No. 619,383. Patented Feb. 14, 1899.

F. G. BECKER.

TWINE BALLING MACHINE.

(Application filed Oct. 18, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2

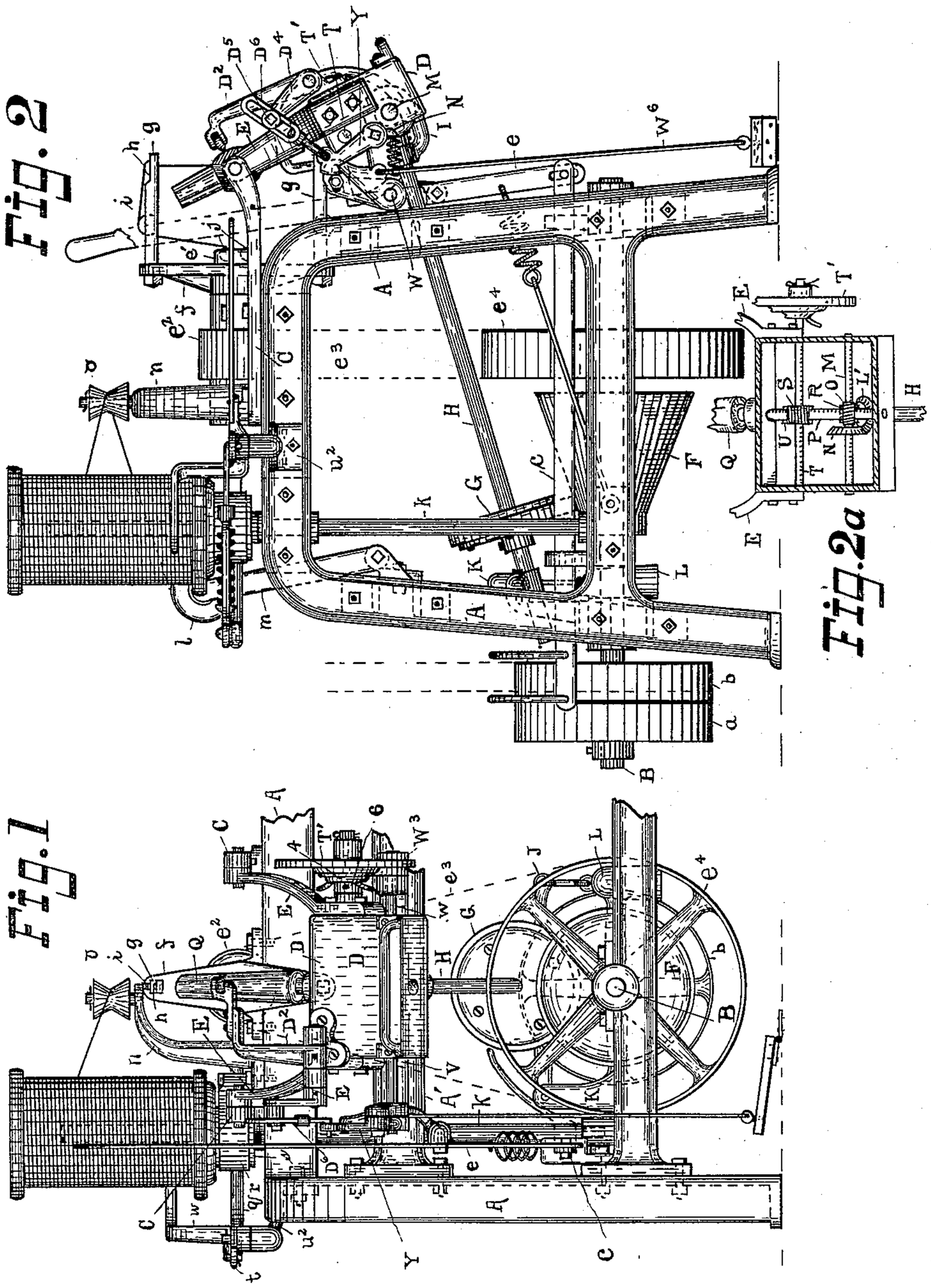

Fig. 2a

Fig. 1

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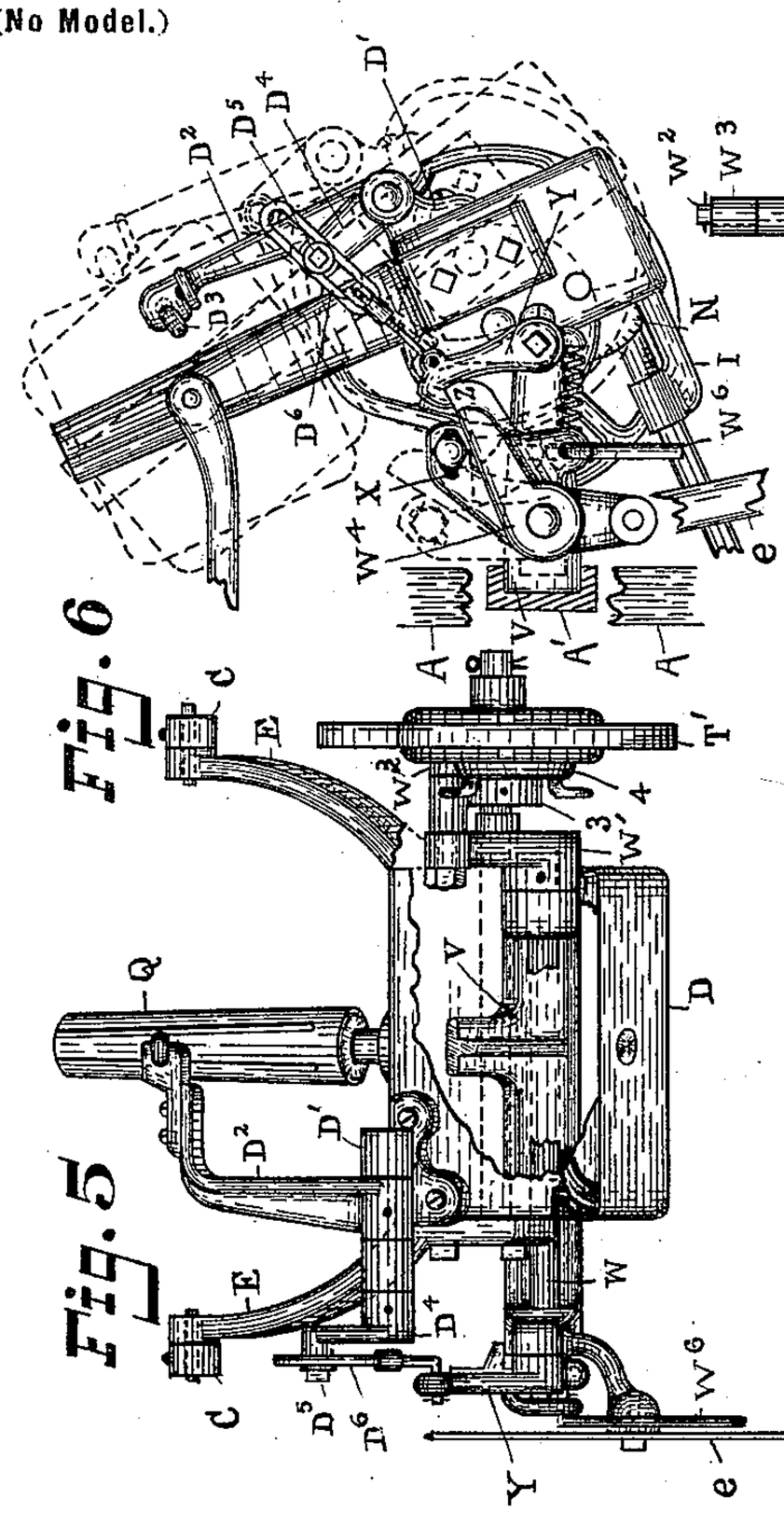

Fig. 6

Fig. 5

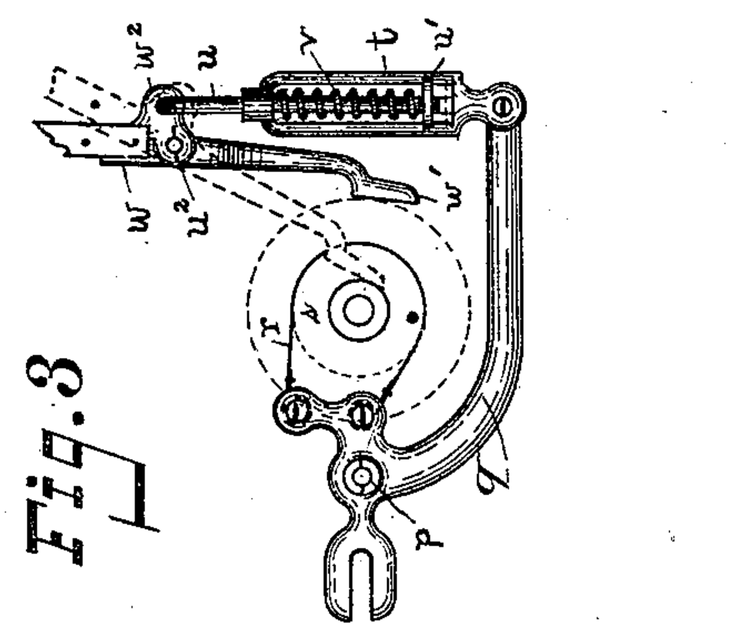

Fig. 3

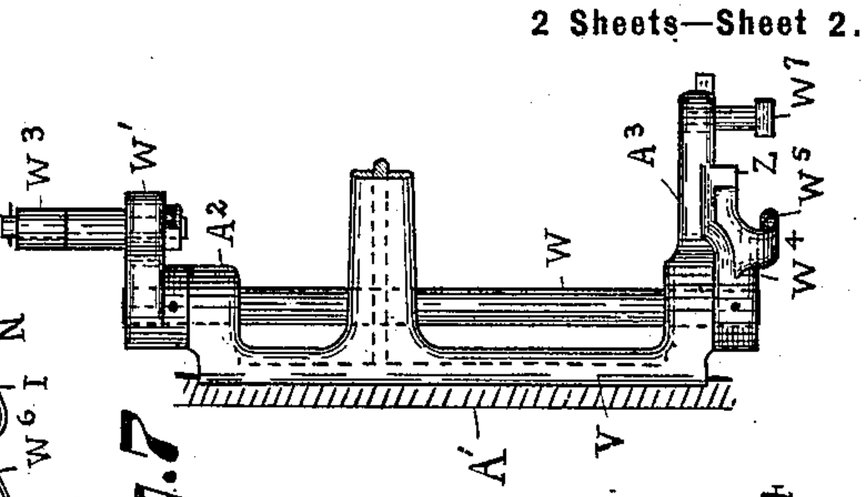

Fig. 7

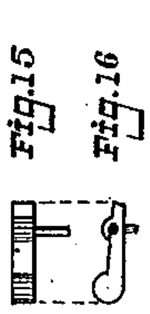

Fig. 15

Fig. 16

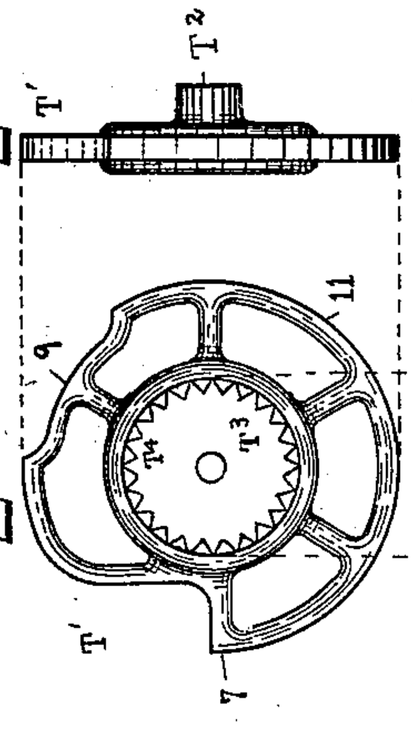

Fig. 9

Fig. 8

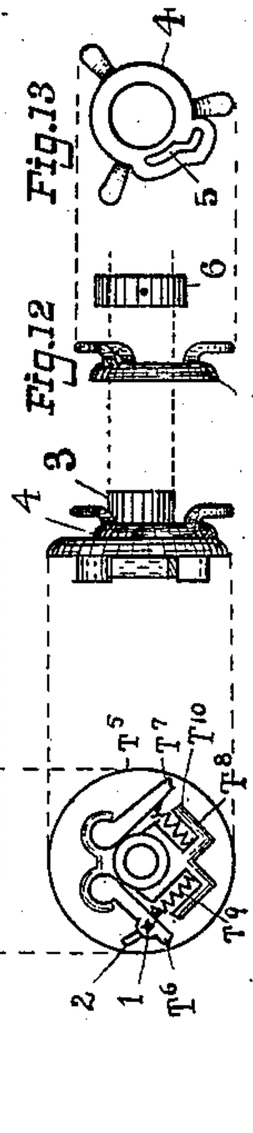

Fig. 13

Fig. 12

Fig. 14

Fig. 11

Fig. 10

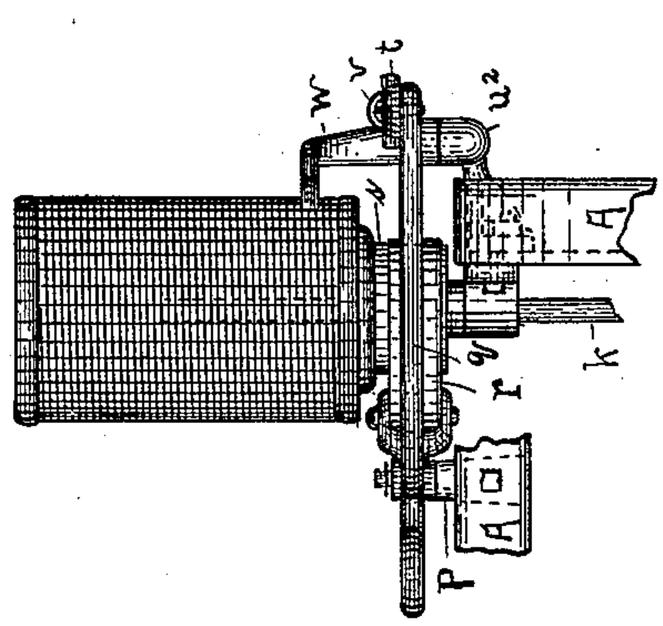

Fig. 4

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UNITED STATES PATENT OFFICE.

FREDERICK G. BECKER, OF PEORIA, ILLINOIS.

TWINE-BALLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 619,383, dated February 14, 1899.

Application filed October 18, 1897. Serial No. 655,512. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK G. BECKER, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Twine-Balling Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to machines for forming finished twine into balls, being wound from the spools which are filled from the twine-making machine.

Heretofore balling-machines have been so constructed as to necessitate the employing of an operator for each machine, because the device not being automatic in its action required continuous attention. Furthermore, the machines were faulty in construction, and should the operator be a little careless or lacking in judgment the breaking of the twine was the result or loose winding of the ball. When the twine was broken, the stopping of the machine was necessary in order to unite the twine. This of course caused much trouble and occupied a great deal of time.

It is the object of my invention, in view of the above, to provide a machine for winding balls which shall be perfectly automatic, so that little or no attention will be required other than to start a new ball each time one is finished.

Furthermore, the object is to provide a machine in which a new tension device is embodied for keeping a continuous even strain upon the twine as it unwinds from its spool. An operator may have charge of several machines of this construction instead of giving his whole time and attention to one machine, as has been mentioned above.

As a further object I provide a gage which is operated by the winding ball, so that after starting the winding the machine is perfectly automatic. I am not aware that a gage has ever been used in this manner on machines of this class, nor indeed am I aware that a gage has been used in any manner whatsoever to acquire my object.

In the drawings forming a part of this application, Figure 1 is a front elevation of the machine. Fig. 2 is a side elevation of the same. Fig. 2^a is a front view of a gear-box carrying a spindle, showing the arrangement of gearings. Fig. 3 is a plan view of a tension attachment, which forms an important part of my invention. Fig. 3^a is a perspective view in detail of a portion of the tension device. Fig. 4 is a side elevation of my tension device shown in Fig. 3, with a spool of twine shown in connection therewith. Fig. 5 is a front elevation of a portion of the machine shown in Figs. 1 and 2. Fig. 6 is a side elevation of the same. Fig. 7 is a plan view of a frame and rock-shaft, forming part of Figs. 5 and 6. Fig. 8 is a side view of the cam with ratchet-toothed interior. Fig. 9 is an edge view of the same. Fig. 10 is a face view of a ratchet-plate with pawls pivoted thereon. Fig. 11 is an edge view of the same, showing a slotted cam-ring and retaining-collar therewith. Fig. 12 is an edge view of the slotted cam-ring. Fig. 13 is a face view of the same. Fig. 14 is an edge view of the retaining-collar. Fig. 15 is an edge view of a controlling-pawl, which is shown in Fig. 10. Fig. 16 is a face view of the same.

A represents the frame of the machine, across the lower reaches of which is journaled a shaft B, having a tight and loose pulley *a* and *b*, respectively. A belt-shift *c*, with its lever *e*, is provided, as usual, the said lever being placed in a convenient position for the operator. Upon the top of the frame is journaled a flier, mounted on a winding-shaft *e'*, consisting of an arm *f*, having a horizontal finger *g* upon each extremity. The outer extremities of said fingers are slotted and are each provided with a roller *h*, and at the middle of the length of each finger is the roller *i*. The shaft *e'* is made hollow, and at the end carrying the said arm *f* are journaled a pair of rollers *j*. A pulley e^2 on the shaft *e'* drives the flier by means of a belt e^3 from pulley e^4 on shaft B.

A vertical revolving shaft *k* is journaled on the side of the frame A and carries on its upper extremity a spool of twine. A roller *l* is mounted on an arm *m*, pivoted to the frame A in the rear of the machine, the lower periphery of which is in line with the center of the hollow shaft *e'*. A rigid arm *n* is secured to the frame and carries a roller *o* at

its upper extremity. The twine is wound from the spool, passes around said roller *o*, thence passes backward from the roller *l*, and from the under side of the said roller through the shaft *e'*, over one of the rollers *j*, thence up and over the rollers *i* and *h*, and down to the winding-spindle, to be hereinafter described.

The tension device used in my improved machine is constructed as follows: A bracket *p*, secured to the frame A, pivotally supports an arm *q*, one end of which supports one end of a bracket *t*. Within the bracket slides a rod *u*, and a spring *v* occupies a position between the head *u'* of the rod *u* and the head of the said bracket, as shown in Fig. 3. A lever *w* is pivotally supported on a bracket u^2 on the machine-frame, the forward end of which is within easy reach of the operator at the front of the machine. The opposite end of said lever, beyond its fulcrum, is provided with a foot *w'*, which bears against the twine on the spool. A projecting arm w^2 on the lever *w* pivotally supports the free outer end of the said rod *u*. Upon the vertical shaft *k* beneath the spool is a drum *s*, which is encircled for part of its circumference by a band-brake *r*, generally made of spring-steel, the two ends of which are loosely secured to the free ends of the lever *q* described. In operation the lever *w* is thrown in a direction to increase the distance between the shaft *k* and the foot *w'*, whereby the spool of twine may be set upon the shaft, to which it is secured by any good means. Upon releasing the lever the foot *w'* bears against the twine on the spool, as above set forth.

It will be seen that the greater the distance between the shaft *k* and the foot *w'* the greater will be the strain upon the spring *v* as well as the swing of the lever *q* upon its fulcrum, which tends to increase the friction of the band-brake upon the drum *s*. In winding from the full spool the twine has a greater leverage than when winding from a spool nearly empty. Therefore the greater tension must be applied at the start. This is accomplished as is easily seen from the drawings. As the twine reduces the diameter of the winding-spool the foot *w'* falls and gradually diminishes the friction of the band-brake upon the drum *s*, so that the tension is perfectly even at all times. In former practice the band-brake was employed as well as a lever; but to the lever was pivoted one end of a thread-bar carrying a hand-wheel, with a suitable stop on the frame, against which the hand-wheel was allowed to bear, whereby in the turning of the wheel the thread-bar was drawn forward, together with the lever, and the friction of the band-brake upon the drum increased. The operator in starting the machine with a full spool would give the hand-wheel a sufficient number of turns to give the necessary tension; but as the diameter of the twine on the spool decreased and the operator neglecting to loosen the wheel the leverage of the pull of the twine was diminished, the strain upon the twine was too great, and the result was the breaking of the twine.

Upon the top of the frame A are secured two arms C, which project beyond the front of the machine and pivotally support a gear-box D by arms E, bolted thereto. Upon the shaft B is a cone friction-wheel F, whose greatest diameter faces the front of the machine, and upon it rests a friction-wheel G, carried on an angling-shaft H, having bearings at one end in the pivotally-hung arm I of the gear-box, the shaft with its lower end simply resting by its wheel G upon the cone F, being held in place on the cone by a lever J, within which the said shaft H is held, as in common practice with machines of this class, one end of the lever being pivoted to a standard K, the other end carrying an adjustable weight L. The upper end of the shaft H carries within the gear-box D a beveled gear-wheel L', which drives a shaft M by means of a gear-wheel N, and upon the same shaft M is fixed a worm O, which drives a vertical shaft P by means of the worm-wheel R. The upward continuation of said shaft outside of the gear-box constitutes the balling-spindle Q. Said shaft P also carries a worm S, which drives a horizontal shaft T by a worm-wheel U. This shaft projects outside of the box and carries the cam T'. This construction is shown only in Fig. 2^a, being omitted in the other figures because of possible complication of the drawings.

A portion of the main frame V, which is secured to the cross-piece A', carries at each end thereof a projection A^2 and A^3, Fig. 7. A rock-shaft W has its bearings in these projections, one end of said shaft having an arm W' secured thereto with a wrist-pin W^2, which is adjustable in a slot X and carries a roller W^3 on its outer end. The opposite end of said shaft W carries a lever-arm W^4, which supports by an eye w^5 a foot-lever by a rod w^6.

Upon the projecting portion A^3 of the frame V is fixed a wrist-pin W^7, which carries a dog Y, Figs. 1, 2, 5, and 6, which engages the lip *z* of the lever-arm W^4.

Upon the gear-box D is secured a bearing-bracket D', carrying a gage D^2, consisting of an arm, as shown, having on its free end a roller D^3. The said arm carries a short arm D^4, having a pin D^5, which supports and engages a link D^6. This link is pivotally attached to the dog Y by suitable means. The gage D^2 occupies a position just in front of the spindle Q, as shown, the use of which will be presently described. As before mentioned, the shaft T, within the gear-box, carries the cam T', and, as will be seen from Figs. 8 and 9, a hub T^2 is formed therewith, which turns freely on said shaft T. The interior of the cam is bored out, but leaves a wall T^3, and a number of ratchet-teeth T^4 are cut on the inner periphery of the cavity thus formed. A slotted plate T^5, carrying the pawls T^6 and T^7, covers the said cavity hav-

ing the pawls within. A raised housing T^8 incloses springs T^9 and T^{10}, which serve to keep the pawls thrown outwardly into engagement with the ratchet-teeth T^4. The pawl T^6 is provided with a pin 1, which projects through a slot 2 in said plate T^5. Upon the opposite side of the plate is a hub 3, which is secured to the shaft and carries a cam-ring 4, having a slot 5, and a collar 6 serves to hold the ring 4 in place. The pin 1 is of sufficient length to pass through the plate T^5 and slot in ring 4, so that said ring is capable of moving the pawl T^6 when swung in the proper direction. The plate T^5 is fast on the shaft by its hub; but the cam is free to revolve independently thereon. The pawl T^7 permits the cam to move in one direction only. However, when the pawl T^6 occupies the position shown in Fig. 10 the cam is held against turning in either direction. By the simple turning of the ring 4 the pawl T^6 is drawn out of engagement with the teeth T^4 by reason of the slot 5 and pin 1, thus permitting the cam to revolve freely in one direction.

Having now fully described the construction of the machine, the operation may now be understood. The shaft B in revolving transmits motion to the friction-wheel G and shaft H and spindle Q through the gearing in the box D, the said spindle receiving the twine from flier, as shown. The start is made by disengaging the pawl T^6 and bringing the cam into position, so that point 7 of the cam rests upon roller W^3 of rock-shaft W. The pawl T^6 is now to be locked and the machine set in motion. The spindle Q makes a few revolutions, which allows the twine to be started thereon, and the cam then drops to the position shown by solid lines, Fig. 2. The spindle continues its revolutions, and by the time the point of contact of the cam with the roller W^3 is at the point 11 the ball is of sufficient size to raise the gage-arm D^2 and by it bring the arm D^4 to its upward limit within the slot in the link D^6. It also continues farther than the length of the slot and raises the link in the same line of direction, thus lifting the dog Y from the lip Z of the lever-arm W^4. The ball is now of sufficient size to receive its cover. The said arm W^4 rises on being released by the dog by reason of the weight of the cam and gear-box arrangement upon the roller W^3 of the arm W′ to position shown by broken lines, Fig. 6, and brings gear-box into position, as shown by solid lines, Figs. 2 and 6. The spindle Q now continues to revolve till the ball has its final layer or cover, after which it is removed and the operation repeated.

It will be noted that the spindle Q will revolve slowly at first or at least at a speed just sufficient to permit the twine to wrap in even closely-laid layers; but as the ball grows larger the spindle must necessarily have an increased speed, else the windings would overlap. This is accomplished by the use of the coned friction-pulley F. The cam serves to draw the friction-wheel G farther up the cone F upon a constantly-increasing diameter, which obviously increases the speed of the said wheel G. Thus the cam not only constantly changes the speed for the growing diameter of the ball, but also gives to the ball the proper form by keeping its upper and lower edges always at a point on a line which might be drawn from the pivotal points of the arms E of the gearing-box, with the arms C of the frame, to the periphery of the roller *h* on the arm *g* of the flier, said pivotal points being at the center of the ball.

The flier is provided with the two arms *g*, so that the device is counterbalanced, one arm only being used in practice; but both are provided with the same means, so that in case of the giving out of one the other may be used. Naturally when the gear-box and its parts return to their first or starting position the shaft H returns to its former position, the pulley G attaining position upon the smaller diameter of the cone-pulley.

Those acquainted with twine-balling machinery and its heretofore faulty construction will appreciate my improvements, as have been fully described.

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

1. In a twine-balling machine, the main frame, a spool-carrying spindle having bearings on the said frame, a brake-drum on the spindle, a lever *q* pivoted on the frame, a brake-band attached to the lever substantially as shown, a lever *w* pivoted to the main frame and adapted to bear on the spools, a tension device connecting the levers *q* and *w*, consisting of the link *t*, rod *m* and spring *v* surrounding said rod and arranged substantially as herein set forth and described.

2. In a twine-balling machine, the combination with the main frame and spindle-driving mechanism, a gear-box pivoted to the said frame, a rock-shaft supported on the frame, two arms on the said shaft, a foot-lever pivoted to one of the arms, a roller on the opposite arm, a cam-shaft T in the said gear-box, an adjustable cam on said shaft T for engaging the rock-shaft roller, a lock within the cam for engaging and disengaging the cam and its shaft, a ball-gaging arm having pivotal bearing on the gear-box, a dog pivoted to gear-box and adapted to engage one of the arms of the rock-shaft, an arm D^4 pivotally connecting the gage-arm and dog, all substantially as set forth and described.

3. In a twine-balling machine, the main frame, a gear-box with its driving mechanism, a rock-shaft on the main frame, a foot-lever attached thereto, a roller on said rock-shaft, a cam-shaft on the gear-box, an adjustable cam on the shaft and capable of independent movement thereon, a suitable gage pivoted to the said gear-box and means for loosely connecting the gage and rock-shaft, a wind-

ing-spindle in the gear-box, substantially as described for the purposes set forth.

4. In a twine-balling machine, the main frame, a gear-box pivoted thereto, driving mechanism in the gear-box, a winding-spindle driven by said mechanism, a rock-shaft on the main frame, an arm w^4 on the shaft, a foot-lever attached to the arm, an arm w' on the said shaft, a roller on the arm, an adjustable cam on the gear-box engaging said roller, the frame V as part of the main frame, an arm A^3 thereon, a pin W^7 on the arm, a dog y on said pin for engaging said arm W^4, an adjustable link D^6 pivoted at one end to the said dog, a gage D^2 pivoted on the gear-box, an arm D^4 operating with said gage and engaging said link D^6, in combination with a flier for winding twine on said winding-spindle, driving mechanism for same, a spool-carrying spindle on the frame and means for governing its movements substantially as set forth.

5. For a twine-making machine, an adjustable cam consisting of the hollow body of irregular contour, a series of teeth on the inner annular surface of the hollow portion, a shaft for carrying the cam, a covering-plate for the hollow portion, an independent spring-actuated pawl pivoted to the said plate, an adjustable pawl pivoted to the plate, a cam-ring mounted on the plate, a pin on the adjustable pawl and a slot in the cam-ring for engaging the pin substantially as set forth and described.

6. In a twine-balling machine, an adjustable cam therefor, consisting of the hollow body thereof, a shaft, a series of ratchet-teeth on the inner annular surface of the said hollow body, a covering-plate on the shaft adjacent to the cam, a spring-actuated pawl pivoted to the said plate for engagement with the ratchet-teeth, a spring-actuated adjustable pawl pivoted to the plate, a cam-ring mounted on the said covering-plate, means on the adjustable pawl and on the cam-ring for operating said pawl, all being arranged substantially as and for the purposes herein set forth and described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK G. BECKER.

Witnesses:

J. P. McMAHAN,

J. HARDACRE.