No. 867,153. PATENTED SEPT. 24, 1907.

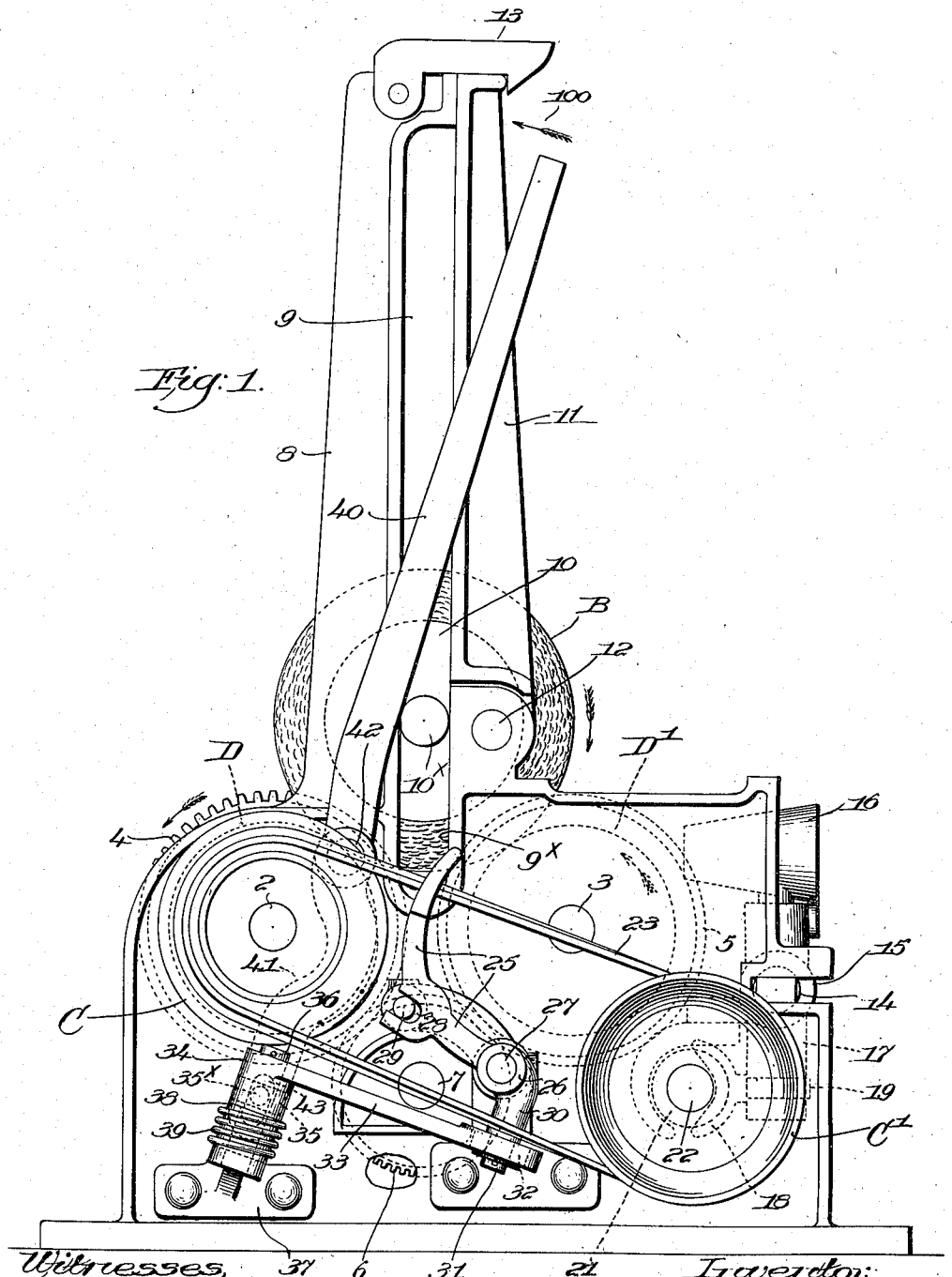
A. E. RHOADES.

BALLING MACHINE.

APPLICATION FILED MAY 2, 1907.

2 SHEETS—SHEET 1

Fig. 1.



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2 SHEETS—SHEET 2.

Fig: 3.

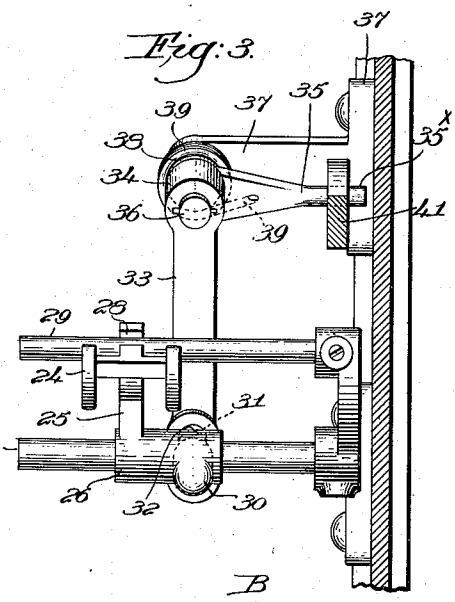
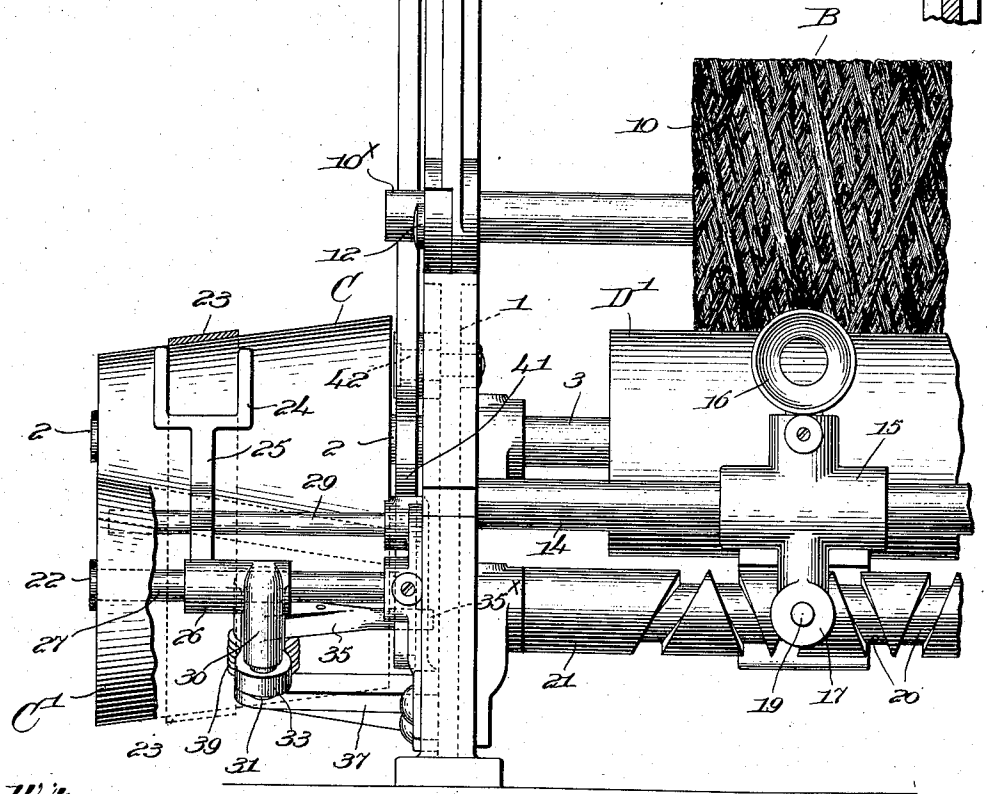


Fig: 2.



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UNITED STATES PATENT OFFICE.

ALONZO E. RHOADES, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

BALLING-MACHINE.

No. 867,153. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed May 2, 1907. Serial No. 371,366.

To all whom it may concern:

Be it known that I, ALONZO E. RHOADES, a citizen of the United States, and a resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Balling-Machines, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to winding apparatus of the type wherein a number of yarns or threads taken from spools or bobbins on a creel are gathered together into what is technically termed a "chain" and wound spirally upon a beam or roll to form a ball.

The yarn mass or ball should be of uniform diameter from end to end, and in apparatus of this general type, one example of which forms the subject matter of United States Patent No. 379,616, granted to Straw March 20, 1888, the chain or rope of yarns is led through a traversing guide-eye or trumpet. Such guide-eye is operated by a traverse-screw and effects the laying of the chain of yarn helically from end to end of the ball. In said patent the thread of the double or crossing screw-shaft which effects the traverse of the guide or trumpet is made with a steeper pitch at the ends than at the intermediate portion, to insure a quick reversal of the trumpet and thereby avoid undue accumulation of the yarn chain at the ends of the ball. The screw-shaft is rotated at constant speed, however, from the beginning of the winding to the end thereof, and while the balls so made are very satisfactory in general there are times when the tendency of the ball to bulge at the ends is still found to occur. The cylinders or drums on which the ball rests and by which it is rotated during the winding rotate at a constant speed, and while the diameter of the ball gradually increases its surface speed remains constant, but the revolutions of the ball per revolution of the drums gradually decreases. Consequently, if the speed of the traversing screw-shaft is constant throughout the winding the angle at which the rope or chain is laid upon the ball will not vary as the diameter of the latter increases, but the spirals will be longer and farther apart. That is, the distance between the adjacent spirals of the winding on a smaller diameter will be less than it will be between adjacent spirals on a larger diameter, so that there is more tendency for the yarn to pile up on itself and less tendency for each layer to firmly bind the yarn previously wound into the general mass of the ball. In my present invention I have devised means to overcome this tendency by varying the pitch of the winding during the winding operation, and this is effected by automatically changing the ratio between the speed of the traverse and the surface speed of the ball.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

In practice the yarn or thread, taken from the spools or bobbins of the creel-frame in usual manner, is led through the reed and over and under usual rolls of the warping-machine of suitable construction, neither the creel-frame nor the warping-machine being shown herein as they are well-known in the art and form no part of this invention. From the warping-machine the sheet of yarn or thread is gathered into a rope or chain, as usual, and led to the balling machine, either directly or after passing through a measuring mechanism, such for instance as forms the subject matter of United States Patent No. 815,378 granted to me March 20, 1906.

I will now describe in detail one practical embodiment of a balling machine in accordance with my present invention.

Figure 1 is a left hand side elevation of a balling machine embodying my invention, the ball being shown in process of winding; Fig. 2 is a partial elevation thereof viewing Fig. 1 from the right, the right hand side of the machine frame being omitted to save space and as it is practically a duplication of the frame at the left; Fig. 3 is a top plan view of the variable speed mechanism and the means whereby it is controlled automatically during the winding of the ball.

Referring to the drawings, the sides 1 of the main frame are of suitable size and shape to provide bearings for two shafts 2 and 3, on which are mounted the driving drums D and D′, arranged in parallelism a short distance apart and between the frame sides, the latter being substantially alike, and only one side frame is illustrated in the drawings. The drum shafts have fast thereon gears 4, 5, see full and dotted lines Fig. 1, at the right hand side of the machine, viewing Fig. 2, meshing with an intermediate gear 6 rotatable on a stud 7, Fig. 1, on the right hand side of the frame. Upright standards 8 on the frame sides are each provided with an elongated open slot 9, extending at its lower end into the adjacent frame side, at $9^{\times}$, see Fig. 1, to receive the journals $10^{\times}$ of the roll or cylinder 10 on which the ball of yarn is wound, the open slots being closed by arms 11 fulcrumed at 12 on the main frame and each held in operative position by a lock or catch 13.

It will be seen by reference to Fig. 1 that the driving drums are rotated in the same direction and at the same speed, as they are equal of diameter, and the balling roll 10 is supported thereby and said roll and the ball, as it is formed thereupon, will be rotated by surface contact with the drums. The upright guideways $9, 9^{\times}$ for the roll journals $10^{\times}$ are located midway between the axes of the drums D, D′, as herein shown, and as the diameter of the ball increases the roll journals will gradually rise in said guideways. A horizontal

transverse rod or bar 14 rigidly mounted in the frame sides in front of and below the shaft 3 of drum D′ has slidably mounted upon it a sleeve-like carriage 15 having attached to it a guide-eye or trumpet 16, through which the rope or chain of yarn is led and by lateral movement of said guide-eye the chain is traversed upon the ball.

In Figs. 1 and 2 the ball in process of formation is shown at B. A depending portion 17 of the carriage 15 forms a bearing for a follower 18, see dotted lines Fig. 1, the shank 19 of the follower being swiveled in the bearing, so as to permit the follower to coöperate with the double or crossing threads 20 on a rotatable traverse shaft 21, mounted in bearings on the frame sides.

The mechanism so far described is in its essential features substantially the same as shown and described in Patent No. 379616 before referred to, and in practice the threads on the traverse shaft are made of steeper pitch at the ends than at the intermediate portions, to effect a quick reversal of the carriage at each end of its stroke, as and for the purpose set forth in said patent.

In the present embodiment of my invention the drums D and D′ are driven at a constant speed during the operation of winding a ball, and the traverse shaft 21 is rotated at a gradually decreasing speed as the diameter of the yarn-mass or ball B increases. I have not shown herein the driving connections for the drums, as the same may be of any convenient character, such for instance as in Patent No. 379,616.

At the left hand side of the machine the shaft 2 is extended beyond the frame side, and a speed-cone C is fixedly secured thereto, tapering outwardly, and an opposite reversed speed-cone C′ is fixedly secured to the extension 22 of the traverse shaft 21, outside of the frame side, as clearly shown in Figs. 1 and 2. Said cones are connected by a transmitting belt 23, and by shifting the belt along the cones the speed of rotation of the traverse shaft 21 will be varied, according to the direction the belt is shifted, it being understood that the cone C is the driving member and the cone C′ the driven member of the speed-changing mechanism.

It will be manifest that the surface speed of the ball remains constant as the diameter of the ball increases, and in order to change the ratio between the surface speed of the ball and the speed of the traverse during the winding operation I have provided means herein to gradually decrease the rotative speed of the traverse shaft 21 as the diameter of the ball increases.

Referring to the drawings the belt-shifter comprises a fork 24 on the upper end of a bent arm 25 terminating at its lower end in a lateral sleeve-hub 26 slidably mounted on a rigid guide-rod 27 extended from the frame side between the speed-cones. The bent arm 25 is slotted at 28, Fig. 1, to loosely embrace a second guide-rod 29, secured to and projecting from the frame side, so that the fork 24 can be moved in parallelism to the axes of the cones C and C′. The hub 26 has a depending extension 30 terminating in a cylindrical portion 31 which is extended loosely into a longitudinal slot 32 in a long arm 33 fast on a hub 34 which has a short arm 35, shown substantially at right angles to the arm 33, the two arms constituting a bell-crank.

As shown in Fig. 1 the hub 34 of the bell-crank is mounted on a spindle 36 forming part of a bracket 37 bolted to the frame side 1, the lower portion of the spindle being enlarged at 38 to form a seat for the hub and having coiled around it a spring 39. One end of the spring is fixed and its other end is connected with the bell-crank, the winding of the spring being such that it tends to swing inward the long arm 33 and move the hub 26 and belt-fork 24 to the right, Fig. 2, to thereby shift the belt 23 toward the larger end of cone C and the smaller end of cone C′. The bracket-spindle 36 is inclined, Fig. 1, so that the path of movement of the arm 33 is in a plane at right angles to the extremity 31 of the hub extension 30, thereby obviating any tendency to bind in the slot and pin connection between the bell-crank and the hub 26.

In order that the belt-shifter may be controlled or governed in accordance with the diameter of the ball being wound I have provided a controller, shown as a lever 40, 41 fulcrumed on a stud 42 on the frame side, the longer arm 40 being upturned close to the standard 8 on said frame side and resting upon the adjacent journal $10^{\times}$ of the balling-roll 10. The shorter arm 41, see dotted lines Fig. 1, is bent to at all times clear the shaft 2, and at its lower end is slotted at 43 to receive the stud-like end $35^{\times}$ of the short arm 35 of the bell-crank.

Viewing Fig. 1 it will be obvious that as the diameter of the ball B increases the journals $10^{\times}$ will gradually rise, and the controller arm 40 will be slowly swung in the direction of arrow 100, its depending arm 41 being swung in the opposite direction and thereby turning the bell-crank on its axis 36 to swing its long arm 33 outward, or to the left, Fig. 2. Such movement operates to gradually move the belt-shifter to the left, and the belt 23 will thereby be gradually shifted from the smaller to the larger end of the driven cone C′, resulting in a gradual diminution in the speed of rotation of said cone and its attached traverse shaft 21. Consequently the traverse speed will be gradually reduced in accordance with the gradual increase in the diameter of the ball, during the winding operation. When the ball is started, with the minimum diameter and the given surface speed, the traverse will be at the maximum speed, for then the traverse shaft will be rotated at the highest speed, but as the rotations of the ball diminish with its increasing diameter the controller will act through the speed-changing mechanism to gradually decrease the speed of the traverse shaft, and consequently of the traverse. As a result the pitch of the winding of yarn laid upon the ball is gradually diminished from the beginning to the end of the winding operation, overcoming any tendency of the yarn to pile up on itself, and each succeeding layer serves to more securely and firmly bind and compact the preceding layers into the general yarn-mass.

When the winding is about to begin the balling-roll 10 will rest directly upon the driving drums D and D′, and then the journals $10^{\times}$ will be at their lowest point in the upright guideways. At such time the lower arm 41 of the controller 40, 41 will be in its extreme left hand position, viewing Fig. 1, with the belt 23 at the proper point on the speed-cones to begin the winding.

The spring 39 operates to keep the arm 40 of the con-

troller in engagement with the adjacent roll-journal 10[illegible] and will assist in restoring the controller and the belt-shifting means to starting position, in readiness to begin the winding of a ball.

My invention is not restricted to the precise details of construction and arrangement herein shown and described as the same may be modified or changed in various details by those skilled in the art without departing from the spirit and scope of my invention.

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

1. The combination, in a balling machine, of positively driven drums to support and rotate the ball by surface contact therewith, a traverse-shaft having double or crossing threads, a carriage reciprocated thereby and provided with a guide-eye to deliver the chain of yarn to the ball, and means directly actuated solely from the drums to rotate the traverse-shaft and automatically effect a gradual change in the ratio between the traverse speed and the surface speed of the ball throughout the winding operation.

2. The combination, in a balling machine, of positively driven drums to support and rotate the ball by surface contact therewith, a traverse-shaft having double or crossing threads, a carriage reciprocated thereby and provided with a guide-eye to deliver the chain of yarn to the ball, and speed-changing mechanism directly connecting the drums and the traverse-shaft, to vary automatically the speed of rotation of one with relation to the other and thereby effect a gradual change in the ratio between the surface speed of the ball and the traverse speed throughout the winding operation.

3. The combination, in a balling machine, of means rotated at constant speed to effect rotation of the ball by surface contact therewith, means, including a traverse shaft, to lay the yarn chain upon the ball as the latter is rotated, direct connections between the ball-rotating means and the traverse shaft to rotate the latter, said connections including speed-changing-mechanism, and a controller for said mechanism, governed automatically by the ball, to cause said mechanism to diminish the speed of rotation of the traverse shaft as the diameter of the ball increases.

4. In a balling machine, in combination, drums driven at a constant speed, to support and rotate the ball by surface contact therewith, a driving cone connected therewith, a driven cone, a traverse shaft connected therewith and having double or crossing threads, a guide-eye for the yarn-chain, reciprocated by said shaft, a belt connecting the cones, and automatic means to gradually shift the belt from the smaller to the larger end of the driven cone as the diameter of the ball increases, to thereby reduce the speed of the traverse shaft as the winding progresses.

5. The combination, in a balling machine, of positively driven drums to support and rotate the ball by surface contact therewith, a traverse-shaft having double or crossing threads, a carriage reciprocated thereby and provided with a guide-eye to deliver the chain of yarn to the ball, connections between the drums and the traverse-shaft, including speed-cones and a belt connecting them, a belt-shifter, and means governed by the diameter of the ball to operate said belt-shifter and gradually decrease the speed of the traverse shaft as the diameter of the ball increases.

6. In a balling machine, a positively driven drum to rotate the ball by surface contact, means to traverse the yarn upon the drum, said means including a traverse shaft, reversed cones rigidly connected with the drum and the traverse shaft, a belt connecting them, to drive the shaft cone from the drum cone, and means to automatically shift the belt from the smaller to the larger end of the shaft cone as the ball increases in diameter, to thereby cause the yarn to be laid upon the ball with a gradually decreasing pitch throughout the winding operation.

7. The combination, in a balling machine, of a roll on which the chain of yarn is wound to form a ball, means to rotate the ball by surface contact therewith, means actuated independently of the ball to traverse the yarn-chain and lay it upon the ball, speed-changing mechanism to actuate the traverse means, said mechanism directly connecting the ball rotating and the traverse means, and a controller for said mechanism, operated by the change in the position of the roll as the diameter of the ball thereon increases.

8. The combination, in a balling machine, of driving drums rotated at constant speed, a roll on which the ball is wound, driven by surface contact with the drums, upright guides for the journals of the roll, means, including a traverse shaft having a double or crossing thread, to lay the chain of yarn upon the ball, opposed cones operatively connected with the driving drums, a transmitting belt between the cones, and a belt-shifter having a member in engagement with and positioned by the roll as the ball thereon increases in diameter, to gradually shift the belt from the smaller to the larger end of the traverse shaft cone and thereby decrease the speed of the traverse means as the winding progresses.

9. The combination, in a balling machine, of means to support and rotate the ball at a constant surface speed, means to traverse the chain of yarn and lay the same upon the rotating ball, and an instrumentality to effect automatically a gradual diminution in the speed of the traverse means as the diameter of the ball increases.

10. The combination, in a balling machine, of means to rotate the ball, means actuated independently of the ball to traverse the chain of yarn and lay the same upon the ball as the latter rotates, and an instrumentality to effect automatically a gradual change in the ratio between the traverse speed and the surface speed of the ball as the winding progresses.

11. The combination, in a balling machine, of means operating at a constant speed to rotate the ball, means actuated independently of the ball to traverse the chain of yarn and lay the same upon the ball as the latter rotates, and an instrumentality governed by or through the increase in the diameter of the ball to effect automatically a gradual change in the ratio between the traverse speed and the surface speed of the ball as the diameter of the latter increases.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALONZO E. RHOADES.

Witnesses:
CLARE HILL DRAPER,
EUGENE BEAUDRY.