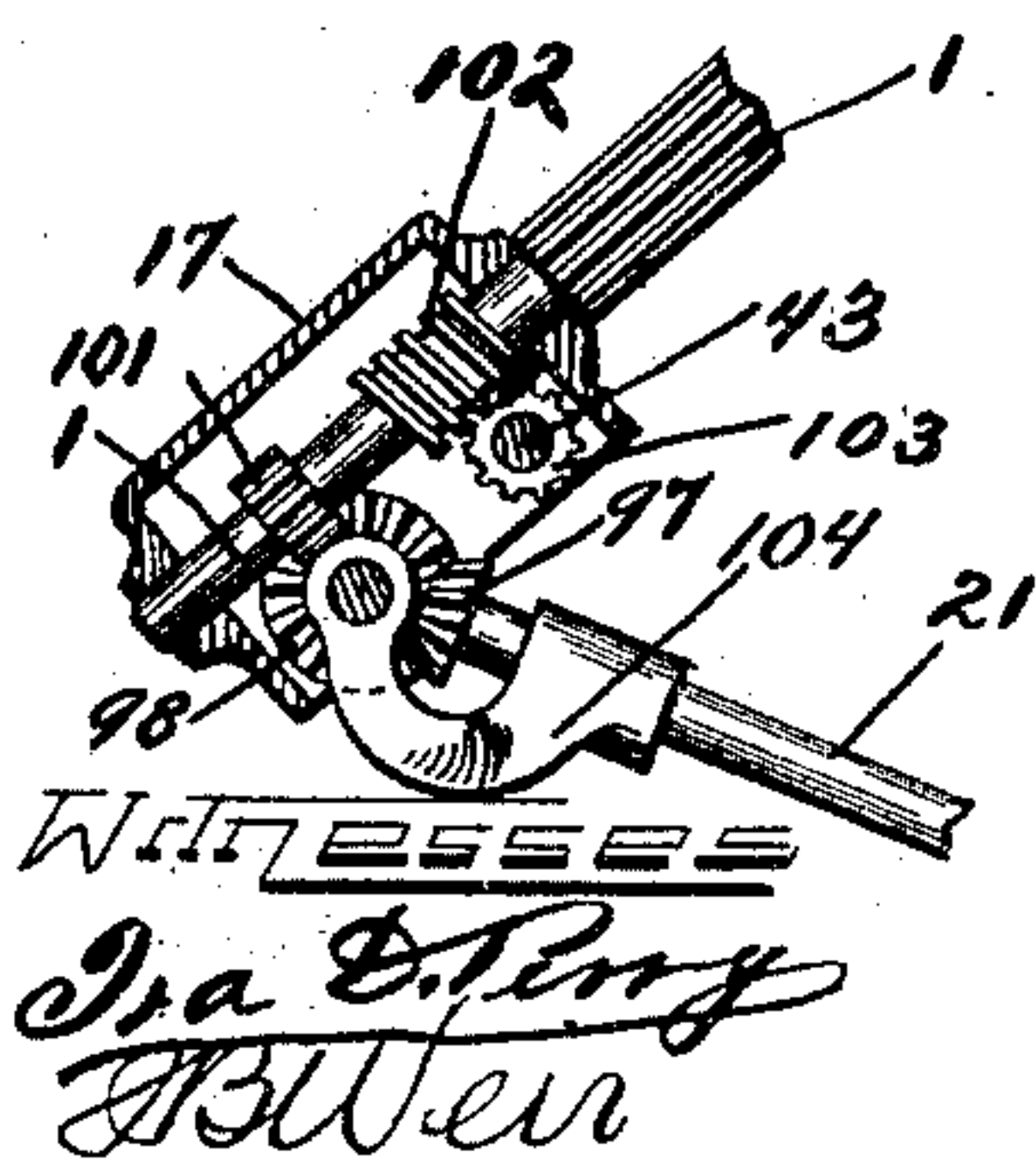
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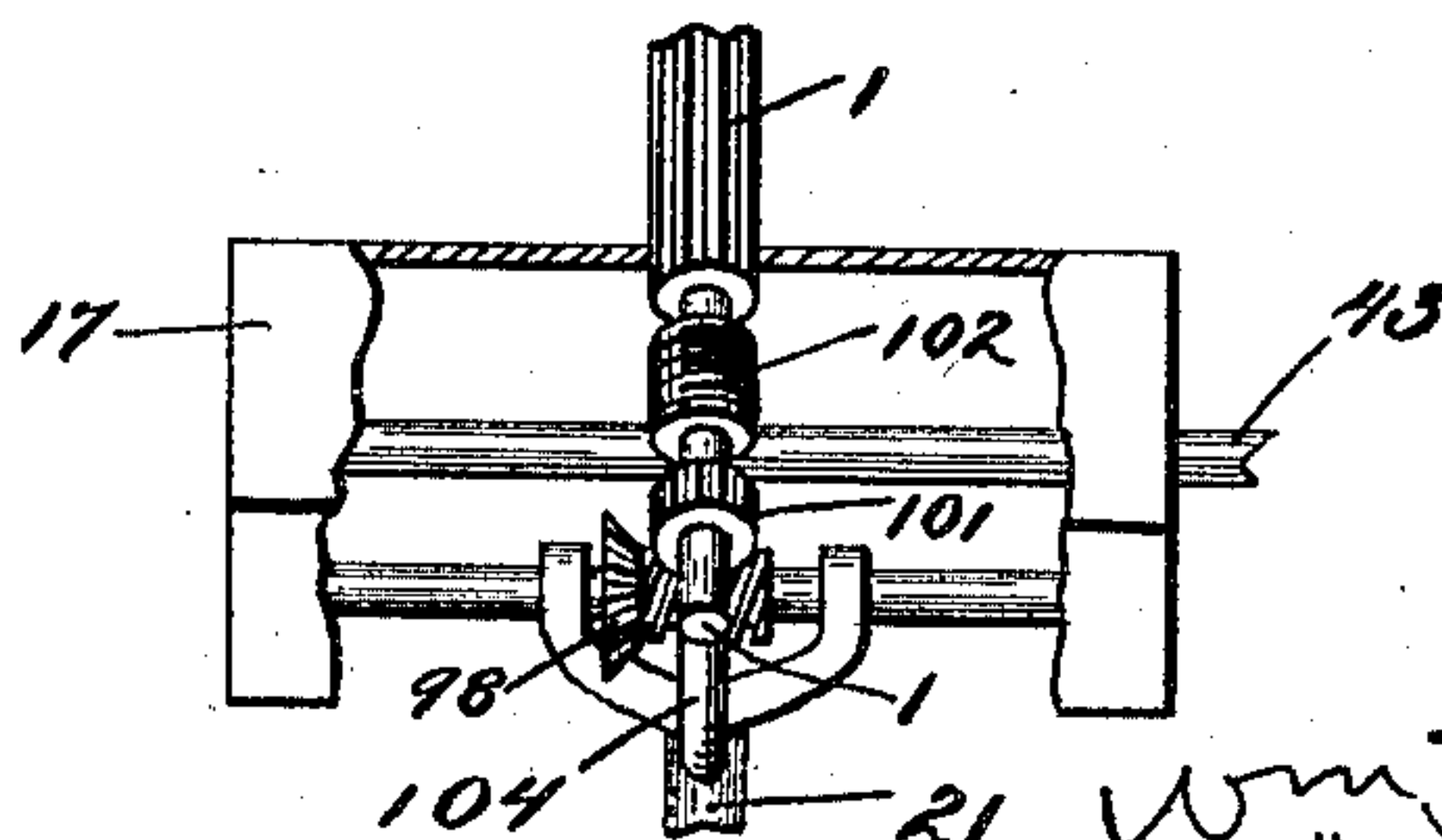


11.



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UNITED STATES PATENT OFFICE.

WILLIAM FLEMING, OF CHICAGO, ILLINOIS.

BALLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 696,669, dated April 1, 1902.

Application filed May 31, 1901. Serial No. 62,503. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FLEMING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Balling-Machines, of which the following is a full, clear, and exact specification.

This invention relates to machines for balling yarn, twine, cord, and other strands of that class in which the winding is done by the combined rotary action of a pin or spindle and a flier and the ball is given the desired form as to diameter and length by the oscillatory motion of the pin or spindle with relation to the strand extending thereto, and which oscillatory motion of the pin is produced by a revolving cam serving to support the pin-frame and through the agency of which the machine is stopped; and the invention has for one of its important objects to automatically release the said cam from the shaft which revolves it when the ball has attained a predetermined size, whereby the cam may be thereafter utilized for holding the pin-frame stationary until time for producing the final winding or cover.

Another important object of this invention is to regulate the size of the ball automatically.

The invention has for another object to automatically change the angle of the pin or spindle for producing the final winding or cover without requiring any assistance or special care on the part of the operator.

Another object of the invention is to automatically stop the machine or stop the rotation of the flier and pin when the winding operation has been carried on a sufficient time to produce a complete ball of predetermined size.

Another object of the invention is to automatically stop the operation of the machine when substantially all of the yarn has been unwound from the spool.

Another object of the invention is to automatically stop the machine in the event the yarn breaks; and the invention has for its object, finally, to cause the tension of the yarn-spool to automatically decrease as the amount on the spool decreases.

With these ends in view my invention con-

sists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of the improved balling-machine, showing the parts in the position for commencing the winding. Fig. 2 is a similar view showing the parts in the position they assume after the body of the ball has been substantially completed and the winding of the cover commenced. Fig. 3 is a similar view showing the parts in the position they assume at or about the completion of the winding operation. Fig. 4 is a front elevation of the machine, showing the parts substantially in the position illustrated in Fig. 1. Fig. 5 is a view similar to Fig. 4, showing the parts substantially in the position illustrated in Fig. 3, the automatic belt-shifting mechanism being thrown into action and the trip for disengaging the belt-shifter latch being about to come into action. Fig. 6 is an enlarged detail view of the improved form of cam, hereinafter described, looking toward the inner face thereof. Fig. 7 is a plan view thereof. Fig. 8 is a plan section thereof, taken on the line 8 8, Fig. 6. Fig. 9 is an enlarged detail perspective view of the cam which automatically disengages the aforesaid cam from its operating-shaft, as hereinafter explained. Fig. 10 is a rear elevation of the machine looking from the opposite end presented in Fig. 5. Fig. 11 is a detailed cross-section of the pin-frame and connecting parts, and Fig. 12 is a front view thereof with the casing broken away.

The ball of yarn or thread is omitted from all figures of the drawings for the sake of clearness; but the form of such ball and the manner of winding it are well known to those skilled in the art and need not be explained.

1 is the pin or spindle upon which the ball is wound, and 2 is the flier, having two arms 3 4, through either of which the strand of yarn 5 is passed to the pin or spindle 1 in the ordinary manner, the strand 5 being carried through the axial passage of the flier-shaft

in the usual way from a tension roller or pulley 6, mounted in the upper end of spring-actuated arm 7.

8 is the spool upon which the yarn is wound originally and from which it runs to tension-pulley 6 in the ordinary manner, the spool being journaled in suitable standards 9, mounted on frame members 10.

The flier 2 is revolved in one direction by a belt 11, passing over pulley 12 on the shaft of the flier and deriving motion from a pulley 13 on driving-shaft 14, which in turn receives motion from driving-pulley 15, connected to shaft 14 by a pair of bevel-gears 16 or any other suitable means.

17 is the pin or spindle frame in which the pin or spindle 1 is journaled in the usual or any suitable manner, and which frame is provided with arms 18, extending upwardly to and pivoted on supporting-brackets 19, projecting from frame member 20, so that when pin-frame 17 is not otherwise restrained it will swing downwardly toward a perpendicular position. The angle of inclination of this frame 17, as is well understood, determines the shape of the ball being wound upon the pin or spindle 1. The nearer the pin 1 is held to a horizontal position the wider the diameter of the ball, and the nearer it is held to a perpendicular position the longer the ball. When the winding is started, the pin is held in the position shown in Fig. 1, causing the mechanism to wind to the diameter of the ball, and as the winding proceeds the pin assumes a less horizontal position and moves nearer to the perpendicular, causing the strands to wind to the length of the ball, and the pin is thus oscillated back and forth during the winding operation in a greater or less degree, as may be necessary for producing a ball of the desired form or shape, and finally winding the cover thereon. This automatic oscillation of the pin is accomplished by means of a cam C of the peculiar shape illustrated in Fig. 6, which is mounted upon the pin-frame 17 and automatically revolved from a counter-shaft 21 by any suitable means, which will be presently described. This cam just referred to comprises a nosepiece 22, which at the beginning of the winding operation is set against a support 23, secured to main frame member 10 and preferably having an antifriction-roller 24, against which the cam rolls. As the winding operation proceeds, it being understood that the pin or spindle 1 revolves in the reverse direction of the rotation of the flier 2, the cam-nosepiece 22 revolves downwardly or toward the right; but before it entirely leaves the antifriction-roller 24 sufficient strand has been wound upon the pin 1 toward the diameter of the ball to produce a body upon which to wind the balance, and the nosepiece 22, constituting, as it does, the support of the pin-frame 17 and connected mechanism, permits the pin-frame to gravitate toward roller 24 as soon as the upper edge of the nosepiece comes

into engagement therewith, permitting the pin and frame to rapidly approach the perpendicular and causing the strand to wind toward the length of the ball the requisite number of winds, whereupon by the continued rotation of the cam in the same direction an abrupt shoulder 25 thereon engages roller 24 and again forces the pin-frame 17 outwardly, and thereby causes the strand to wind to the diameter of the ball. From the shoulder 25 to an abrupt shoulder 26 on the cam the further rotation of the cam produces a slight oscillation of the pin, causing the pin to first slightly approach the perpendicular immediately after rounding shoulder 25, and thereby again winding slightly toward the length of the ball and afterward to assume a less upright position, when a wave or promontory 27 on the cam, about midway between shoulders 25 26, engages roller 24, thereby again causing the strand to wind slightly to the diameter, and after promontory 27 passes roller 24 the latter is encountered by another depression between promontory 27 and shoulder 26, which depression causes the strand to again wind slightly to the length, and the winding to the diameter is again produced as the rise or promontory 26 passes roller 24, whereupon the winding is about finished.

As better illustrated in Figs. 6 and 8, the cam C is journaled upon a hub 28, which constitutes one member of a clutch, said hub having a flange 29 on one side and a detachable flange 30 on the other side for holding cam C in place, so that the cam may revolve independently of the hub. In one side of the cam is formed a slot 31, through which projects a lever 32, provided with a recess 33, in which is located a pin 34, constituting the support for a locking-dog 35, projecting through a part of cam C into contact with the periphery of hub 28 and adapted to ride on said periphery until it coincides with a socket 36 in the hub, as shown in Fig. 6, whereupon it will be pulled inwardly into engagement with said socket by means of springs 37, secured to lever 32 and to cam C, thus locking the cam against independent movement with relation to its hub. One end of lever 32 is pivoted at 38 between a pair of ears 39, formed on one side of the cam, and the other end of said lever is provided with an antifriction-roller 40, which projects into line with a cam 41, secured to the under side of pin-frame 17, as better shown in Fig. 5, and projecting a sufficient distance therefrom to be engaged by the antifriction-roller 40 as cam C revolves. This cam 41 is provided with a depression 42, into which antifriction-roller 40 settles after the cam 41 has deflected lever 32 a sufficient distance to disengage dog 35 from socket 36 in the hub 28 of the cam, thereby permitting the hub to continue its rotation with cam-shaft 43 independently of cam C. The roller 40 encounters fixed cam 42 just before cam C arrives into the position shown in Fig. 2, when the depression in the cam at the point

between the promontory 27 and the abrupt shoulder 26 is approximately in engagement with roller 24, and it will therefore be seen that by releasing cam C from its hub at this moment the extra weight of that side of the cam on which shoulder 26 is formed will cause the cam to continue to revolve toward the right; but this movement is soon arrested by a stop 44, consisting of a rod or arm, as shown in Fig. 4, projecting from the side of pin-frame 17 into the line of movement of an arm constituting a catch 45, secured to the side of cam C, as shown in Fig. 2, thus arresting cam C and holding it in the position shown in Fig. 2, with the abrupt shoulder 26 resting against roller 24 and maintaining pin 1 in substantially the same position as the starting position. At this period the winding of the ball is nearly completed, and when it attains the predetermined size it automatically releases arm 45 from stop 44 and throws the machine out of action after its operation has continued for a sufficient time only to wind the cover thereon. The mechanism for accomplishing this will now be described.

As shown in Figs. 4 and 5, a bell-crank lever is pivoted at 46 to pin-frame 17 and has one arm 47 provided with an adjustable slide 48, which carries an antifriction-roller 49 in such a position that when the ball attains the predetermined size it will press said roller outwardly and force the other arm 50 of the bell-crank lever downwardly and cause an antifriction-roller 51, carried on the end thereof, to engage the beveled head 52 of a stud 53, mounted on arm 45 and deflect said arm outwardly beyond the reach of stop 44, arm 45 being flexible and preferably composed of a strip of thin steel. As shown in Fig. 7, the stud 53 is adjustably held in arm 45 by a pair of jam-nuts 54, whereby it may be readily adjusted with reference to roller 51, and the latter is adjustably attached to arm 50 of the bell-crank by means of a slotted slide 55 and bolt 56. The extremity of arm 45 is provided with an antifriction-roller 57, journaled therein in any suitable way for receiving the impact of stop 44, one side of the roller 57 having a flange 58 to avoid the possibility of the roller slipping past stop 44 as it moves upwardly into engagement therewith. When the expansion of the ball effects the release of the arm 45 from stop 44, the heavier side of cam C swings downwardly, as before described, away from roller 24 and permits pin-frame 17 and the entire mechanism carried thereby to gravitate toward the perpendicular into the position shown in Fig. 3, whereupon an incline 59, secured to one side of pin-frame 17, comes into engagement with an antifriction-roller 60, journaled on the upper horizontal end of an arm 61, whose lower end is connected to a collar 62, journaled on shaft 63, a part of said arm 61 being extended below said collar and held in a vertical position by a guide-pin 64. The engagement of roller 60 by cam 59 shifts collar

62 against the hub of a bevel-gear 65, secured to shaft 63, with capability of revolving it, but also capable of sliding longitudinally thereon and coming into engagement with a companion gear 66, secured to stud-shaft 67, which is driven by a worm-wheel 68 from a worm 69 on main shaft 14, gear 65 being held normally out of engagement with gear 66 by spring 70, coiled on shaft 63 and bearing between a pin 71 thereon and the hub of gear 65. The shaft 63 is mounted in suitable standards 72 73 and is provided with a trip 74, rigidly secured thereto and having a counterweight 75^x, whereby the trip is held normally in a perpendicular or upright position, as shown in Fig. 2. When the incline 59 strikes roller 60, the motion imparted to shaft 63 from gear 66 will cause said trip 74 to revolve and carry an antifriction-roller 75 on the upper end thereof around into engagement with the under side of a latch-bar 76, which is supported at one end by a swinging arm 77, having slot 78, through which passes pivot-bolt 79, and supported at the other end by a stop or lug 80 on standard 73, the lower side of latch-bar 76, where it rests on lug 80, being cut away to form a shoulder 81, which engages lug 80 and holds bar 76 against longitudinal movement. This end of bar 76 may also be retained in position with capability of limited vertical movement by means of a headed pin 82, projecting through a slot 83 in the bar and secured in the upper end of standard 73. Bar 76 is the latch which holds belt-shifter 84 against movement and is connected with said belt-shifter through the agency of shaft 85 (to one end of which arm 77 is secured) and a crank-arm 86, secured to the other end of shaft 85, said crank-arm 86 being connected by a rod 87 to belt-shifter 84, which has a slide 89, mounted on frame member or rail 90. Thus it will be seen that the falling of pin-frame 17, when arm 45 is released from stop 44, automatically lifts latch 76 and permits belt-shifter 86 to throw belt 91 from the fixed pulley 15 to loose pulley 92. This shifting motion of the belt-shifter is induced by a spring 93, having one end secured to arm 77 and the other to lug 94 on the frame of the machine, so that the instant the latch 76 is released the belt will be shifted. It will be seen, however, that the trip 74 does not release latch 76 as soon as shaft 63 begins to revolve, because, as shown in Fig. 2, the normal or starting position of trip 74 is in front of latch 76, and consequently it does not release said latch until it has made a complete revolution, and it is during this revolution that the finishing-cover of the ball is wound, the parts being so proportioned and timed that by the time trip 74 arrives at the position shown in Fig. 3 and releases latch 76 the winding of the ball will be entirely finished and the machine thrown out of operation. When it is desired to again set the machine for winding another ball, the operator lifts pin-frame 17 by means of a handle 17^a thereon, and at the same time revolves

cam C by means of handle c until the dog 35 snaps into its socket 36, thus locking cam C to its hub 28. Then by disengaging the clutch member on hub 28 from its companion member 95, which is secured rigidly to cam-shaft 43, the cam C may be turned independently of shaft 43 until its nose 22 engages roller 24 in the starting position, as shown in Fig. 1, and in which position the cam C, as well as pin-frame 17 and connected parts, may be securely held by the reengagement of the clutch members 28 95. These clutch members may be thus locked into position by means of a hand-nut 96, threaded on the outer end of cam-shaft 43, in such a manner that by tightening up the nut clutch member 28 will be forced into firm engagement with its companion member, and by loosening the nut the cam C, with its hub or clutch member, may be rotated into the desired position independently of the shaft.

The cam-shaft 43 and pin 1 may be driven from shaft 21 by any suitable gearing. In the drawings I have shown the upper end of shaft 21 provided with a bevel-gear 97, which meshes with a companion gear 98 on a shaft 99, journaled in pin-frame 17, and having a worm 100, which engages a worm-wheel 101 on the lower end of pin 1, and the pin 1 in turn is provided with a worm 102, engaging with a worm-wheel 103 on shaft 43, whereby the latter is given the requisite speed of rotation. The upper end of shaft 21 is journaled in a yoke 104, which is swiveled at one end upon the shaft 99, so that pin-frame 17 may oscillate with relation to shaft 21. Shaft 21 derives motion from a friction-cone 105 on driving-shaft 14 impinging a friction-wheel 106, secured to shaft 21. The lower end of shaft 21 is provided with a weight 107 for holding friction-wheel 106 in firm contact with cone 105, and the shaft is guided in its vertical movement by arm 21^a or any suitable means.

108 and 109 are friction-shoes curved approximately to the contour of the yarn on the spool 8 and held in engagement therewith by means of springs 110, sleeved on stems 111 between shoulders 112 thereon and the upper side of the frame of the machine, two of said stems 111 being provided for each of the shoes and serving to impart the tension of springs 110 to the periphery of the yarn on the spool for causing the requisite tension or friction and preventing the spool from unwinding too rapidly. By these means it will also be seen that as the diameter of the spool decreases the friction will proportionately decrease as a direct result of the decrease of surface in contact with the shoes and the recoiling of the springs 110, thus subjecting the yarn to less strain or pull that might otherwise be caused by the decrease of leverage or diameter of the roll.

In order that the machine may be automatically stopped when the spool becomes empty, the tension device is connected with the belt-

shifter latch-bar 76. This may be accomplished by adjustably attaching the lower ends of one pair of the stems 111 to an arm which is bent downwardly and carries a lug or bar 114, secured thereto and projecting under the belt-shifter latch 76, so that as the shoe 108 rises with the decreasing of the roll of yarn the arm 114 will gradually lift the latch 76, and by the time the yarn is reduced to about two yards on the spool the arm 114 will have disengaged said latch, permitting spring 93 to throw the belt from the fixed to the loose pulley through the agencies already described. In order that the machine may also be stopped in the event the yarn or strand should break, an automatic trip device is employed, which depends for its inactive condition upon the continuity of said strand. As shown in the drawings, this consists of a roller 115, resting upon the strand 5 and having a stem 116 passing downwardly through a cross member 117 of the frame and having its lower end pivoted at 118 to a horizontal lever 119, which is pivotally supported from a hanger 120 on the frame and has its other end engaging under latch-bar 76. Thus it will be seen when strand 5 breaks the weight of stem 116 and connected parts will throw latch-bar 76 upwardly and effect the shifting of the belt onto the loose pulley.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a balling-machine, the combination of a spindle for holding the ball and winding the strand, means for operating said winding means, means for changing the inclination of the spindle during the winding of the strand, means for temporarily arresting the action of said spindle-inclining means and means for releasing said arresting means by the expansion of the ball, substantially as set forth.

2. In a balling-machine, the combination of a ball pin or spindle, a movable support therefor, whereby the angle of the pin with relation to the strand may be changed, winding means, a cam movable bodily with said support, a rest for said cam, means for rotating said cam, means for arresting the rotation of said cam at a certain period, means adapted to be actuated by the ball for releasing said cam, and thereby permitting a further movement of said pin-support, and means actuated by said further movement of the pin-support for throwing the winding means out of action, substantially as set forth.

3. In a balling-machine, the combination of a pin or spindle, a pivoted gravitating support or frame therefor, winding means, a cam movable bodily with said support, a stationary rest for said cam, means for rotating said cam, means for arresting the rotation of said cam at a certain period, means adapted to be actuated by the ball for releasing said cam and thereby permitting a further movement of said pin-support, and means actuated by said further movement of the pin-support

for throwing the winding means out of action, substantially as set forth.

4. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, an irregular cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, means for arresting said independent movement of the cam, and means for releasing said cam from said arresting means by the expansion of the ball, substantially as set forth.

5. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a gravitating cam for supporting said frame, revolving in unison with said winding means, and being also movable independently thereof, means for arresting said independent movement of the cam, and means for releasing said cam from said arresting means by expansion of the ball, substantially as set forth.

6. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, a catch on said cam, and a stop on said pin-frame for arresting said independent movement of the cam, and means for releasing said catch and stop by the expansion of the ball, substantially as set forth.

7. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame revolving in unison with said winding means, and being also movable independently thereof, a flexible catch on said cam, and a stop on said pin-frame for arresting the independent movement of said cam, and means for releasing said stop and catch by the expansion of the ball, substantially as set forth.

8. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, a catch on said cam, having a flanged roller, 57, and a stop on said frame for engaging with said roller and arresting the independent movement of said cam, and means for releasing said roller and stop by the expansion of the ball, substantially as set forth.

9. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, a catch on said cam, a stop on said frame for engaging with said catch and arresting the independent movement of said cam, and a trip actuated by the expansion of the ball for releasing said stop and catch, substantially as set forth.

10. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, a catch on said cam, a stop on said frame for engaging with said catch and arresting the independent movement of said cam, and a trip carried by said pin-frame and actuated by the expansion of the ball for releasing said stop and catch, substantially as set forth.

11. In a balling-machine, the combination of a ball pin or spindle, a movable support or frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, a catch on said cam, a stop on said pin-frame for engaging with said catch and arresting the independent movement of said cam, an adjustable lug on said catch, and a trip arranged to be actuated by the expansion of the ball for engaging said lug and releasing said catch and stop, substantially as set forth.

12. In a balling-machine, the combination of a ball pin or spindle, a movable pin-frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means and being also movable independently thereof, means for detachably connecting said cam operatively with said winding means, and means for releasing said detachable means automatically by the rotation of the cam for permitting the independent movement of the cam, substantially as set forth.

13. In a balling-machine, the combination of a ball pin or spindle, a movable pin-frame therefor, winding means, a cam for supporting said frame, revolving in unison with said winding means, and being also movable independently thereof, means for detachably connecting said cam operatively with said winding means, means for releasing said detachable means for permitting the independent movement of said cam, a stop for arresting said independent movement of the cam, and means for releasing said stop by the expansion of the ball, substantially as set forth.

14. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, adapted to revolve in unison with said winding means, and being also movable independently thereof, means for detachably connecting said cam operatively with said winding means, means for releasing said detachable means for permitting the independent movement of said cam, a stop for arresting said independent movement of the cam, means for releasing said stop by the expansion of the ball and permitting said pin-frame to drop, and means actuated by the falling of the pin-frame for throwing said winding means out of action, substantially as set forth.

15. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, adapted to revolve in unison with said winding means, and being also movable independently thereof, a spring-actuated dog for detachably connecting said cam operatively with said winding means, and means for releasing said dog automatically by the motion of the cam, substantially as set forth.

16. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, adapted to revolve in unison with said winding means and being also movable independently thereof, a spring-actuated dog, for detachably connecting said cam operatively with said winding means, and the cam, 42, fixed with relation to said first cam for releasing said dog as said first cam revolves, substantially as set forth.

17. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, having a hub-revoluble independently thereof and on which said cam is journaled, a spring-actuated lever secured to said cam, a dog connected with said lever for locking said hub and cam together, and a cam, 42, interposed in the line of movement of said lever for engaging the same and disengaging said dog from said hub, substantially as set forth.

18. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, a hub on which said cam is journaled, revolving in unison with said winding means, means for detachably connecting said hub and cam together, and cam, 41, for disengaging the last said means, and having the depression, 42, in which the last said means settles, for holding the first said cam and hub disengaged, substantially as set forth.

19. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, a cam-shaft for said cam operatively connected with said winding means and provided with a clutch member, a second clutch member detachably secured to said cam, means for automatically detaching said cam from said second clutch member as the cam-shaft revolves, means for limiting the independent movement of said cam, and means for disengaging said clutch members at will, substantially as set forth.

20. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, movable independently of said winding means, a cam-shaft for said cam operatively connected with said winding means, a clutch member secured thereto, a second clutch member detachably connected to said

cam, a second cam fixed to said frame, means carried by said first cam for engaging said second cam and releasing the first cam from said clutch member, means for limiting the independent movement of said first cam, and means for disengaging said clutch members at will, substantially as set forth.

21. In a balling-machine, the combination of a ball pin or spindle, a movable frame therefor, winding means, a cam for supporting said frame, a cam-shaft for said cam operatively connected with said winding means, a clutch member on said cam-shaft, a second clutch member, a spring-actuated dog for securing said second clutch member to said cam, means for holding said dog released as the cam-shaft revolves, a disengageable stop for holding said cam against independent movement when said dog is released, means for releasing said stop by the expansion of the ball, and means for releasing said clutch members at will, substantially as set forth.

22. In a balling-machine, the combination of means for forming the ball, means for driving said ball-forming means, a power-transmitting device for imparting motion to the last said means, a shifter for throwing said power-transmitting device out of action, a latch for holding said shifter inactive, a revolving trip for releasing said latch, a gear for actuating said trip, and means operatively related to and adapted to be actuated by the expansion of the ball for shifting said gear into operative connection with said driving means, substantially as set forth.

23. In a balling-machine, the combination of means for forming the ball, means for driving said ball-forming means, a power-transmitting device for imparting motion to said driving means, a shifter for throwing said device out of action, a latch for holding said shifter inactive, two gears normally out of action, one connected with said driving means and the other with said trip, and means for shifting said gears into engagement by the expansion of the ball, substantially as set forth.

24. In a balling-machine, the combination of means for forming the ball, means for driving said ball-forming means, an incline, means for supporting said incline against downward movement, means for releasing said supporting means by the expansion of the ball, a power-transmitting device for imparting motion to said driving means, a shifter for throwing said device out of action, a latch for holding said shifter against movement, a revolving trip for releasing said latch, a shaft for operating said trip, a gear for operating said shaft slidable longitudinally thereof, the roller, 60, arranged to be struck by said incline when it falls, means operatively connecting said roller with said gear for shifting it lengthwise of said shaft, a companion gear, and means connecting said companion gear with said driving means for imparting motion to said first gear when the latter is shifted, substantially as set forth.

25. In a balling-machine, the combination of a spool for the yarn, means for forming the ball, means for driving said ball-forming means disengageably related thereto, tension devices arranged to bear against the yarn on the spool, and means for disengaging said driving means and ball-forming means by the motion of said tension devices toward the spool, substantially as set forth.

26. In a balling-machine, the combination of a spool for the yarn, means for forming the ball, driving means therefor, means for disengaging said driving means from said ball-forming means, a tension device adapted to

bear against the yarn on the spool, a spring for holding said tension device against the spool, an adjustable arm connected to said tension device, a latch for holding out of action the said means for disengaging the driving means and ball-forming means, arranged over, and adapted to be released by, said adjustable arm, as the tension device approaches the spool, substantially as set forth.

WM. FLEMING.

Witnesses:

F. A. HOPKINS,
D. C. GURNEE.