(No Model.) 2 Sheets—Sheet 1.

R. A. KELLY.

TWINE BALLING MACHINE.

No. 347,116. Patented Aug. 10, 1886.

Fig. 1.

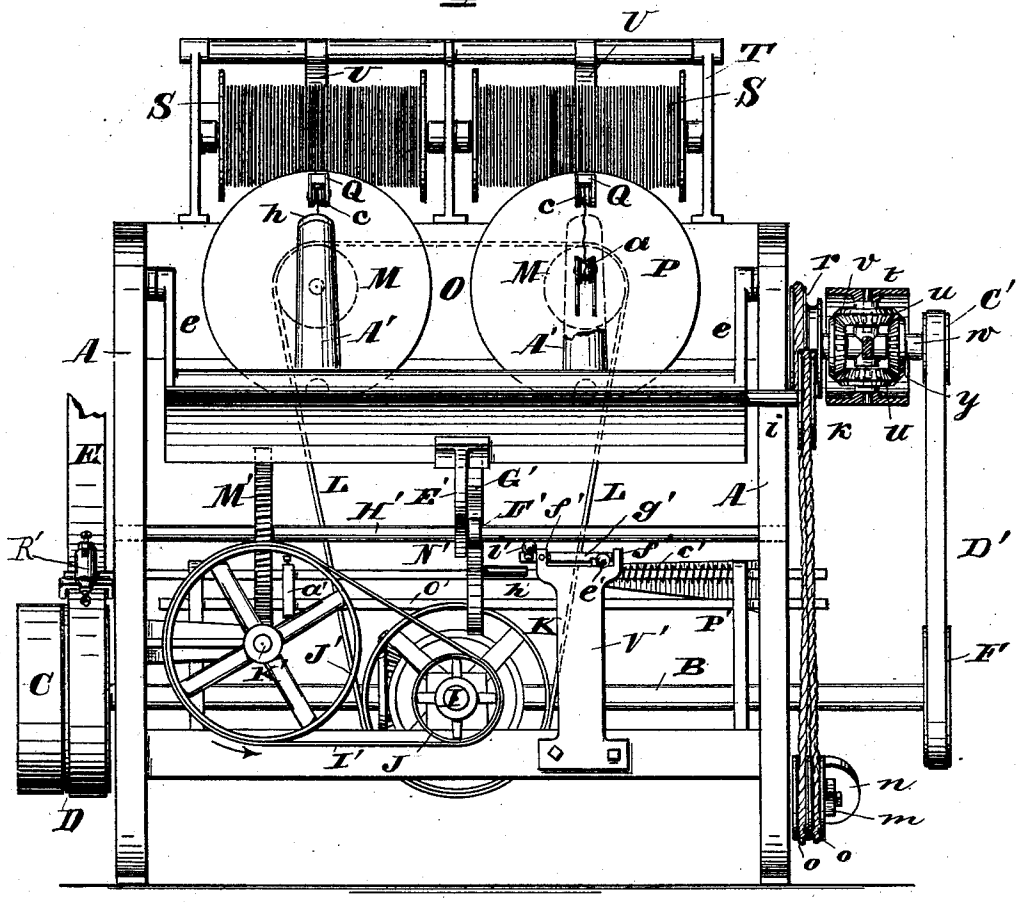


Fig. 5.

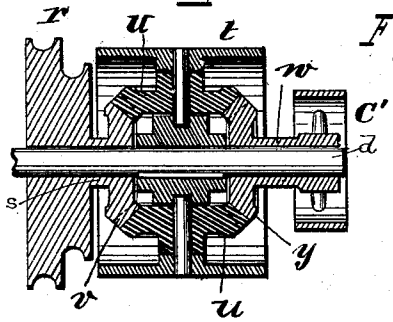


Fig. 2.

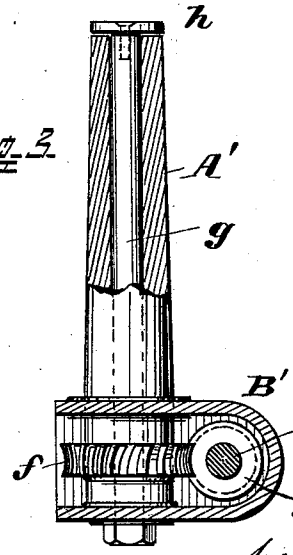
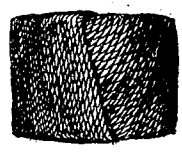


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

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TWINE BALLING MACHINE.

No. 347,116. Patented Aug. 10, 1886.

Fig. 2.

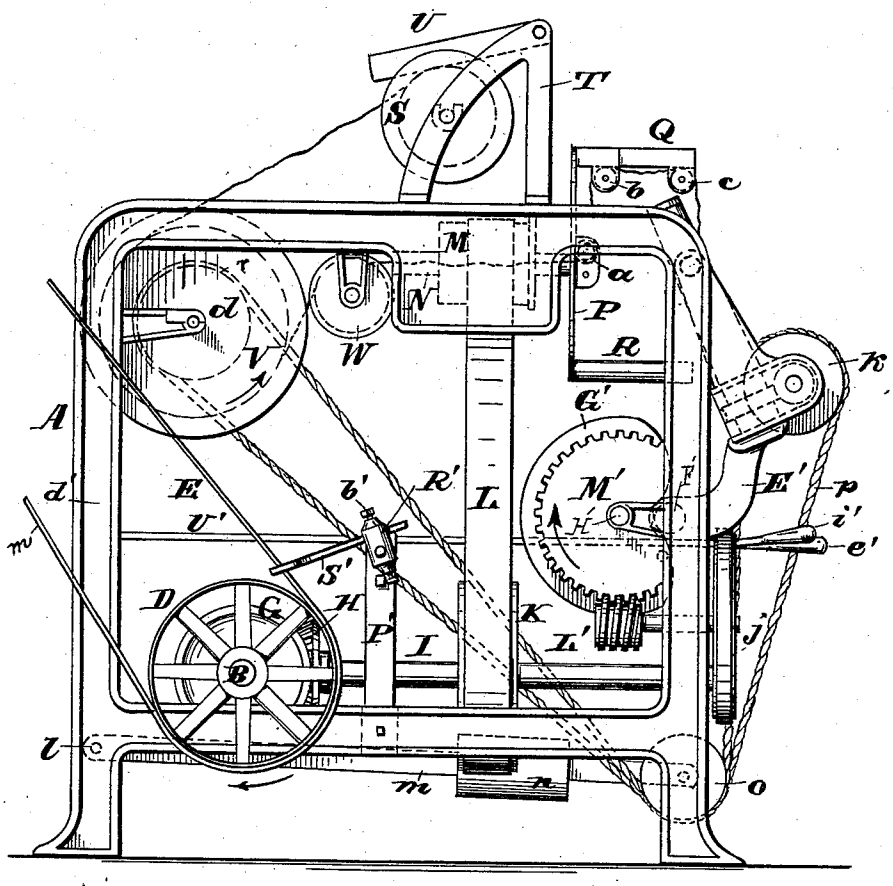


Fig. 7.

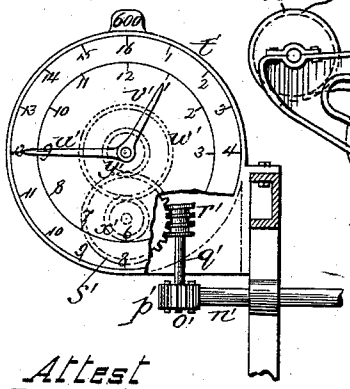
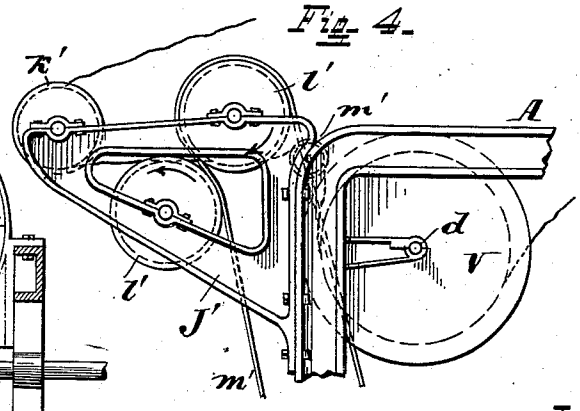


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT A. KELLY, OF XENIA, OHIO.

TWINE-BALLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 347,116, dated August 10, 1886.

Application filed March 11, 1885. Serial No. 158,400. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. KELLY, a citizen of the United States, residing at Xenia, in the county of Greene and State of Ohio, have invented certain new and useful Improvements in Balling-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to that class of machines for balling twine, cords, &c., by which such twine, cord, &c., are made into balls ready for the market, and has for its object the simplification of construction, as well as the increased efficiency, of this class of machines.

The novelty of my invention will be herein set forth, and distinctly pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved machine. Fig. 2 is an end elevation of the same. Fig. 3 is an enlarged detail view, partly in section, of one of the winding-spindles and its connections. Fig. 4 is a detail view of an attachment to be applied to the machine when it is desired to wind cords. Fig. 5 is an enlarged sectional detail of the differential gearing. Fig. 6 is an elevation of one of the finished balls. Fig. 7 is an enlarged elevation, partly in section, of the indicator mechanism.

The same letters of reference are used to indicate identical parts in all the figures.

A represents any suitable well-braced frame-work, to which the various parts of the machine are secured and journaled, and by which they are supported, and it may consist of substantial end castings united by tie-beams securely bolted thereto. Near the bottom, and at the rear of the machine, is suitably journaled a horizontal shaft, B, upon one outer end of which are secured, side by side, the loose pulley C and tight driving-pulley D, driven from the line-shafting by a belt, E. The opposite projecting end of this shaft B is likewise provided with a driving-pulley, F. Keyed upon the shaft B within the frame is a beveled pinion, G, meshing with a similar pinion, H, keyed upon a horizontal shaft, I, at right angles to the shaft B, and which, suitably journaled, extends to the front of the frame and projects therefrom to receive a small pulley, J. Within the frame, and keyed upon the shaft I, is a pulley, K, from which a belt, L, extends up and over two pulleys or drums, M, keyed upon the flier-spindles N. These spindles, which are hollow to permit the passage of the cord or twine through them, are journaled in a box, O, open at its bottom, and which may be integral with or set into and secured between the sides of the frame, and they carry upon their front ends disks P, to which the flier-arms Q are secured. Diametrically opposite the flier-arms and projecting from the face of the disk are balancing-arms R, as is usual in this class of machines. The twine-carrying spools or bobbins S are hung in a frame, T, supported upon the box O, and are provided with pivoted drag or brake arms, U, to prevent the twine being unwound more rapidly than is required.

In the present machine I have made provision for only two winding-spindles and two fliers; but by increasing the width of the machine as many spindles and fliers may be employed as desired.

From the bobbins S the twine passes back and, preferably, twice around two circumferentially-grooved pulleys, V, each in line with its respective spindle N, thence up over and preferably twice around grooved guide-pulleys W, thence straight through the spindles N and up around the small guide-pulleys *a b c* to the outer end of the flier-arms Q. By thus passing the twine twice around the pulleys V and W, or, which would be the same thing, around grooved cylinders or drums in place of pulleys, the twine would be prevented from slipping, and a more positive and certain driving of the shaft *d* accomplished, and whereby an indicator to show the weight of the twine put into each set of balls can be connected to either of the shafts of the pulleys V or W, as will be readily understood by reference to Fig. 7, where the shaft *n'* of the pulley W is shown extended beyond the frame-work, and carries at its end a worm, *o'*, that meshes with a worm-wheel, *p'*, upon the lower end of a vertical shaft, *q'*, whose upper end is provided with a worm, *r'*, that meshes with a gear-wheel, *s'*, within the indicator-case *t'*, which has upon its outer side a dial with an outer row of equi-

distant numbers, extending from one to sixteen, to indicate ounces, and to which the larger hand, *u'*, points, and also an inner row of equidistant figures, extending from one to twelve, to indicate pounds, and to which the short hand *v'* points. The short hand is attached to the larger gear-wheel, *w*, within the case, which meshes with the smaller pinion, *x'*, whereas the long hand is secured to and moves with the pinion *y'*, which meshes with the larger pinion, *s'*. The size of the gears is made such that the short hand passes over but one division of space, while the long hand makes a complete revolution of the dial.

The pulleys *b c* are suitably pivoted to the flier-arms, and the pulleys *a* are pivoted in ears projecting from the disks P, and all of these guide-pulleys of the twine are so arranged as to guide it properly to prevent its wearing or chafing against any of the parts of the machine.

The pulleys V are keyed upon a shaft, *d*, extending across the frame and projecting from one side.

The winding-spindles A' are constructed and applied in the following manner: Hung to the front of the frame by arms *e* is the vibrating spindle-carrier B', occupying a horizontal position across the front of the frame, and which I preferably form in the shape of a hollow U-shaped casting, as shown. The spindles A' are inserted through bushed or bossed apertures in the upper plate of the carrier, and receive upon their lower ends, after being inserted, keyed worm-wheels *f*. A tie-bolt, *g*, is inserted from the under side through the bottom plate of the carrier and up through the spindle, where it is secured by a head or washer, *h*, attached by a tap-screw or otherwise. Journaled through the ends of the carrier B' is a shaft, *i*, carrying within the carrier worms *j*, which mesh with the worm-wheels *f*, to cause the revolution of the spindles as the twine is being wound on them. In this manner I provide a very secure and simple support for the spindles, wherein the driving parts are housed and shielded from dust and dirt. The outer end of the shaft *i* is provided with a grooved pulley, *k*, either single, as shown, or in the form of a cone to permit the driving cord or belt to be changed to regulate the speed of the shaft *i* during the finishing of the balls. Pivoted, as at *l*, to the rear side of the frame, is a forwardly-projecting arm, *m*, carrying an adjustable weight, *n*, adapted to slide thereon and be secured at any point desired. The outer end of this arm *m* has a lateral stud or spindle, on which is pivoted two grooved pulleys, *o o*. A cord or strap, *p*, passes down around the pulleys *o o* and up around a grooved cone-pulley, *r*, secured to a sleeve, *s*, upon the projecting end of the shaft *d*. Keyed to the shaft *d*, just outside of the cone *r*, is a drum, *t*, upon two of the arms or spokes of which are loosely fitted beveled gears *u u*, which mesh with a beveled pinion, *v*, keyed upon the end of the sleeve *s*. Upon the outer end of the shaft *d* is slipped a sleeve, *w*, carrying at its inner end a beveled pinion, *y*, meshing with the pinions *u u*, and at its outer end a pulley, C', driven by a belt, D', from the pulley F. This construction constitutes a differential gearing, as will be readily understood, the object of which is to cause the rapidity with which the twine is fed to govern the speed of revolution of the winding-spindles in the following manner: The shaft *i* is driven from the cone-pulley *r* through the medium of the cord or strap *p*, and the cone-pulley is driven by the pulley C' through the medium of the differential gearing. If the gears *u* were stationary, so as to have a revolution on their axes merely, the speed of the pulley *r* would be uniform with that of the pulley C'; but as the drum *t* is secured to the shaft *d*, so as to revolve therewith by the action of the twine passing through the machine, it is evident that the gears *u*, in addition to rotating on their axes, revolve around the gears *y* and *v* and in the direction of revolution of the gear *v*; hence the speed of the gear *v* and cone *r* varies with the speed of the drum *t*, so that the faster the drum *t* travels the slower will be the speed of the cone *r*, and consequently of the shaft *i* and winding-spindles A'. This change in the speed of revolution of the winding-spindles is rendered necessary to secure a proper winding of the balls by the gradual increase in the size of the balls, and as the balls grow larger they take off the twine more rapidly, and thereby increase the speed of the pulleys V and shaft *d* to effect the decrease in the speed of the winding-spindles, as before stated, and thus the machine is rendered automatic in this particular, as in others to be presently explained.

To cause the spindle-carrier with its spindles to so vibrate as to present the spindles properly to the twine being wound on them, I secure an arm, E', to the lower side of the carrier B', which arm carries at its lower inner extremity a roller, F', that bears against a cam-disk, G', of the shape shown, which is keyed upon a horizontal shaft, H', suitably journaled in the frame. A belt, I', passes from the pulley J around a pulley, J', fastened, as will be hereinafter explained, upon a shaft, K', whose inner end is provided with a worm, L', meshing with a worm-wheel, M', upon the shaft H'. In this manner motion is communicated from the shaft B through the medium of the shaft I, pulleys J and J', and other parts described, to the shaft H', and consequently to the cam, which is shown at its normal position of rest in Fig. 2, just before or at the starting of the machine, and which makes one complete revolution during the complete winding of the balls upon the spindles, and then stops to permit the removal of the balls. This cam in its revolution forces out the spindle-carrier B' through the medium of the arm E', and

causes the winding-spindles, whose position of inclination at the starting of the balls is shown in Fig. 2, to gradually assume a more horizontal position, and then to return again to their first position as the winding of the balls is completed. From this vibration of the spindle-carrier B′ will be seen the necessity for having the weighted arm *m* and pulleys *o*, for as the carrier travels up or down the pulleys *o* rise and fall, and at all times maintain the proper tension of the driving-strap *p*.

To cause the machine to stop automatically when the balls are finished and the cam has made an entire revolution, I employ the following mechanism: Two horizontal rods, N′ O′, extend across the machine and have sliding bearings in uprights P′ suitably secured to the frame-work. These rods, which are preferably round in section, are held from turning by a clamp-brace, *a′*, Fig. 1. The rod N′ carries at its projecting end an adjustable perforated head, R′, from which the belt-shipper rod S′, embracing the belt E, extends and is secured by a set-screw, *b′*. Coiled around the rod N′ is a spring, *c′*, which bears at one end against one of the uprights, P′, and at the other against a shoulder or swell upon the rod N′. A lever, U′, pivoted, as at *d′*, at the back of the frame, extends forward to the front of the machine, and is provided with an operating-handle, *e′*. This lever U′ is connected by a slot and pin to the rod N′, so that by taking hold of the handle *e′* the rod can be drawn back to compress the spring *c′* and to cause the belt E to be shipped to the driving-pulley. To hold it when thus shifted the forward end of the lever U′ rests upon the top of a standard, V′, at the front of the machine, provided with stop-shoulders *f′*, to one of which is pivoted a latch, *g′*, that catches over and engages the lever U′ when the belt has been shifted to the tight pulley. A stud or pin, *h′*, is so arranged upon the cam G′ that when said cam has just about completed its revolution the pin *h′* comes in contact with the projecting end of and lifts the latch *g′*, thereby freeing the lever U′ and the spring *c′*, which, recoiling, forces out the rods N′ O′ and consequently the shipper, thereby throwing the belt onto the loose pulley and stopping the machine. To restart the machine, it is only necessary to draw back the lever U′ until it is engaged by the latch *g′*, whereupon the belt will be shifted to the tight pulley, as before described.

If it is desired to stop the machine at any time before the completion of the winding of the balls, it is only necessary to trip the latch *g′* and the spring *c′* will cause the belt to be shifted to the loose pulley, and to do this the more readily I provide an operating-handle, *i′*, which projects forward from the rear end of the latch *g′*, as shown.

The arrows in the different figures will show the direction of revolution of the various parts, and it will be understood that the rod O′ is only employed to prevent the turning of the rod N′ through the medium of the clamp-brace *a′*.

When it is desired to ball cord, I provide an attachment to the machine, which is shown in Fig. 4, which can be readily put onto or taken off the machine, as the case requires. It consists of any suitable frame, *j′*, carrying grooved rollers *k′* and rope-covered stretching and rubbing rollers *l′*, which are revolved in directions opposite to the line of travel of the cord by a belt, *m′*, arranged as shown, and driven from a pulley (not shown) upon the shaft B. The cord leaving the pulleys *l′*, by which it is stretched and its projecting fibers removed, passes over a small grooved guide-pulley, *m′*, and thence around the pulley V on its way to the winding-spindles.

Having thus fully described my invention, I claim—

1. The combination, with the winding-spindles, the winding-spindle driving-shaft connected to said spindles by worm-gearing, and a shaft revolved by the passage of the twine through the machine, of the differential gearing, substantially as described, connected to said shaft, and a cord or belt connecting said differential gearing and the spindle-driving shaft, whereby the speed at which the twine is fed onto the spindles determines and regulates the speed of said spindles, substantially as described.

2. The combination of the twine-driven shaft *d*, the pulley *r*, loose upon said shaft, drum *t*, keyed to said shaft, pulley C′, loose upon said shaft, the intermeshing gears *u v y*, with connecting belt or cord *p*, extending from pulley *r* to pulley *k*, the main driving-shaft B, pulley F upon said shaft, belt D′, spindle-driving shaft *i*, pulley *k*, the winding-spindles and worm-gearing, substantially as and for the purpose specified.

3. The combination and arrangement of the vibrating spindle-carrier B′, the worm-shaft *i*, journaled therein and provided with worms *j*, the hollow spindles A′, carrying the inclosed worm-wheels *f*, meshing with the worms *j*, the bolts *g*, passed through the spindles A′ and serving to secure the same in place, the arm E′, and revolving cam G′, substantially as described.

4. The belt-shipper mechanism consisting of the adjustable shipper-arm S′, head-piece R′, sliding rods N′ O′, spring *c′*, lever U′, latch *g′*, cam G′, with means for actuating the same, and pin *h′*, the parts constructed and arranged in the manner and for the purpose specified.

5. The combination of the winding-spindles carried on a vibrating frame, said vibrating frame, means, substantially as described, for vibrating said frame, differential gearing, constructed substantially as described, for controlling the speed of the winding-spindles and connected by belt or cord to the driving-shaft of said winding-spindles, the means for driving said differential gearing, the driving-shaft, the fliers, and means for rotating the same, and grooved pulleys connected to and actuat-

ing the differential gearing, whereby the passage of the twine more than once around said pulleys in its passage to the fliers and winding-spindles drives said pulleys positively and regulates the speed of the winding-spindles, substantially as described.

6. The combination of the winding-spindles carried on a vibrating frame, said vibrating frame, means, substantially as described, for vibrating said frame, differential gearing, constructed substantially as described, for controlling the speed of the winding-spindles, and connected by a belt or cord to the driving-shaft of said winding-spindles, the means for driving said differential gearing, the driving-shaft, the fliers, and means for rotating the same, grooved pulleys connected to and actuating the differential gearing, and a measuring-indicator actuated by said pulleys, whereby the passage of the twine more than once around said pulleys in its passage to the fliers and winding-spindles drives said pulleys positively and regulates the speed of the winding-spindles, and whereby the length of the twine in the balls is determined, substantially as described.

ROBERT A. KELLY.

Witnesses:
G. W. DUKIN,
ELDORUS G. TAYLOR.