No. 877,917. PATENTED FEB. 4, 1908.

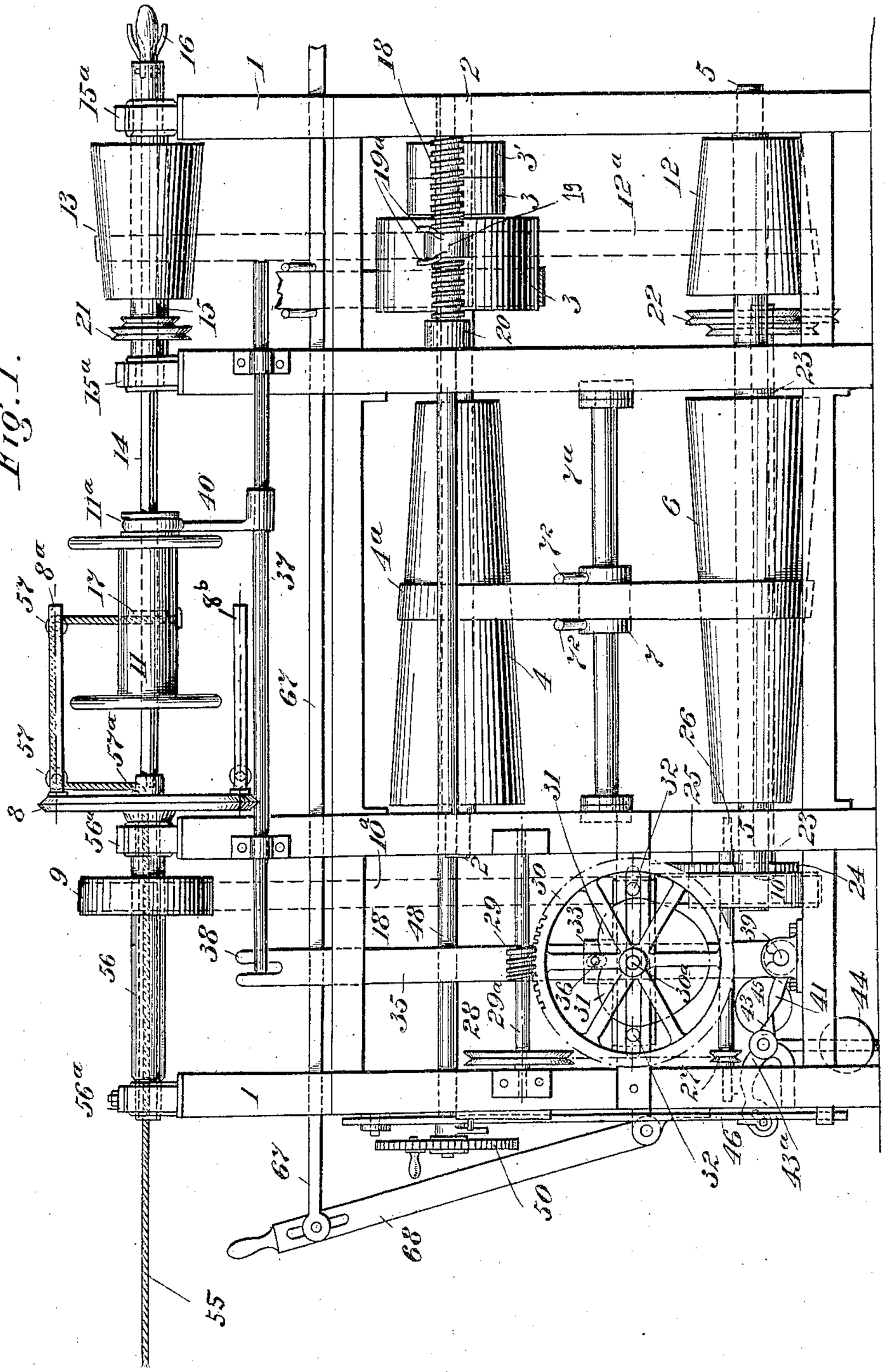
L. DUGAUQUIER.

YARN SPINNING MACHINE.

APPLICATION FILED JUNE 25, 1900.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Geo H Petersen
James C. Babcock

Inventor:
Leon Dugauquier
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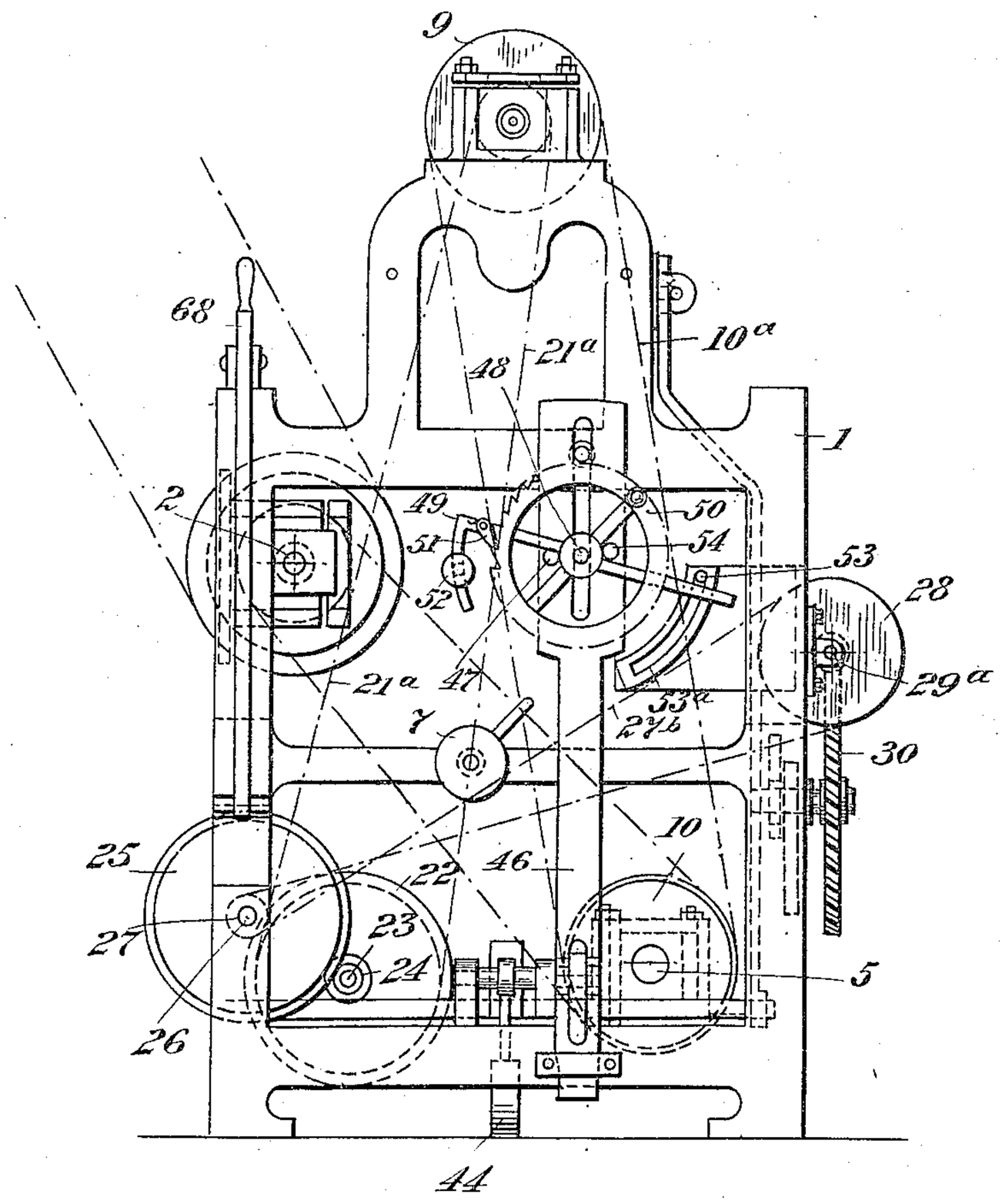
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 12.

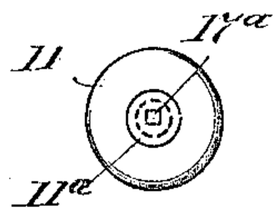


Fig. 11.

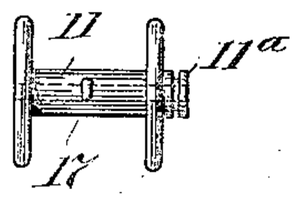
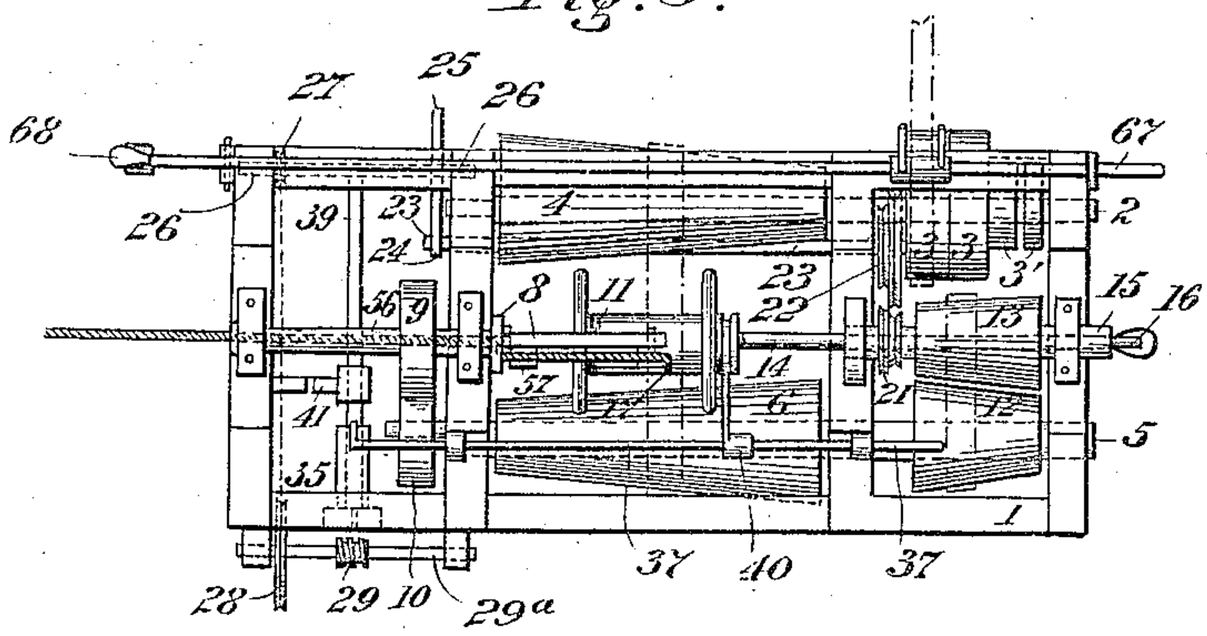


Fig. 3.



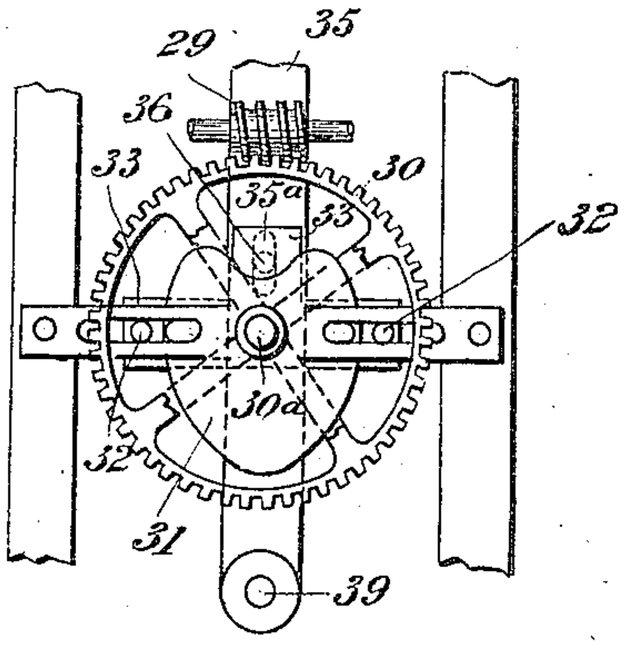


Fig. 4.

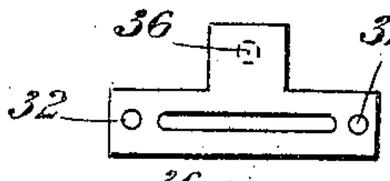


Fig. 8.

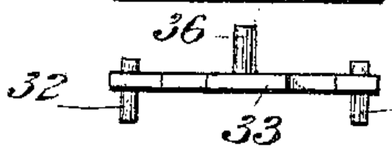


Fig. 9.

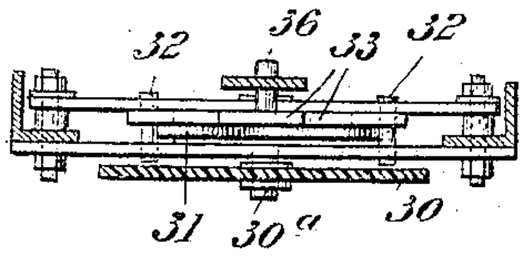


Fig. 10.

Witnesses.

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4 SHEETS—SHEET 4.

Fig. 16.

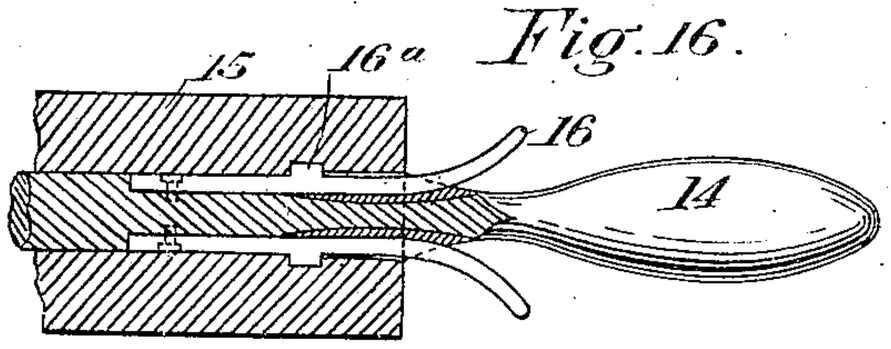


Fig. 5.

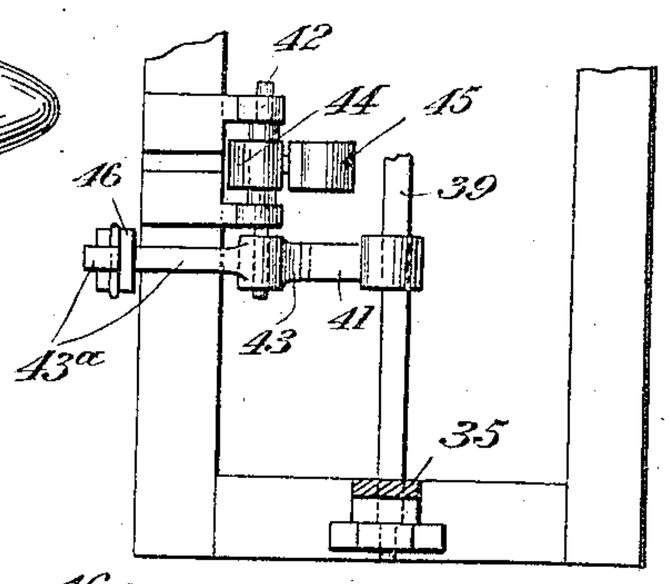


Fig. 7.

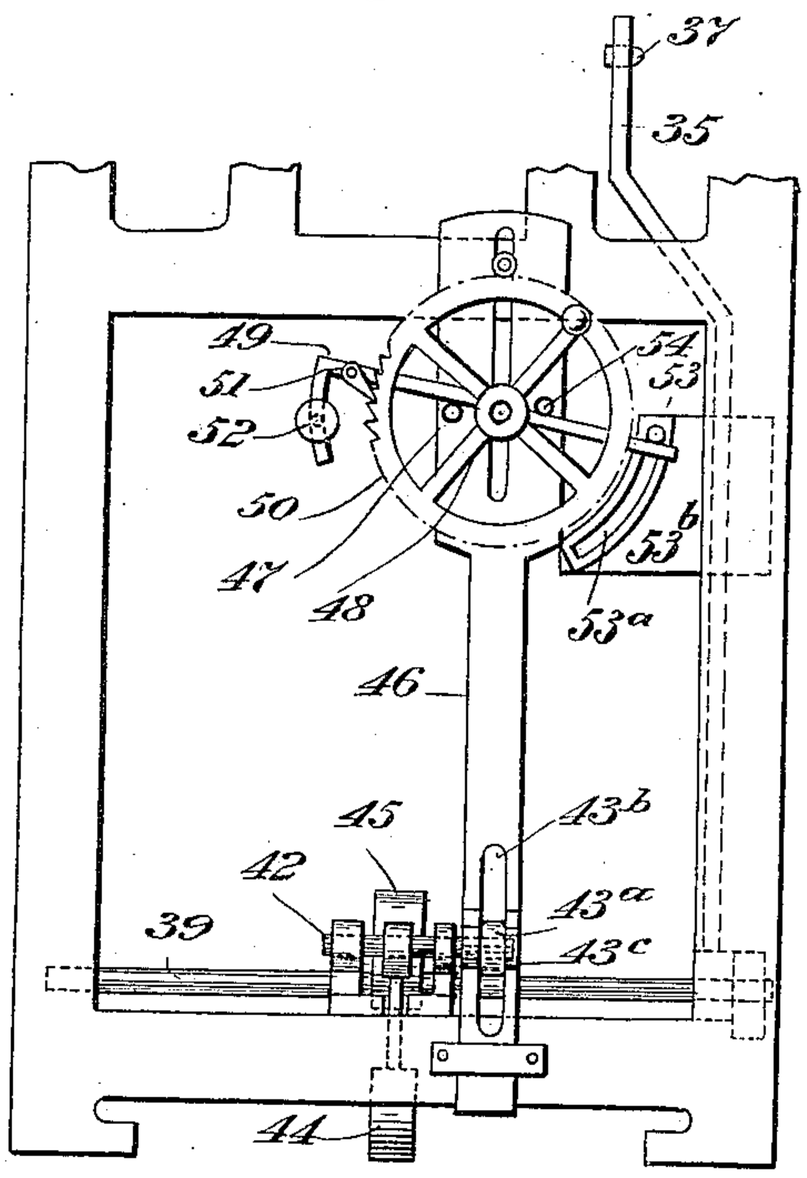


Fig. 6.

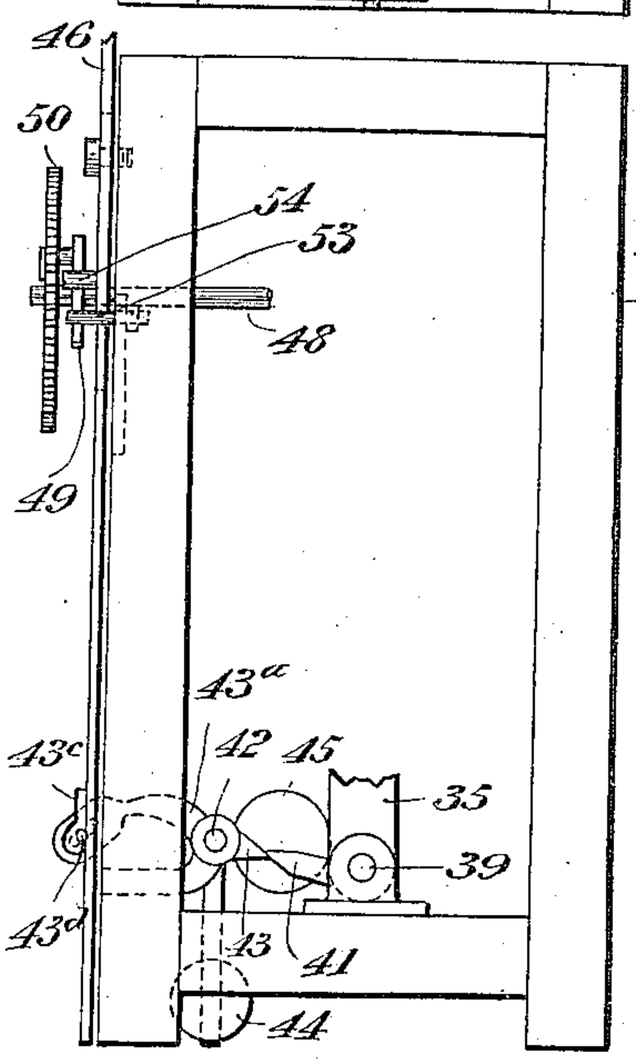


Fig. 13.

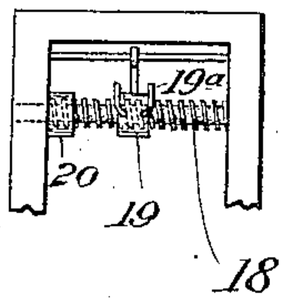
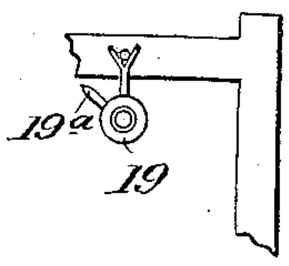


Fig. 15.

Fig. 14.



Witnesses:

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UNITED STATES PATENT OFFICE.

LEON DUGAUQUIER, OF HOUDENG-GOEGNIES, BELGIUM.

YARN-SPINNING MACHINE.

No. 877,917. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed June 25, 1900. Serial No. 21,471.

To all whom it may concern:

Be it known that I, LEON DUGAUQUIER, a subject of the King of Belgium, and resident of Houdeng-Goegnies, Belgium, have invented certain new and useful Improvements in Yarn-Spinning Machines, of which the following is a specification.

An important use of this machine is in the spinning of rope or cord from hemp.

The chief object of my invention is to provide satisfactory mechanism for spinning rope or any other form of yarn consisting of fibers twisted together in a strand from hemp of any desired quality.

To this end the said invention consists in the construction and operation of parts hereinafter more particularly set forth.

In the accompanying drawings, Figure 1 represents a front elevation of a machine embodying my invention; Fig. 2 represents an end elevation of the same, taken from the left side of Fig. 1; Fig. 3 represents a plan view of the same on a reduced scale; Fig. 4 represents in detail elevation the worm and worm-wheel hereinafter described; Figs. 5, 6 and 7 represent detail views of parts of the bobbin-shifting and twist-regulating mechanism; Fig. 8 represents a detail front view of the plate 33 hereinafter described; Fig. 9 is a top plan view of plate 33; Fig. 10 represents a horizontal section through Fig. 4 on a plane taken just above wheel 30; Figs. 11 & 12 represent the spool or bobbin in detail side and end view. Fig. 13 represents on a reduced scale a detail front elevation of the belt-shifting nut 19, its operating screw-threaded sleeve 18 and the stop collar 20, all hereinafter described, with their supporting frame and certain coöperating parts. Fig. 14 is an end elevation of Fig. 13. Fig. 15 shows a detail view of ring 20. Fig. 16 shows a detail of shaft 14.

In the frame 1 of the machine I mount a driving shaft 2 which is actuated by any suitable motor not shown, through a broad pulley 3 or a pair of pulleys 3′, of less diameter arranged side by side, one of the pulleys 3′ being fast and the other loose. By shifting a driving pulley from one of these three pulleys to another the speed of the machine may be increased or diminished or it may be stopped or started at will. The said driving shaft carries also a cone pulley 4, keyed thereon, which drives, by a belt 4^a, a cone pulley 6 reversely arranged with respect to pulley 4, as is usual in such cases, and keyed on the main shaft 5 which is mounted in frame 1 parallel to the driving shaft 2. Between said cone pulleys 4 and 6 a rod 7^a is arranged parallel to the said shafts. On this rod is mounted a collar 7, which may be fastened thereto at any point chosen along the said rod corresponding to the position of the belt 4^a, as determined by the degree of speed desired, the position of the said belt and collar as aforesaid being adjusted by hand. The said collar is provided with two radial pins 7^2, making it a fork which has for its object to prevent the belt from shifting out of position and to shift it from one position to another as needed or desired. A pulley 10 is keyed on the said main shaft 5, and drives by a straight belt 10^a indicated in dotted lines in Fig. 1, pulley 9 of equal diameter thereto, which is fast on a hollow shaft or sleeve 56 mounted in bearings 56^a of frame 1 and carrying a flier 8 which is rotated by said belt. At the other end of main shaft 5 a cone pulley 12 is fast thereon being connected in the usual manner by a belt 12^a to another but smaller cone pulley 13 fast on a sleeve or hollow shaft 15 turning in bearings 15^a of frame 1. To this shaft is normally locked an inner square bobbin shaft 14 by spring catches 16 fixed to the latter and provided with pins 16^a engaging notches arranged inside the shaft 15, as shown in detail in Fig. 16. The spool or bobbin 11 is mounted on bobbin shaft 14 between the horizontal arm 8^a and 8^b of the flier and is square bored at 17^a Fig. 12 to fit the said shaft and insure its turning therewith.

The horizontal arm 8^a of flier 8 carries two guide pulleys 57; a third, marked 57^a, (see Fig. 1) being mounted on the hub of the said flier. The course of the yarn 55 is first through sleeve or shaft 56 then over the pulley 57^a then over the pulleys 57 then down to the spool 11, to which its end is attached by a suitable hook 17. The number of revolutions of the flier, and consequently the number of twists given to the yarn per minute will correspond to the number of rotations of the main shaft 5, being governed solely by the position of the connecting belt on cone pulleys 4 and 6, which the position of fork 7 on its rod 7^a indicates and determines. The bobbin or spool 11 turns in the same direction more rapidly than

the said flier, the belt 12ª being shifted in practice on pulleys 12 and 13 to a position insuring this extra speed. The length and pitch of the twist will depend on the relative speed of the bobbin and flier and this will of course be regulated by the positions of the driving belts. If the belt connecting pulleys 4 and 6 be left unchanged, the shifting of belt 12ª forward or backward on cone pulleys 12 and 13 will correspondingly increase or diminish the speed of rotation of the bobbin thus varying the relative speed of the bobbin and flier and the length or pitch of the twists.

It is necessary of course to provide for the endwise reciprocation of the bobbin or spool as the yarn is wound thereon and for the regularity of such winding as it reciprocates. To this end the sleeve or hollow shaft 15, which normally turns at the same speed as the bobbin, carries a grooved pulley 21 Fig. 1 connected by a belt 21ª (Fig. 2) to a pulley 22 Figs. 1 and 2 keyed on shaft 23, each of these pulleys having several grooves of different diameters. A pinion 24, also keyed on shaft 23 gears with a similar pinion 25 and this drives the shaft 26 on which the latter pinion is keyed. A grooved pulley 27, fast on shaft 26, drives by a grooved pulley 28, to which it is geared by a crossed endless cord or belt 27ᵇ a screw shaft 29ª carrying a screw or worm 29 which meshes with and drives a worm wheel 30, thereby also rotating a heart shaped cam 31, both the worm wheel and the said cam being fast on the same short shaft 30ª, so that they turn together, the latter shaft being under and at right angles to the shaft 29ª. The said cam by its alternate contact with two pins 32 of a sliding plate 33, arranged vertically behind the cam wheel, the said pins having sufficient interval to receive the said cam between them, imparts a transverse reciprocating movement to the said plate 33. Said plate is provided with a third pin 36, (Figs. 4, 8, 9 and 10) which pin is inserted in a hole or slot 35ª (Fig. 4) of a lever 35, keyed on a shaft 39, and causes, by the aid of said pins 32, the oscillation of the said lever and the fork 38 on the upper end thereof. Said fork receives the cranked end of a rod 37 and causes the endwise reciprocation of said rod, as well as of another fork 40, formed on the latter. This last named fork engages a grooved terminal hub 11ª of said bobbin, so that the latter partakes of this endwise reciprocating movement. As the yarn always passes to the spool from the same point of the flier, this being the location of the final guide roller 57 near the end of arm 8ª, the different courses of the yarn will be packed one against the other on the spool by such endwise reciprocation and the winding will take place regularly from end to end of the said spool and there will be the same amount of winding for each revolution of the bobbin during the formation of one layer. There must also be the same amount of winding for each revolution of the flier, notwithstanding that the diameter of the bobbin of course increases by twice the thickness of the yarn at each layer of yarn. I therefore provide the following means for reducing the rotary speed of the bobbin automatically after each layer sufficiently to compensate for the increased circumference of the bobbin.

Upon a shaft 42 journaled in bearings secured to the machine framework is fixed a beam one arm of which (43ª) is slotted at its free end and projects through a slot 43ᵇ arranged longitudinally in a vertical sliding plate 46, carrying on its outside and at each side of the slot 43ᵇ a block 43ᶜ traversed by a pin 43ᵈ which also extends across the slotted end of the arm 43ª. The latter is thus hingedly connected to said plate 46. The other arm 43 of the beam is wedge shaped and directed nearly towards the center of the shaft 39. Two weights 44 & 45 are also secured to the shaft 42 and intended to counterbalance the plate 46 and to keep the arm 43 in the desired position. Upon the shaft 39 is keyed a lever 41 the position of which is such that it is directed towards the center of the shaft 42, when the lever 35 has completed just the half of its stroke. The lever 41 and the arm 43 are in the same vertical longitudinal plane (see Fig. 1) and wedge-shaped at their ends, their length, the inclination of the contact faces of said wedge-shaped ends and their consequent degree of disengagement being calculated in such a manner that they are only disengaged when the lever 35 arrives at the end of its stroke. When the lever 35 is inclined to the left it causes 41 to bear from above upon the arm 43 and the opposite arm 43ª will be raised and will raise also the plate 46. When 35 arrives at the end of its stroke, the contact between 41 and 43 ceases, the latter will be suddenly returned by the weight 44 into its original position and with it the plate 46. The lever 35 when deviating afterwards to the right, the lever 41 will encounter the part 43 and push it from below, thus lowering the other arm 43ª and the plate 46 until the end of the stroke of lever 35. This action will then be repeated and the plate 46 will again be suddenly returned into its initial position by the action of the weight 44. Owing to the peculiar arrangement of the levers 41 and 43 upon their respective shafts; the amplitude of the stroke of lever 43ª will be the same after every oscillation of the lever 35 to the right or the left. It will be the same for the plate 46 which immediately after every oscillation *i. e.* after every layer of yarn being terminated upon the spool, will return to its initial position. The plate 46 carries two pins 47 and 54 arranged at the same distance from the fulcrum of the lever 49 oscillating round the shaft 48. The line

connecting the centers of the pins 47 & 54 being almost at right angles to the direction of the movement of the plate 46 and passing at the same time through the fulcrum of the lever 49, it follows that the lever 49 will be raised equally at each stroke of the lever 35, and that by the pin 47 pressing from below the upper arm when the lever 35 oscillates to the left and by the pin 54 pressing the lower arm from above when it oscillates to the right. The upper arm of the lever 49 carries a counter-weight 52 and a catch 51 intended to operate a partial rotation of a ratchet wheel 50 only when the lever 49 descends. Consequently at every oscillation the lever 35 the lever 49 will be raised to the same height and fall at the completion of every layer of yarn upon the spool, producing each time the same partial rotation of the wheel 50 and of its shaft 48. Upon the latter is keyed a tubular externally screw-threaded sleeve 18 which is arranged between the cones 12 & 13. Upon this screw is mounted a nut 19 which by the rotation of the screw 18 is caused to travel along the latter from the left to the right, see Fig. 1. As this nut carries two pins 19[a] engaging the belt 12[a] of the conical pulleys 12 & 13 driving the spool, the speed of the latter will be immediately decreased of the same amount after each layer of the yarn has been couched upon the spool. However, as this decrease of speed must vary in accordance with the thickness of yarn to be spun a stop pin 53 has been provided for the lever 49. This pin can be secured at any desired point of a segmental groove 53[a] arranged in the plate 53[b] (Fig. 7) attached to the frame and is intended to limit the fall of lever 49. According to the position the pin 53 in the segmental groove the amount of rotation of the shaft 48 and consequently the amount of decrease of the spool speed will be varied according to the thickness of the yarn to be produced.

To regulate the rotary speed of the bobbin at the beginning of the operation, the pawl 51 is reversed, freeing the ratchet wheel 50 which is then turned by hand until the nut 19 moves the belt 12[a] to the parts of the cone pulleys 12 and 13 having diameters which correspond to the speed desired. A stop collar or ring 20 is adjustably fixed on the screw 18 at the inner end thereof to limit the inward or rearward travel of the said forked nut. Thus the machine can be adjusted at the beginning of the operation to the desired length, or pitch of twist in the yarn, and will remain uniform, by reason of the automatic compensating devices hereinbefore described, until the winding of the bobbin is entirely completed.

In spinning hemp the operation is as follows. The pins 53, the forked nut 19, forked collar 7 and the belts connecting the two pairs of cone pulleys are adjusted as before described to their desired positions. The springs 16 are pressed together by hand to free the bobbin shaft 14 from the shaft 15 and the former, having then no bobbin on it, is drawn out sufficiently to permit the spool or bobbin to be set in the position shown in Fig. 1 with its hub in the fork 40. The square shaft 14 is then passed back through the square bore 17[a] of said spool or bobbin until its journaled end enters a recess in the end of shaft 56 which serves as an inner bearing or end guide for said shaft 14. Then the machine is threaded; that is to say one end of the rope yarn 55 is led through the hollow shaft 56, running out of the inner end thereof through a side passage and over the rollers 57, and fastened to the spool or bobbin by spring catch 17. The machine is started by a means of a shifting lever 68, a shift rod 67 loosely jointed to the upper end thereof and a fork or pair of belt-shifting pins carried by said rod, which shift the power transmitting belt, not shown, from one of the loose pulleys 3 or 3′ to one of the corresponding pulleys fast on the driving shaft 4, the pulley chosen depending on the speed to be given to the said driving shaft; and there the said belt remains until the bobbin is completely wound, unless some occasion should arise making it necessary to stop the machine in the interval. The bobbin shaft or spindle 14 is again withdrawn, as before explained to permit the removal of the full bobbin and the substitution of an empty one, and the said shaft or spindle is replaced as before. The pawl 51 is then momentarily reversed, freeing the wheel 50 and the latter is turned by hand to shift the belt 12[a] to the desired place on cone pulleys 12 and 13 until the fork nut 19 is stopped by the ring 20 arranged at the desired point to produce the desired initial length of twist.

Having thus described my invention, what I claim as new and desire to secure by letters patent is:

1. In a yarn making machine, the combination of a driving shaft and main shaft with cone pulleys thereon, an adjustable connecting belt, a fork for adjusting said belt, a rotary flier, gearing for driving the said flier at a constant rate relatively to the main shaft, a bobbin shaft, additional cone-pulleys fast on said main-shaft and bobbin shaft respectively, an endless belt connecting the said pulleys and a screw shaft and nut adapted to shift this belt on the said cone-pulleys substantially as set forth.

2. In a yarn making machine, the combination of a bobbin shaft and means for rotating the same, with a device engaging the bobbin to reciprocate it along the said shaft, consisting of a rotary cam, a sliding plate having pins acted on by said cam to oscillate the said plate, and a rod recipro-

cated by said plate and carrying the above mentioned device for reciprocating the bobbin substantially as set forth.

3. In a yarn making machine, a bobbin shaft, in combination with a main shaft cone pulleys and belt, a screw shaft and traveling nut for shifting the said belt, an adjustable stop-collar limiting the travel of said nut, a ratchet wheel turning said screw-shaft, a pawl or catch engaging said ratchet wheel, a counterpoised lever 49 carrying said pawl to turn said ratchet wheel as the said lever descends and permitting such descent only at the completion of each course of yarn on the spool substantially as set forth.

4. In a yarn making machine, a bobbin shaft in combination with a tubular shaft sleeved thereon, a spring catch or spring catches 16 attached to one of said shafts and engaging internal notches of the other, said catches also protruding beyond said outer shaft for convenience of compression by hand, thereby permitting the separation of said shafts at will, devices for supplying yarn to a bobbin on the said bobbin-shaft and mechanism for rotating the said tubular shaft, thereby through the aforesaid connections rotating also the bobbin shaft and bobbin substantially as set forth.

5. In a yarn-spinning machine, the combination of a main shaft a bobbin shaft with means for regularly decreasing the rotary speed of the bobbin after each layer of yarn has been wound thereon, the said means consisting of cone pulleys on both shafts and a belt a lever 35, positively connected devices whereby the rotation of said main shaft rocks the said lever, a lever 41 rocked by said lever 35, a counterbalanced arm 43 rocked by lever 41, a sliding plate 46 carried by one end of said arm and provided with two pins, a counterweighted lever 49 arranged to be rocked upward or downward by one or the other of said pins as the arm 43 oscillates, a pawl carried by lever 49, a ratchet wheel 50 operated by said pawl, and belt shifting mechanism operated by said ratchet-wheel for progressively moving the belt on the cone pulleys decreasing the rotation of the said bobbin shaft, the relative lengths of the contacting parts of lever 41 and beam 43 and the arrangement of the aforesaid parts being such as to provide for the momentary disengagement of said beam from said lever whenever the winding of a new layer of yarn on the bobbin is completed, whereupon the said counterbalanced beam and plate 46 return to their former position substantially as set forth.

6. In a yarn spinning machine, the combination of a bobbin shaft and means for driving the same, with belt shifting devices and cone pulleys for varying the speed of its rotation, a pawl and ratchet for operating said devices to regularly decrease the said speed, an oscillating lever carrying said pawl, a reciprocating sliding plate adapted to act on said lever in either direction, an oscillating cam engaging said plate and causing its reciprocation means operated by said bobbin-shaft for rocking said cam but arranged to free it from such action at regular intervals, and means for returning said lever automatically to its former position when thus freed, the aforesaid devices being adapted and arranged to have such freeing and returning action coincide with the winding of each layer of yarn on the bobbin substantially as set forth.

In testimony whereof I have hereunto set my hand, in presence of two witnesses.

LEON DUGAUQUIER.

Witnesses:
O. SCHER,
GREGORY PHELAN.