(No Model.) 4 Sheets—Sheet 1.

J. GOOD.

MACHINE FOR BALLING TWINE, &c.

No. 390,361. Patented Oct. 2, 1888.

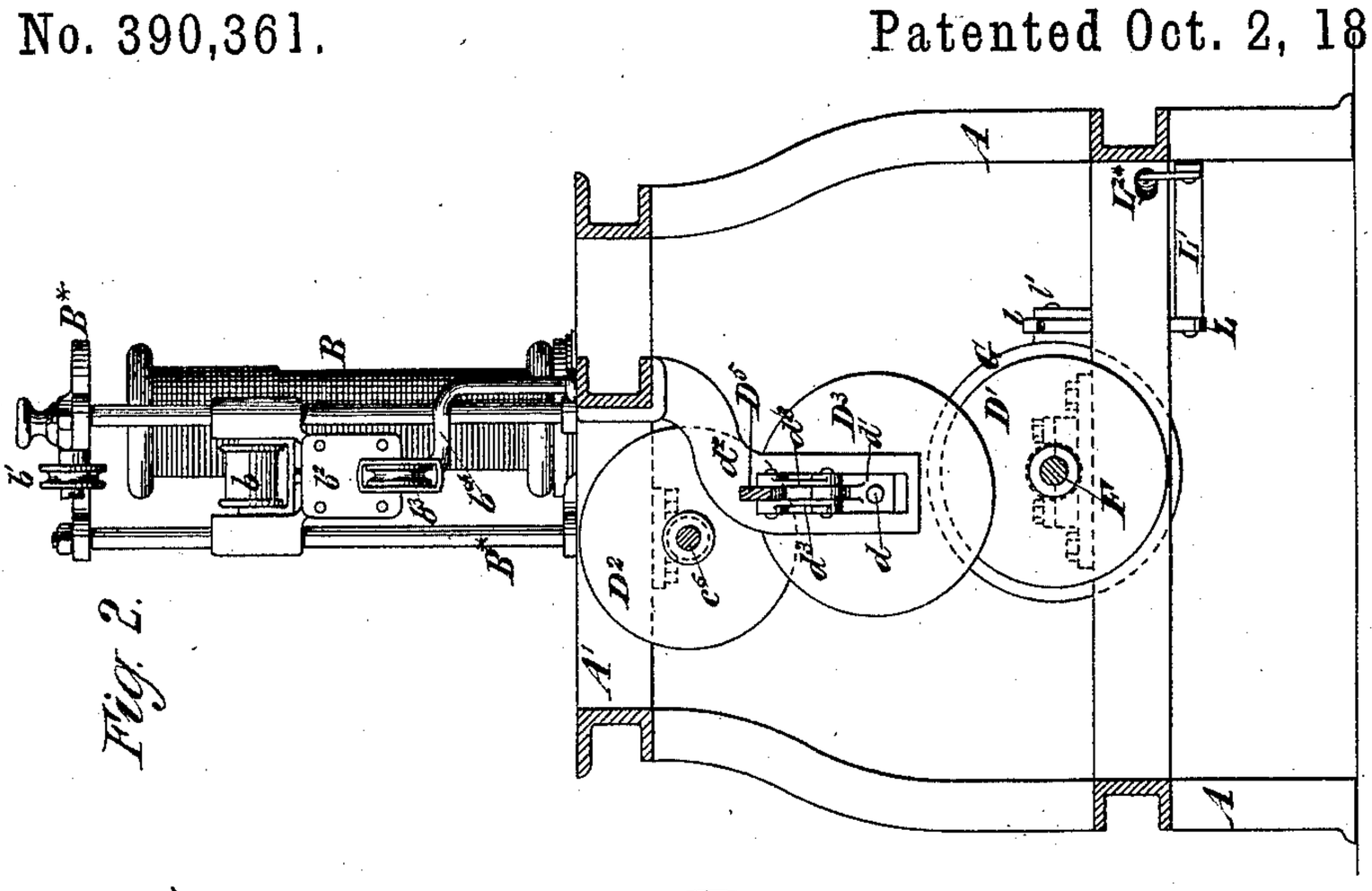


Fig. 2.

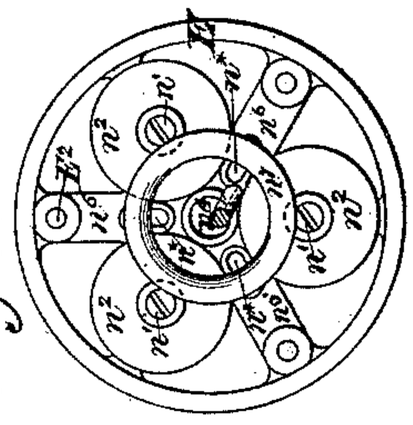


Fig. 8.

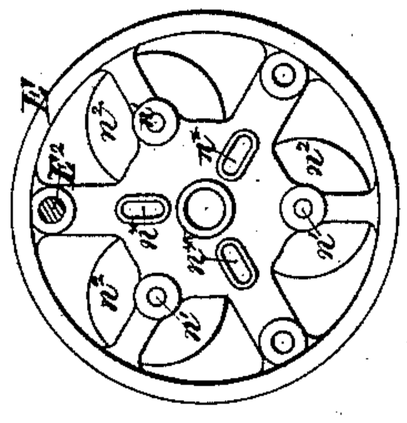


Fig. 7.

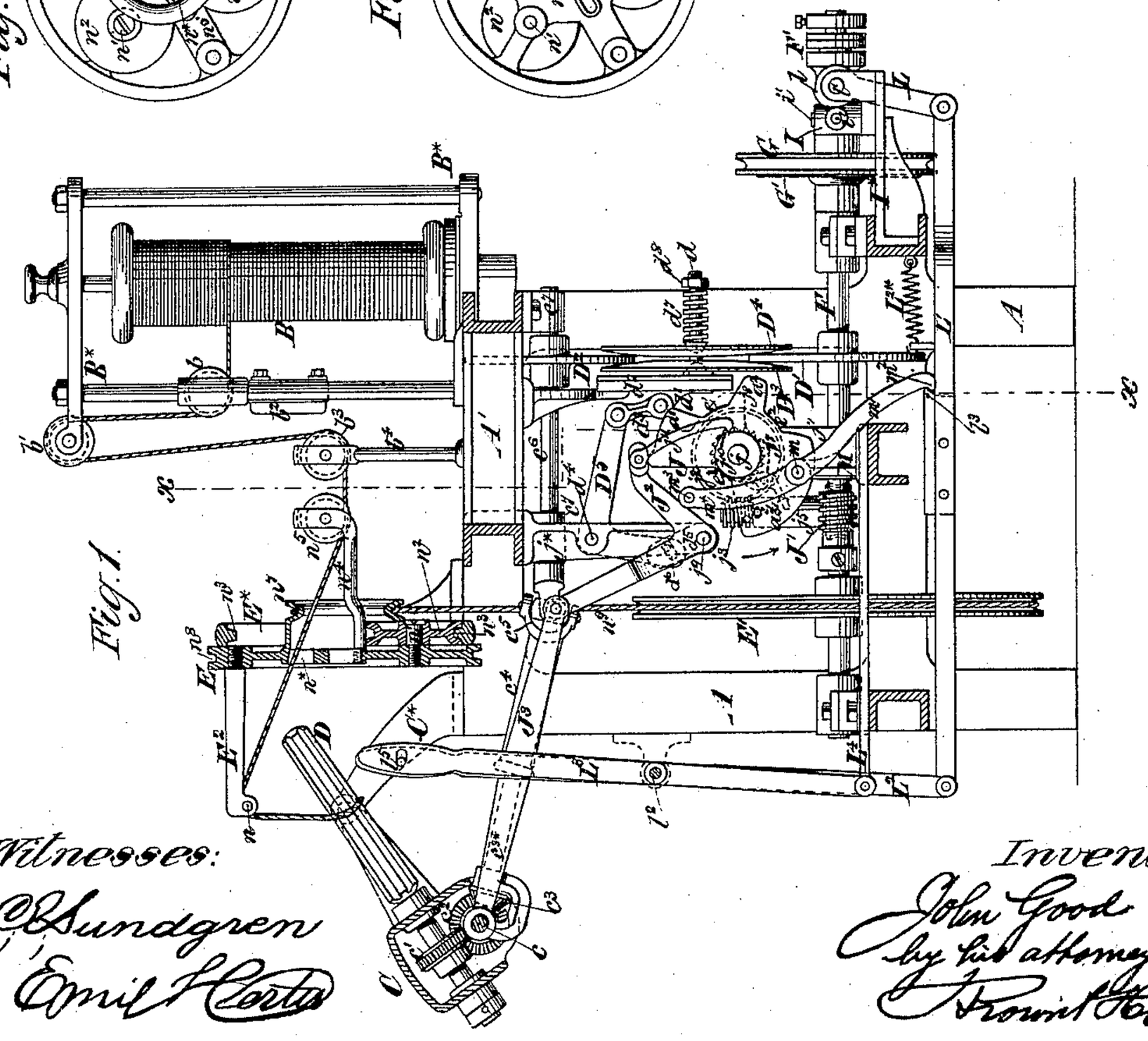


Fig. 1.

Witnesses:
C. B. Sundgren
Emil Hertz

Inventor:
John Good
by his attorneys
Howson & Sons

(No Model.)

4 Sheets—Sheet 2.

J. GOOD.

MACHINE FOR BALLING TWINE, &c.

No. 390,361. Patented Oct. 2, 1888.

Fig. 3.

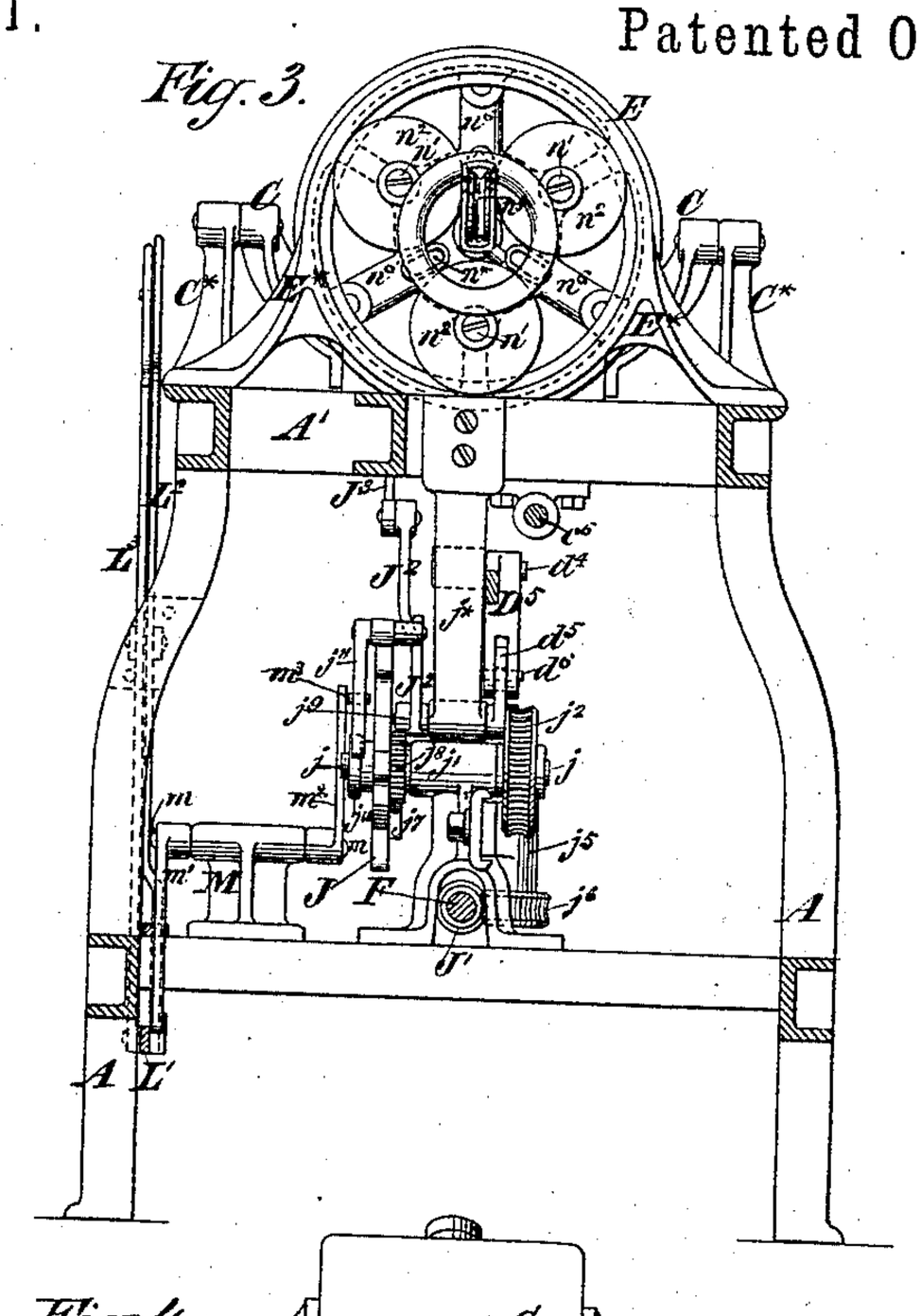
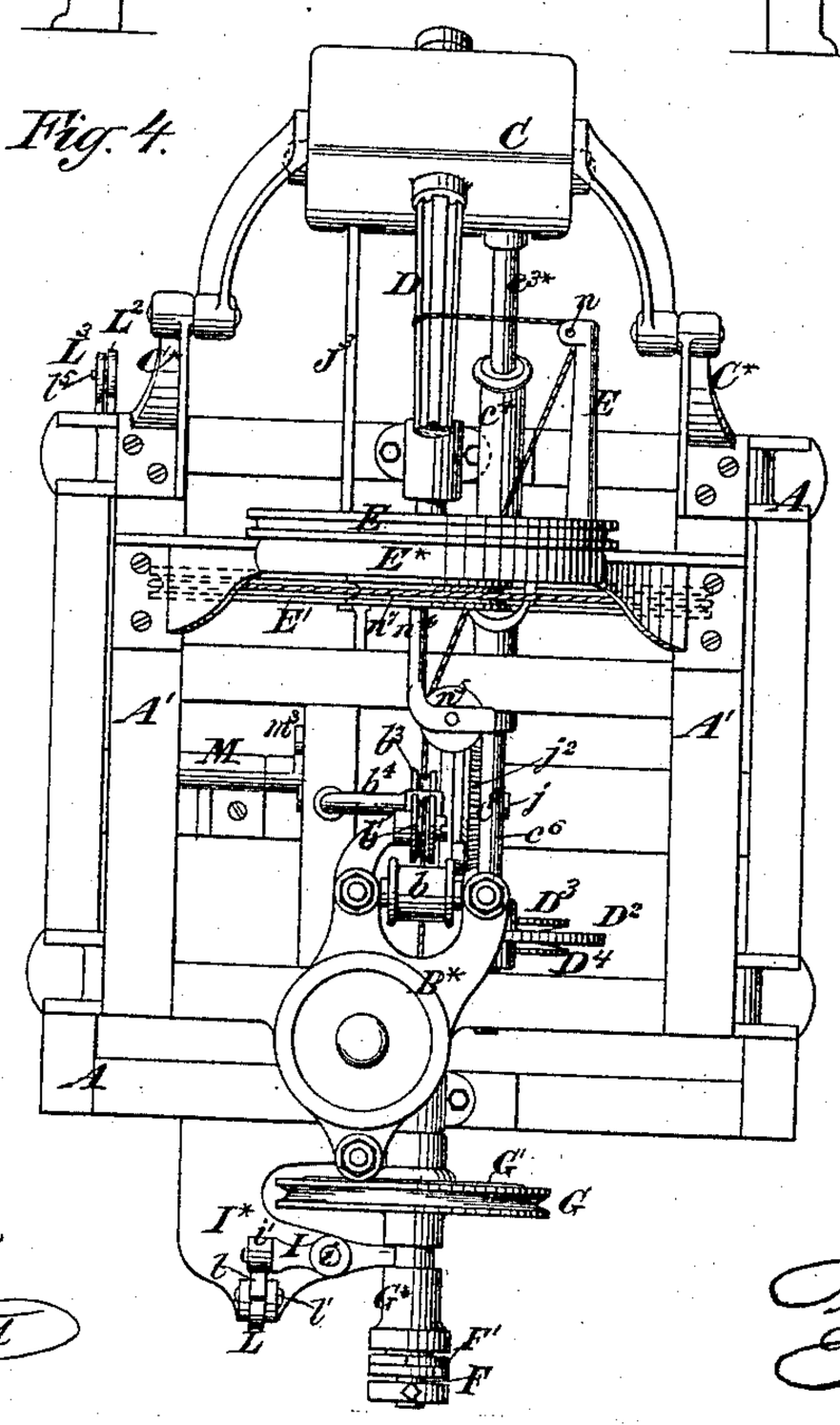


Fig. 4.



Witnesses:
O. L. Sundgren
Emil Horter

Inventor:
John Good
by his attorneys
Brown & Hall

(No Model.) 4 Sheets—Sheet 3.

J. GOOD.

MACHINE FOR BALLING TWINE, &c.

No. 390,361. Patented Oct. 2, 1888.

Fig. 6.

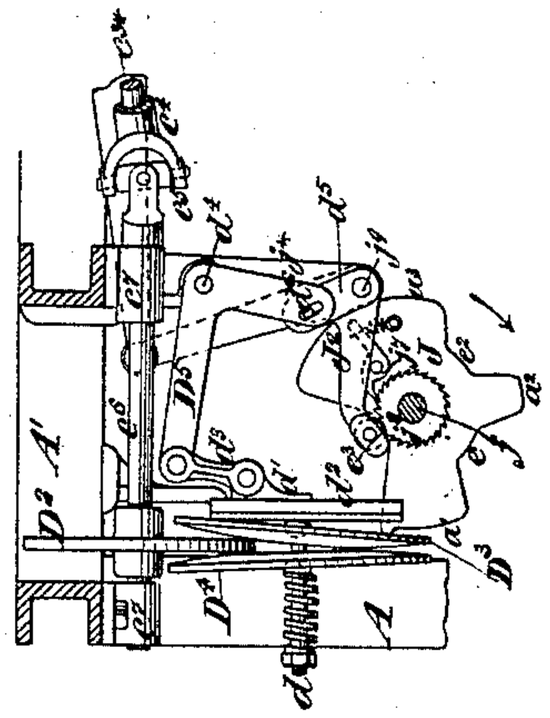
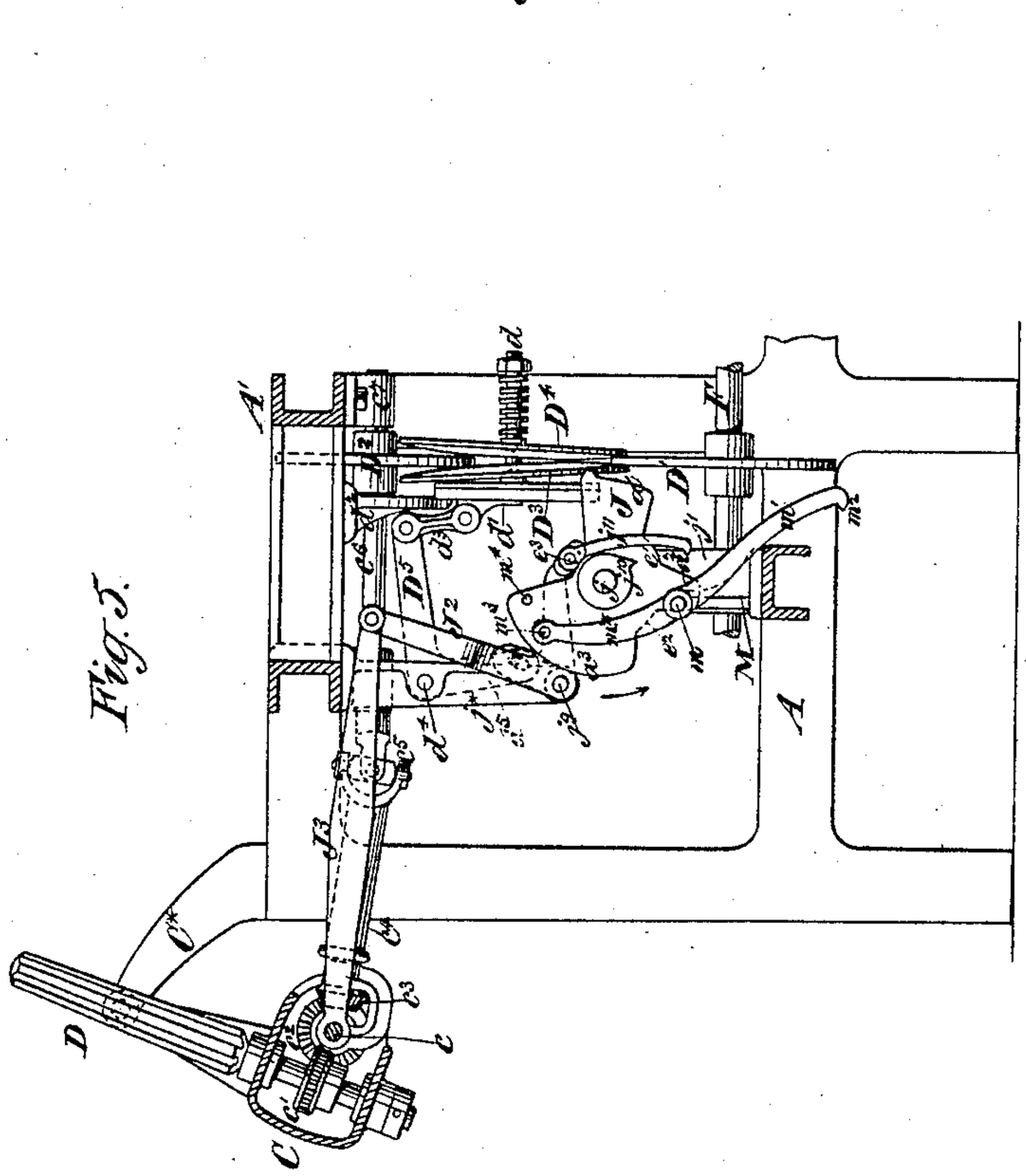


Fig. 5.



Witnesses:
C. L. Sundgren
Emil Horton

Inventor:
John Good
by his attorneys
Brown & Hall

(No Model.) 4 Sheets—Sheet 4.

J. GOOD.

MACHINE FOR BALLING TWINE, &c.

No. 390,361. Patented Oct. 2, 1888.

Fig. 11.

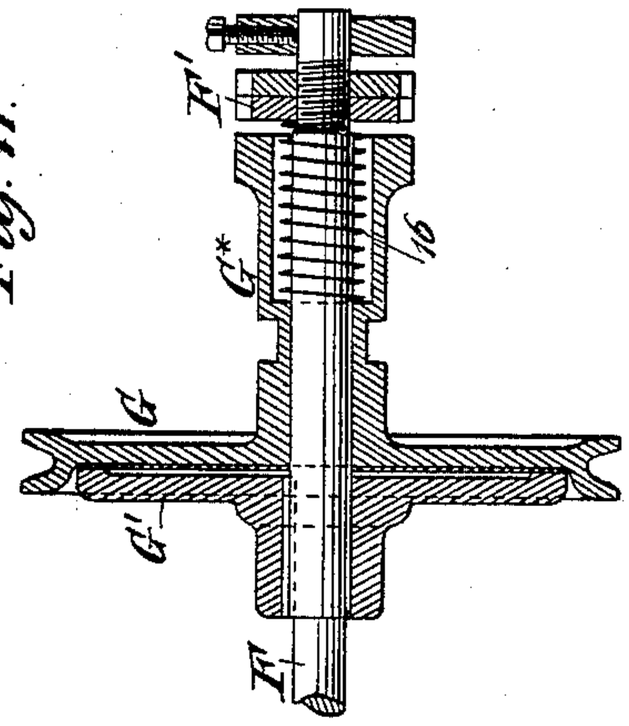


Fig. 9.

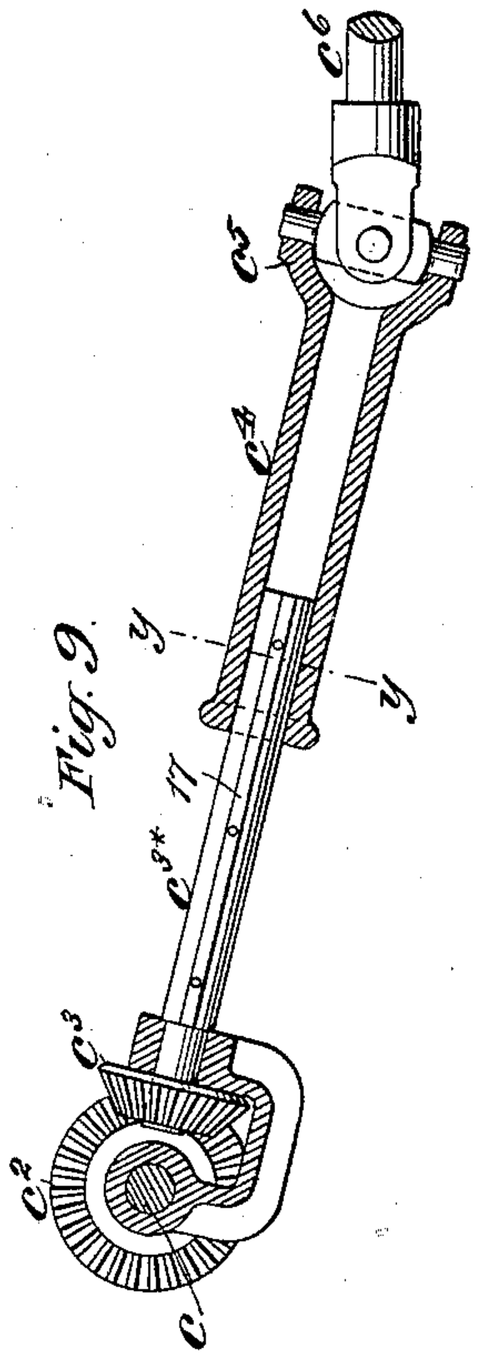
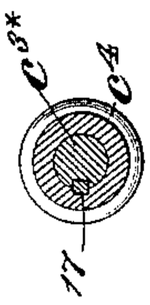


Fig. 10.



Witnesses:
C. L. Sundgren
Joseph W. Roe.

Inventor:
John Good
by his attorneys
Brown & Hall

UNITED STATES PATENT OFFICE.

JOHN GOOD, OF BROOKLYN, NEW YORK.

MACHINE FOR BALLING TWINE, &c.

SPECIFICATION forming part of Letters Patent No. 390,361, dated October 2, 1888.

Application filed January 5, 1886. Serial No. 187,691. (No model.)

To all whom it may concern:

Be it known that I, JOHN GOOD, a citizen of the United States, residing in the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Machines for Balling Twine and Cordage, of which the following is a specification.

This invention consists in certain means, hereinafter described and claimed, whereby I produce the variations in the inclination of the ball-spindle relatively to the planes of rotation of the winding-flier which become necessary in the successive stages in the winding of the ball.

It also consists in certain means, hereinafter described and claimed, whereby I effect the requisite changes of speed of rotation of the ball spindle at different stages of the winding operation.

Figure 1 in the drawings is a vertical sectional elevation of a balling-machine with my improvements, taken nearly in a plane coincident with the axis of the winding-flier, but deviating slightly from such plane to show as many working parts as possible. Fig. 2 is a vertical section at right angles to Fig. 1, nearly in the line *x x* of the latter figure, and showing the parts to the right of that line. Fig. 3 is a transverse vertical section taken nearly in the same line *x x*, but showing the parts on the left of that line. Fig. 4 is a plan of the machine. Fig. 5 is a sectional view corresponding with Fig. 1, but having the winding-flier and the supply-bobbin omitted, and showing the balling-spindle and its driving and controlling mechanism in positions different from those shown in Fig. 1. Fig. 6 a view of part of the above-mentioned driving and controlling mechanism, taken from the opposite side of the machine to Figs. 1 and 5. Fig. 7 is a view of that face of the flier which is toward the balling-spindle; and Fig. 8 is a view of the opposite face thereof, the projecting part being in section in both of these views. Fig. 9 is a longitudinal view, partly in section, of parts of the shafts for driving the spindle. Fig. 10 is a transverse sectional view in the line *y y*, Fig. 9. Fig. 11 is a sectional view of the driving-pulley and friction-clutch for driving the main shaft.

Similar letters of reference indicate corresponding parts in the several figures.

A A A′ designate the framing of the machine, represented as consisting, mainly, of standards A A and a horizontal entablature, A′. Upon one end of the said entablature is erected the bobbin-stand B* for the supply-bobbin B, and upon the other end are secured the two standards C* C*, which contain the bearings for the swinging head C, which carries the balling-spindle D, and between said standards and bobbin-stand there is erected on said entablature the stand E*, which contains or supports the bearings for the ring E of the winding-flyer. On the lower part of the said framing are the bearings for the main shaft F of the machine, which is furnished with a driving-pulley, G, a pulley, E′, for driving the winding-flier, a friction-disk, D′, for driving the balling-spindle, and an endless screw, J′, for driving the cam J, by which the movements of the swinging head to change the inclination of the balling-spindle are produced.

The cam J, which has its working periphery constructed with three projecting wings, a' a^2 a^3, and three intervening depressions, e' e^2 e^3, is fitted to one end of a short shaft, *j*, (see Figs. 1 and 3,) which works in a bearing in a standard, *j″*, erected on the lower part of the main framing, and the other end of which has secured on it a worm-gear, j^2, which gears with an endless screw, j^3, on the upper end of a short upright shaft, which works in a bearing in a bracket, j^5, secured to the standard *j″*, the lower end of the said upright shaft having secured to it a worm-gear, j^6, (see Fig. 3,) which gears with the endless screw J′ on the main shaft. Thus it may be readily understood the cam-shaft *j* is driven by the endless screw J′. The cam J, for reasons hereinafter to be explained, is not fast to its shaft *j*, but fitted loosely thereon, and has fast to one side of it a spring-actuated pawl, j^7, (see Figs. 1 and 6,) which works in the teeth of a ratchet-wheel, j^8, fast on the said shaft *j*. The latter shaft, rotating in the direction of the arrow shown near the cam in Fig. 1, carries the cam round with it, but leaves the cam free to be moved forward when necessary, as will be hereinafter explained, independently of its shaft. The

cam transmits the necessary swinging movements of the box C through an elbow-lever, J^2, which is firmly secured on a short shaft, j^9, which constitutes a fulcrum-pivot, and which works in a bearing in a fixed hanger, j^*, secured to the main framing, one end of the said elbow-lever being furnished with a bowl running on the periphery of the cam and the other end being connected by a rod, J^3, with the shaft c of the balling-spindle gearing within the swinging head.

The cam J is furnished on its outer face, as shown in Figs. 1 and 5, with a hub on which is a single tooth, j^{10}, which may be engaged by a hook-pawl, j^{11}, suspended from the elbow-lever J^2, for the purpose of enabling the cam to be turned forward on its shaft j by pulling out the swinging head by hand, for the purpose of setting the cam to the proper starting-point for balling, for which purpose the cam is made loose upon its shaft, as hereinbefore mentioned.

The shaft c of the balling-spindle gearing, hereinbefore mentioned, is geared with the balling-spindle D by means of an endless screw and worm-gear, c', and the said shaft is furnished with a bevel-gear, c^2, which gears with a bevel-gear, c^3, on one end of an extensible shaft, c^{3*} c^4, which is connected by a gimbal-joint, c^5, with a horizontal shaft, c^6, arranged above and parallel with the main shaft and working in fixed bearings c^7 c^7, secured on the main framing, and which is furnished with a friction-disk, D^2, through which there is given to it by the disk D′ on the main shaft and other friction-disks, D^3 D^4, in a manner to be presently fully described, a variable rotary motion, which motion is transmitted to the balling spindle at a greatly-reduced speed by the shafts c^6 c^{3*} c^4, gears c^3 c^2, shaft c, and the endless screw and worm-gear c'.

The extensible shaft is made of two members, which are fitted together, as shown in Figs. 9 and 10, with a longitudinally-sliding sleeve-joint and a feather, 17, one of said members, c^{3*}, turning, but being confined lengthwise in a bearing in the swinging head, and the other, c^4, being connected with the shaft c^6.

The two disks D^3 D^4, through which the rotary motion is transmitted from the disk D′ to the disk D^2, have slightly conical inner faces, and are both fitted very loosely to a central horizontal spindle, d, which is firmly secured in a block, d', which is free to slide vertically in a fixed hanger, d^2, secured to the main framing. A spring, d^7, coiled on the spindle d and adjusted by a nut, d^8, on the end thereof, makes the disks D^3 D^4 clamp the two disks D′ D^2, which are received between them, in such manner that the disk D′ will drive D^3 D^4 by face friction, and D^3 D^4 will by similar friction drive D^2, the velocity of D^2 varying according as the disks D^3 D^4 are higher or lower, and the edges of D′ and D^2 are respectively near to or farther from the center of D^3 D^4.

The block d', which carries the spindle d of the disks D^3 D^4, is connected by links d^3 with one end of an elbow-lever, D^5, which works on a fixed fulcrum, d^4, in the fixed hanger j^*, hereinbefore mentioned, and the other end of which is connected by a slot and-pin connection, d^6, with an arm, d^5, which is fast on the same shaft, j^9, with the cam-lever J^7. The effect of this connection d^5 d^6 is that as the lower arm of the lever J^2 rises on the cam J to depress the tip of the balling-spindle and incline the said spindle farther from the vertical position, as shown in Fig. 1, the lever D^5 is moved in a direction to lower the block d', and so depress the spindle d and disks D^3 D^4 to make the disk D′ operate nearer the centers of those D^3 D^4 and bring the portions of the latter which are farther from their centers into operation on the disk D^2, and so increase the speed of the latter and of the rotation of the balling-spindle. When the lever J^2 descends or approaches the center of the cam, and the balling-spindle moves toward an upright position, the effect on the lever D^5, block d', and disks D^3 D^4 is the reverse, and the speeds of rotation of the disk D^2 and balling-spindle are diminished.

The winding-flier consists, principally, of a ring, E, having internal radial arms like the spokes of a wheel, and having near the periphery thereof a fixed arm, E^2, to rotate around the balling-spindle for the purpose of winding the twine or cord on the latter, the said arm E^2 having a guide pin or sheave, n, at the end to guide the twine or cord.

The flier-ring E has firmly secured in its radial arms pins n' n' n', which serve as the axles of a number of grooved anti-friction rollers, n^2 n^2 n^2, which are fitted to run around a circular track, n^3, provided all round the circular interior of the flier-stand, the said stand consisting simply of a ring with feet, through which it is bolted onto the main framing. The flier is thus supported in its stand by the anti-friction rollers without a spindle or journals. On the side of the flier next the supply-bobbin B there is firmly attached a carrier, n^4, carrying a grooved guide-sheave, n^5, through which the twine or the cord enters the flier. The carrier n^4 is secured in one of the wheel-like arms of the flier-ring, the position of the said carrier being such that the part of the entering twine or cord which is in contact with the said sheave is opposite the center of the flier. In the spoke-like arms of the flier-ring are openings n^*, through one of which the twine or cord to be balled passes from the guide n^5 to the guide n at the end of the flier-arm. By thus making the flier in the form of a ring or wheel without any spindle or journals, and with openings through it at a proper distance from the center for the passage of the cord or twine, the latter passes through it, as shown in Fig. 1, with only one abrupt bend—viz., at the guide or sheave n—instead of having three nearly rectangular bends as in passing through the winding-fliers commonly used. The flier thus constructed might

be driven by a band running on the pulley E′, properly placed on the main shaft, and in a groove, n^8, in the outer periphery of the ring E itself, but is represented as having connected with the said ring by spoke-like arms n^6 a pulley, n^7, upon which, in Fig. 1, the band n^9 from the pulley E′ is represented as running to drive the flier.

The twine or cord to be balled may be brought to the sheave n^5 from a bobbin arranged in any convenient relation, but is represented as coming from an upright bobbin, B, arranged in a stand, B*, which is furnished with guide-sheaves b b', the twine or cord passing partly around said sheaves, and thence under a sheave, b^3, arranged in proper relation to the flier-sheave n^5, in a fixed stand, b^4. The guide-sheave b has a traverse motion relatively to the bobbin B under the control of the combined action of a weight, b^2, pendent from the said sheave and of the tension of the yarn; but this device needs no full description here, as it is no part of the present invention, but is the subject of my Letters Patent No. 352,312, dated November 9, 1886.

To provide for allowing the machine to stop when the winding of a ball is completed, the driving-pulley G is not fast on the shaft, but is made to form part of a friction-clutch, the other part of which consists of a disk, G′, fast on the driving shaft F. A spiral spring, 16, (see Fig. 11,) applied within a box, G*, in the hub of the pulley and bearing against collars F′ on the shaft, tends always to press the pulley against the disk G′ and keep the machine in gear, except when the driving-pulley is held away from the said disk by other means. This device for keeping the machine in gear, being well known and understood by machinists, needs no particular description here; but I will describe with reference to Figs. 1 and 4 the means of throwing the pulley out of gear.

I is a small horizontal forked lever working on a fixed fulcrum, i, secured in a bracket, I*, secured to the main framing, and the forked inner end of which enters a groove in the hub of the driving-pulley, the outer end of the said lever being furnished with a bowl, i', which is opposite a cam, l, on an upright lever, L, which works on a fixed fulcrum, l', carried by the bracket I*. The said lever L is connected by a coupling-bar, L′, with the lower end of the starting and stopping lever L^2, which works on a fixed fulcrum, l^2, provided on the main framing, and by which the said rod may be made to move the lever to a position in which it will operate on the lever I to throw the pulley G out of gear and hold it there; but while the machine is required to operate, the said coupling-bar L′ is locked in a position to keep the cam l in a position to leave the pulley in gear, as shown in Fig. 1, by means of a hook, m^2, at the extremity of the arm m' of a rock-shaft, m, which works in a fixed stand, M, erected upon the framing of the machine, the said hook engaging with a locking-piece, l^3, on the bar L′. The said rock-shaft m has another arm, m^*, and it and its two arms constitute a lever. The last-mentioned arm carries a pin, m^3, to be operated upon at the proper time for stopping the machine by a pin, m^4, (see Fig. 5,) secured in the cam J. This pin, when the winding and final topping of a ball has been completed, strikes the pin m^3 in the arm m^* of the rock-shaft, and so turns the rock-shaft far enough for the arm m' to withdraw its hook m^2 from the locking piece l^3 on the bar L′, and so leave the said bar free to be acted upon by a spiral spring, L^{2*}, which connects it with the machine-framing. This spring moves the said rod in a direction (viz., to the right as viewed in Fig. 1) to move the lever L and its cam l in a direction to withdraw the pulley G from contact with the disk G′, and thus stop the machine.

To provide for the unlocking of the bar L′ to permit the stopping of the machine at any time desired by the operator standing near the balling-head, there is arranged on the same fulcrum, l^2, with the starting and stopping lever L^2 another hand-lever, L^3, and the latter lever has connected with its lower end a sliding rod, L^4, by which it operates to push the arm m' of the rock-shaft m clear of the locking-piece l^3 on the coupling-bar L′. The two levers L^2 L^3 have their handles close together, so that they can be grasped and worked together, and they are connected in their handles by a slot and pin, as shown at l^5 in Fig. 1, so that L^3 may be first moved to disengage the coupling-bar L′ before L^2 is moved to operate the said rod for stopping the machine.

I will now describe the operation of winding a ball, first supposing the ball-spindle and the cam J to be in the respective positions represented in Fig. 5, which is the position in which they have been left after the winding of a ball, and in which they remain when the machine is at rest. The attendant, having taken the end of the twine or cord from the bobbin B and placed it through the flier and fastened its end to the balling-spindle, takes hold of the swinging head and draws it up to the position shown in Fig. 1, by which movement the lever J^2 is made to bring its pawl j^{11} into operation on the single tooth j^{10} on the hub of the cam J, and so turn the said cam to the position shown in Fig. 1, in which the lever J^2 is on the highest part of the cam. The cam is held in this position until the machine is started by the pawl j^7 and ratchet-wheel j^8. The machine is now started by moving the lever L in a direction to draw the bar L′ to the left, (see Fig. 1,) and so liberate the lever I from the cam l sufficiently to allow the driving-pulley G to come into gear, and the bar L′ and cam l are then locked by the falling of the point of the locking-lever under the catch l^3 on the said bar. The winding of the twine on the spindle by the rapid rotation of the winding-flier while the ball-spindle rotates slowly proceeds in the usual manner, and as the winding proceeds the necessary changes of the line of the spindle are produced by the action of the

cam J through the lever J^2 and rod J^3 on the swinging head, these changes being at intervals, only the very gradual bringing of the spindle slowly to a slightly more nearly vertical position to compensate for the increasing size of the ball-arm, at other intervals being abruptly made first to bring the spindle to a position substantially such as is shown in Fig. 5—that is to say, much more nearly vertical—to produce the operations known as "topping," and afterward to return the spindle to the position substantially such as is shown in Fig. 1, in which the greater part of the winding is performed.

In the example shown the cam produces by the tops of its wings a' a^2 a^3 three stages of winding with the spindle at an inclination not varying greatly from that shown in Fig. 1, the falls from these projections to their succeeding depressions, e' e^2 e^3, producing the changes to an inclination not varying greatly from that shown in Fig. 5 for topping, and the rising succeeding surfaces producing the return to the less inclined position, the topping being performed while the bottoms of the depressions e' e^2 e^3 are in operation, the depression e^3 producing the final topping or finishing of the ball heretofore commonly performed by the attendant taking hold of the swinging head and moving it by hand to change the inclination of the balling-spindle. When this final topping or finishing has been performed, the pin m^4 in the cam J strikes the pin m^3 in the arm m^* of the rock-shaft m and so throws off the arm m' of said rock-shaft from the catch l^3 on the bar L′ and allows the machine to go out of gear and stop. The ball being removed, the machine is ready for a repetition of the operation described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the swinging head and the main shaft of the machine, of a cam-shaft arranged in fixed bearings, gearing, substantially as herein described, between said cam-shaft and main shaft, a cam loose on the said cam-shaft, a lever and connecting-rod through which the cam operates on the swinging head, a ratchet and pawl connection between the cam and its shaft through which the shaft drives the cam, a pawl attached to said lever, and a tooth provided on the cam through which the pawl last mentioned acts to produce the turning forward of the cam on its shaft by a movement of the swinging head, substantially as herein set forth.

2. The combination, with the ball-spindle, the swinging head, the main shaft, a cam and its shaft, and gearing, substantially as herein described, between the cam-shaft and the main shaft, of a cam-lever and connecting-rod for transmitting motion from the cam to the swinging head, a longitudinally-extensible spindle-driving shaft geared with the balling-spindle, friction disks, one on the main shaft and one on the extensible spindle-driving shaft, a pair of movable rotary clamping-disks engaging the disks on the main and spindle-driving shafts, a carriage for said clamping-disks, and a lever connected with said carriage and with the cam-lever producing the movement of the clamping-disks relatively to the friction-disks on the main and spindle-driving shafts for varying the speed of the spindle-driving shaft according to the position of the swinging head, all substantially as herein described.

JOHN GOOD.

Witnesses:
FREDK. HAYNES,
HENRY MCBRIDE.