

**Jan. 18, 1927.**

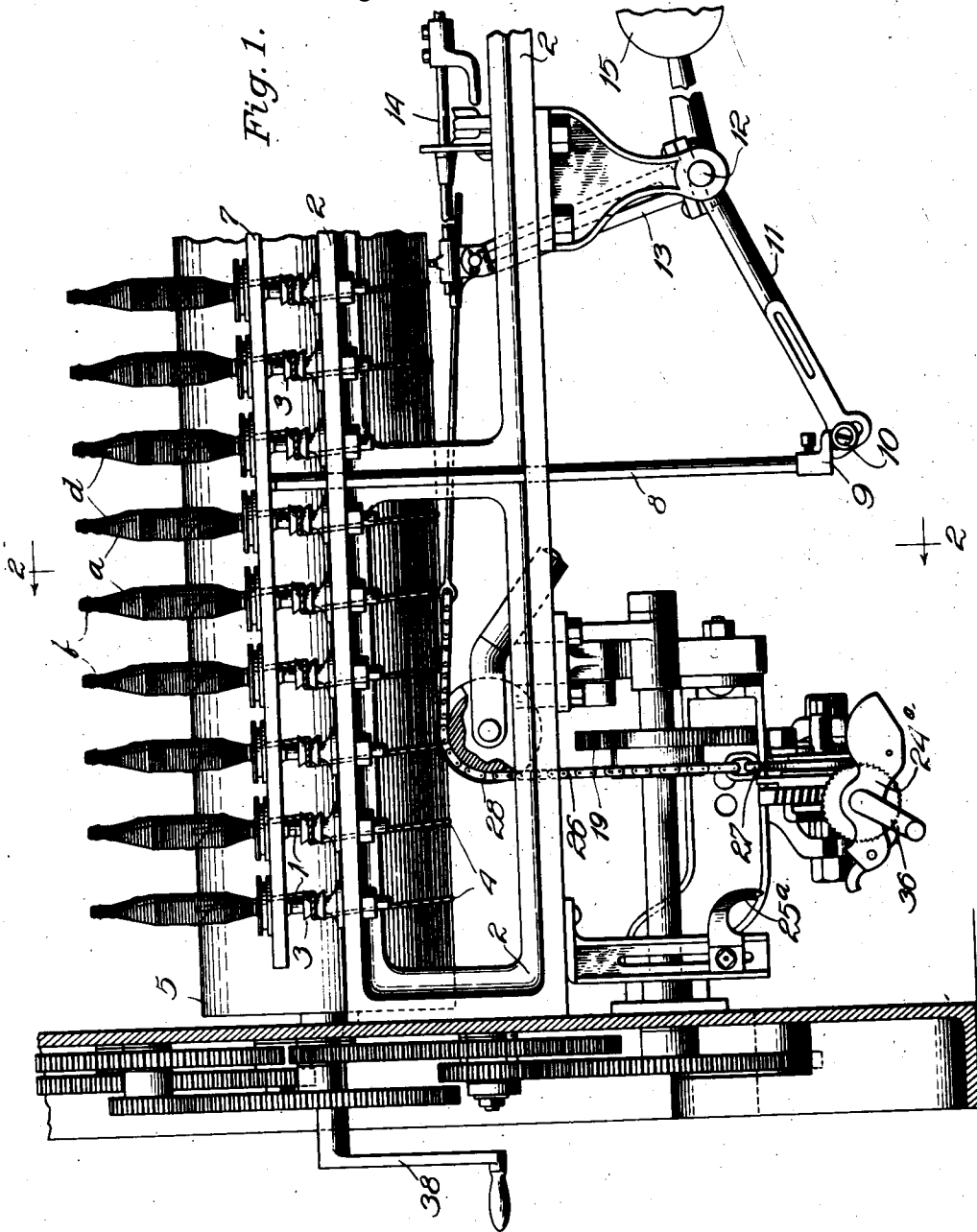
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**1,614,879**

## METHOD OF SPINNING

Original Filed July 14, 1920      3 Sheets-Sheet 1

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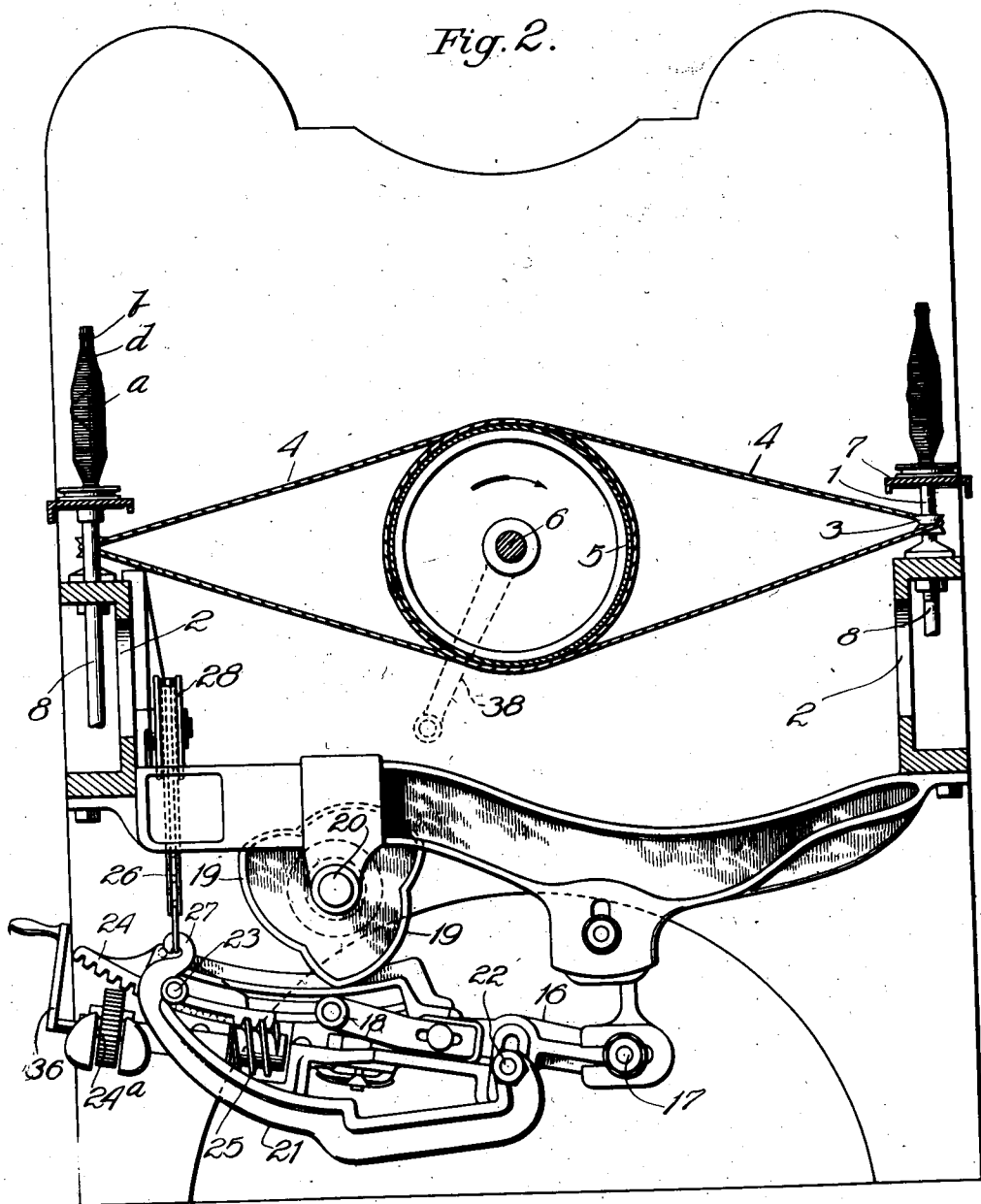
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Fig. 2.



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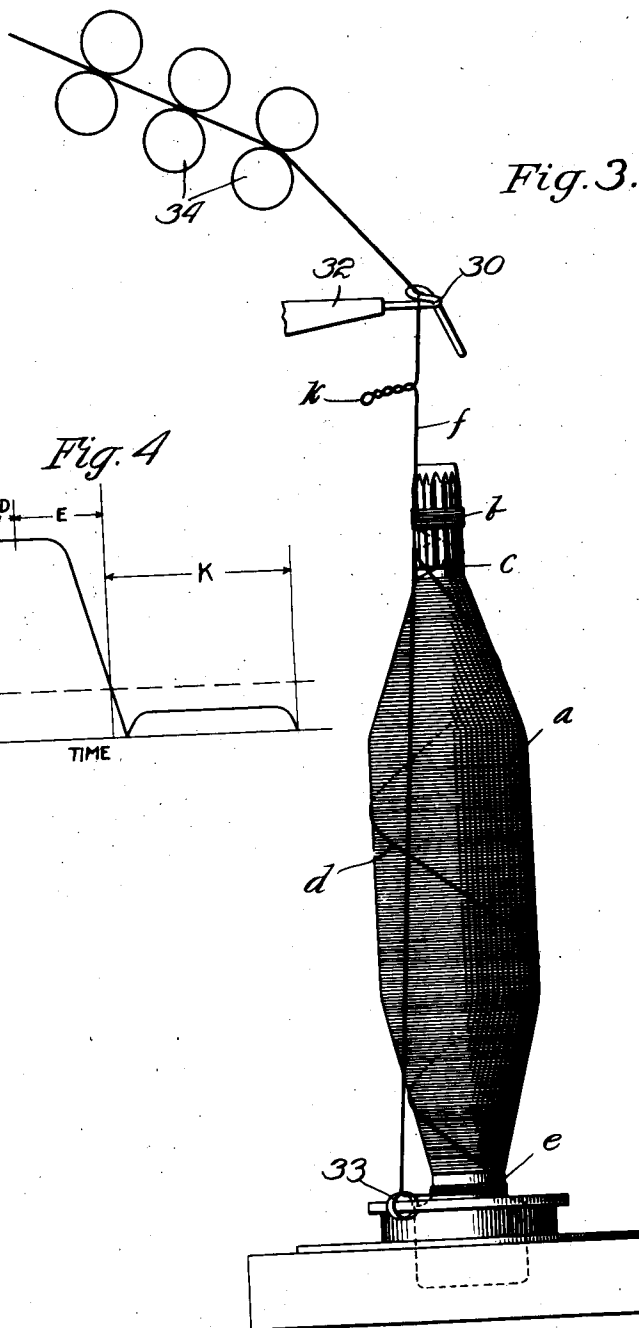
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METHOD OF SPINNING

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## UNITED STATES PATENT OFFICE.

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## METHOD OF SPINNING.

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In order to facilitate the mechanical finding of the free end of the yarn on a filling bobbin or a warp bobbin, it is desirable to spin enough coils of yarn on the upper end of the bobbin to form a small mass or finding coil above the main yarn mass, which coils of yarn may be grasped by a suitable device and stripped off the bobbin. These coils of yarn, of course, are connected by a strand of yarn to the main yarn mass, and when stripped off the bobbin they are followed by said strand, the latter constituting the found end.

Before removing the full bobbins from the spinning frame, it is desirable to spin a few coils of yarn upon the lower end of the bobbin in order that when the bobbin is doffed these coils of yarn shall slip off onto the spindle and afford means for attaching the yarn to the new bobbin. The coils of yarn upon the lower end of the bobbin are spun after the yarn has been coiled about the upper end of the bobbin and thus the coils at the upper end of the bobbin are connected to those at the lower end of the bobbin by a strand of yarn. If the proper number of coils have been wound about the lower end of the bobbin, they will slip off the bobbin and the connecting strand will be broken in the doffing operation; but, if an excessive amount of yarn has been wound about the lower end of the bobbin, some of that yarn will remain wound about the lower end of the bobbin when the bobbin is doffed and, therefore, the strand connecting the upper coils to the lower coils will not be broken. When such a bobbin is placed in a weft-replenishing loom provided with an end-finding device for stripping the upper coils off the bobbin, various difficulties may arise. If the surplus lower coils unwind when the upper coils are stripped off the bobbin, said surplus coils will form a strand of greater or less length which trails along with the found end; and if this strand is of excessive length it will reach into the cloth and cause a defect therein. If the strand connecting the upper and lower coils should break in the end-finding operation, the yarn remnant on the lower portion of the bobbin will either break the weft thread or become woven into the cloth. Or the found end may break in the end-finding operation while being unwound beneath the strand connecting the upper and lower coils.

It is necessary that the strand extending from the front drawing roll to the traveler shall be somewhat slack, in order, principally, to allow the bobbin to be lifted until the strand extending between the traveler and the bobbin assumes such an angle that the coils on the lower end of the bobbin will slide off. If, however, too much slack yarn is spun, there may result excessively large kinks which may catch on the thread guide or other parts and cause breakage of the yarn, or the kinks may be unable to pass through the traveler or the thread guide and thus cause breakage of the yarn when the machine is again started.

The method heretofore used in spinning a doffing coil upon the lower end of the bobbin and in obtaining the necessary slack has consisted in lowering the ring rail to the doffing position and then stopping and restarting the machine repeatedly and in quick succession by shifting the driving belt off and onto the drive pulley. When the ring rail reached the doffing position, some yarn would be wound around the lower end of the bobbin and during the succeeding operation of the machine more or less slack yarn would be spun. In practice, this method of spinning yarn on the lower end of a bobbin and providing slack yarn did not produce satisfactory results. In restarting the machine the belt would sometimes be allowed to remain upon the drive pulley so long that the speed of the machine would increase to the point where some or all of the slack yarn previously spun would be wound upon the lower end of the bobbin, thereby placing an excessive amount of yarn on the lower end of the bobbin and making it necessary to spin more slack yarn to take the place of that which had been unintentionally wound on the bobbin. The spinning of slack yarn might also continue until excessively large kinks had formed in the yarn between the traveler and the drawing rolls. The method just described for putting the machine in condition for doffing not only was unsatis-

factory in results, but also was laborious and required some skill and considerable attention on the part of the operator.

The object of this invention is to provide a simple and convenient method of operating the spinning machine to produce a small yarn mass upon the upper end of the bobbin, to wind the correct amount of yarn upon the lower end of the bobbin, and to spin the proper amount of slack yarn.

In the accompanying drawings, Figure 1 is a fragmental side elevation of a spinning machine by means of which the method may be practiced. Fig. 2 is a transverse sectional view taken in the plane of line 2-2 of Fig. 1. Fig. 3 is a fragmental transverse sectional view showing more or less diagrammatically, the drawing rolls, the thread-board, the bobbin, and the ring rail. Fig. 4 is a graph showing the type of time-speed cycle obtained according to my invention.

The creel is not illustrated in the drawings, as the invention has no particular reference thereto.

The form of spinning machine herein shown comprises spindles 1, the bases of which are mounted in the upper flanges of the ladder rails 2. 3 are the whirls on the spindles. 4 are bands extending from the drum 5 to the whirls 3. The drum 5 is fixed upon the main shaft 6. The ring rails 7 are connected to the upper ends of lifting rods 8, the latter being slidably mounted in the ladder rails 2. To the lower ends of the lifting rods 8 are attached shoes 9 (Fig. 1) that rest upon roller studs 10 carried by arms 11, said arms being located at suitable intervals along the machine. The arms 11 at opposite sides of the machine are arranged in pairs, each pair being fixed upon a rock shaft 12. Rigid with each rock shaft is an arm 13, the several arms 13 being connected by means of a rod 14 so that all of the arms 11 are caused to rise and fall simultaneously. A counterweight 15 attached to each of the rock shafts 12 tends to raise the ring rails.

A build motion of any suitable construction cooperates with the counterweights 15 to produce the upward and downward movement of the ring rails in the normal operation of the machine. Herein is shown a combination warp and filling builder of well-known character. Said builder comprises a builder arm 16 (Fig. 2) pivoted at 17 to a stationary part of the framework. On the builder arm 16 is mounted a roller 18 that bears against a filling cam 19 which is mounted upon a shaft 20. The shaft 20 is driven from the shaft 6 by means of the change-speed gear train illustrated in Fig. 1. A filling arm 21 is pivoted to the builder arm 16 at 22 and lies in contact with a roller stud 23 on a rack 24. Said rack

is slidably mounted on the builder arm 16 to move toward and away from the axes 17 and 22. The rack 24 meshes with a worm 25 which is rotatably mounted in the builder arm 16, said worm being intermittently and slowly rotated in the normal operation of the spinning machine by well-known means such as a counterweighted rock lever 24<sup>a</sup>, rocked at the upper end of each stroke by contact with an adjustable stationary contact 25<sup>a</sup>, and having a pawl and ratchet connection with the worm 25, so as to cause the roller stud 23 to move toward the axes 17 and 22. A chain 26 connected to a hook 27 on the arm 21 extends over a guide sheave 28 and thence to the adjacent arm 13. The counterweights 15 acting through the arms 13 and the chain 26 hold the roller stud 18 against the cam 19.

In the rotation of the filling cam 19 the arms 16 and 21 are swung, thereby causing the ring rails 7 to rise and fall and thus to lay the yarn on the revolving bobbins. As the rack 24 moves toward the axis 22, the arm 21 rises with relation to the arm 16, thereby causing the ring rails 7 to rise gradually so as to cause the yarn masses on the bobbins to lengthen in the well-known manner.

When the main yarn mass *a* has been completed, the ring rail 7 is raised for an instant above the normal upper limit of traverse to spin the finding coil *b*, the coil *b* being connected to the yarn mass *a* by a strand *c*, the ring rail being then quickly lowered below the normal lower limit of traverse to spin the doffing coil *e*, the coil *e* being connected to the coil *b* by a strand *d*. According to my invention, after the doffing coil is completed the spindle is further rotated at a speed much below the normal speed of spinning, the speed being so low that the strand *f* extending from the thread guide 30 to the traveler 33 does not balloon, but instead lies in contact with the yarn mass *a* and is thus carried at the same speed as the bobbin without winding any yarn onto the bobbin. This movement is continued only for the short time needed to allow the drawing rolls 34 to deliver a small amount of yarn. Inasmuch as the yarn thus spun is not wound on the bobbin, the strand *f* becomes slack, said strand kinking at one or more points, as indicated at *k* in Fig. 3. It is this slack yarn which permits the bobbin to be lifted, in doffing, so that the strand between the traveler and the doffing coil *e* slopes downward at a rather steep angle before the slack is taken up. This assures the unwinding of all or practically all of the doffing coil *e* around the spindle where it will be clamped by putting another bobbin in position.

In Fig. 4, I have illustrated graphically the speeds at which the machine is operated

during the final steps of the spinning operation. In the graph the vertical height of the curve indicates the speed and the horizontal displacement corresponds to the time of operation. During the time marked B the finding coil *b* is spun, and similarly the strand *d*, doffing coil *e* and slack *k* are formed during the times indicated by D, E and K, respectively. The shape of the curve during time interval E may obviously vary greatly with the type of machine being operated, being dependent on the inertia of the parts and the braking action, if any, exerted upon them to slow them down. Additional turns will be formed in the doffing coil *e* until the speed drops below the ballooning speed indicated by the dotted line, after which slack yarn will begin to accumulate.

Any suitable means may be employed for finishing the spinning operation as above outlined. In the machine I have disclosed, the ring rails 7 may be raised to spin the finding coil by rotating the worm 25 by means of the handle 36 to allow them to rise above the main yarn mass *a*; and may then be lowered to the position shown in the drawings by stepping on the usual treadle (not shown) to force them into the final position in which position they are retained by the usual latch (not shown). After reaching this position the doffing coil is spun and the source of power is disconnected from the machine.

In order to spin the slack yarn necessary to insure the proper functioning of the doffing coil, the drum 5 should be rotated to drive the machine at a speed below that at which the strand *f* balloons. For this purpose I have illustrated a handle 38 which may be used to rotate the shaft 6 slowly and spin the desired amount of slack yarn. The slack yarn may, and generally will, form one or more kinks *k*, as illustrated in Fig. 3, but the amount of slack required is not enough so that the kink will fail to straighten out when the bobbin is doffed.

When the machine is repeatedly started and stopped by power as has heretofore been the practice, it has been almost out of the question to obtain doffing coils and slack of

even approximate uniformity, the results obtained being almost a matter of accident as far as this part of the work was concerned.

It will be evident that according to my invention it is possible for the operator to quickly and accurately produce the exact amount of slack yarn desired by turning the handle 38.

While I have illustrated and described a suitable machine for practicing my method, it should be clearly understood that the disclosure is merely for purposes of illustration. It will be obvious that the machine may be disconnected from the source of power either by hand or automatically and either with or without braking the parts to bring them quickly to rest. Automatic means might also be provided for performing the operation of driving the machine at low speed to form the proper amount of slack, and other alternatives and variations will naturally occur to those skilled in the art. My invention, therefore, should not be construed as limited to the disclosure, but as defined in the subjoined claims.

I claim as my invention:

1. The method of spinning which comprises the step of forming the main yarn mass, the step of spinning a small finding coil above the main yarn mass, the step of laying a strand from the finding coil to the lower end of the main yarn mass, the step of spinning a doffing coil adjacent to the lower end of the main yarn mass, and the step of driving the machine at a controlled speed below that at which the thread balloons to produce slack yarn.

2. The method of spinning which comprises the step of completing the spinning operation proper and the step of subsequently operating the machine constantly below the ballooning speed to spin slack yarn.

3. The method of spinning which comprises the step of completing the spinning operation proper including the formation of a doffing coil, and the step of operating the machine below the ballooning speed for a definite number of revolutions.

In testimony whereof, I have hereunto set my hand.

HOWARD D. COLMAN.