July 31, 1923. 1,463,408

W. H. SWARTZ

SPEED CHANGING MECHANISM

Filed Sept. 14, 1920 4 Sheets-Sheet 1

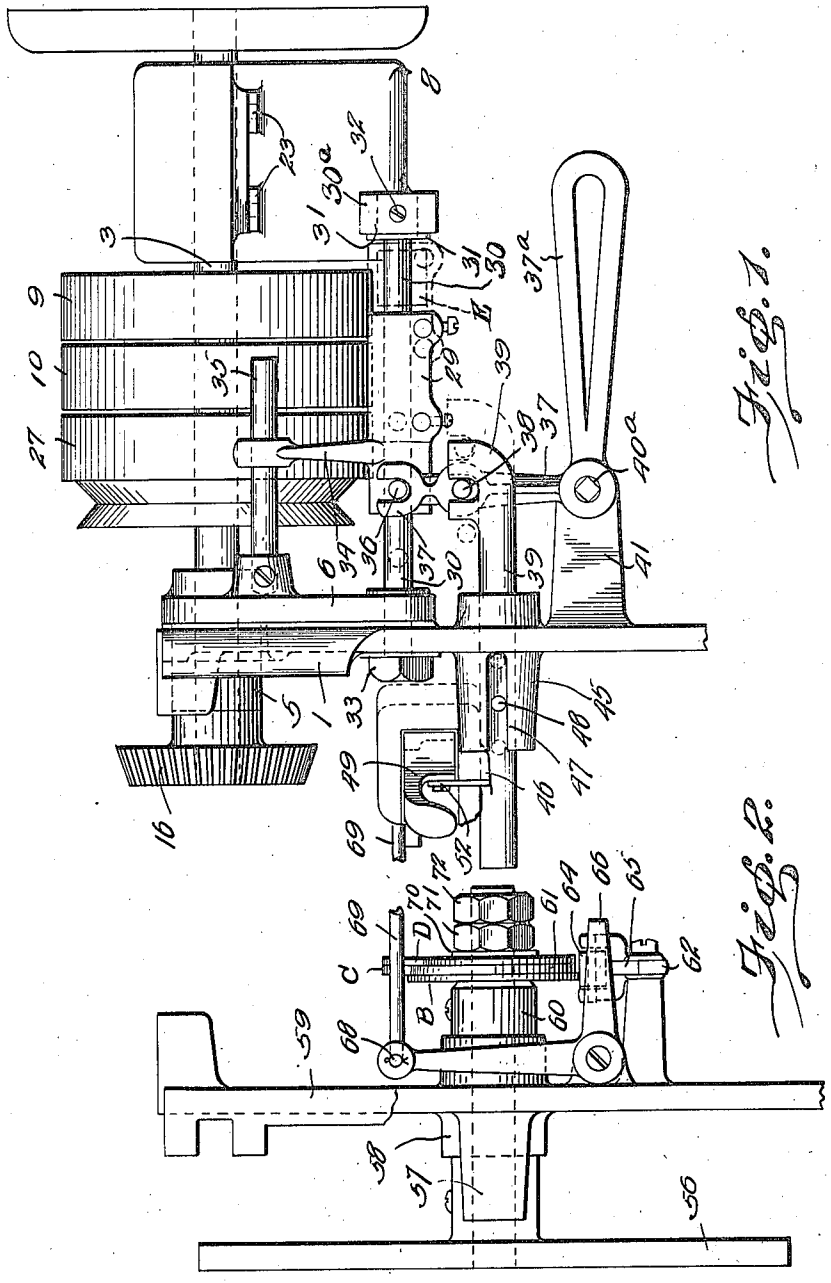


Fig. 1.

Fig. 2.

Witness

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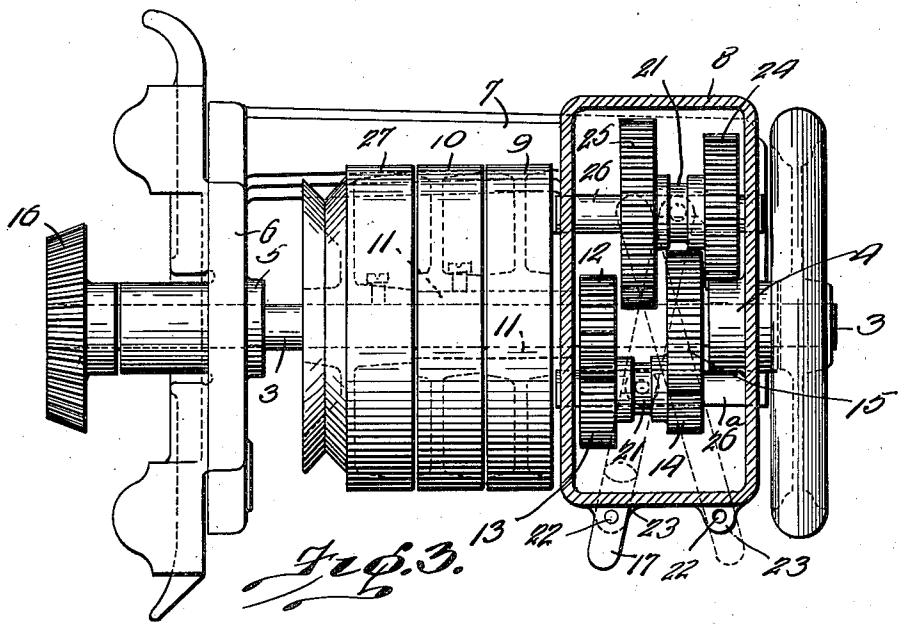


Fig. 3.

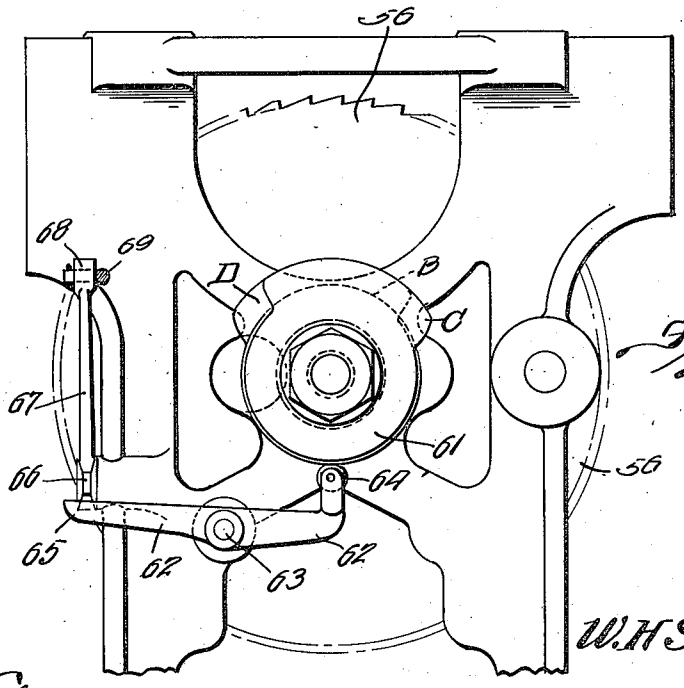


Fig. 6.

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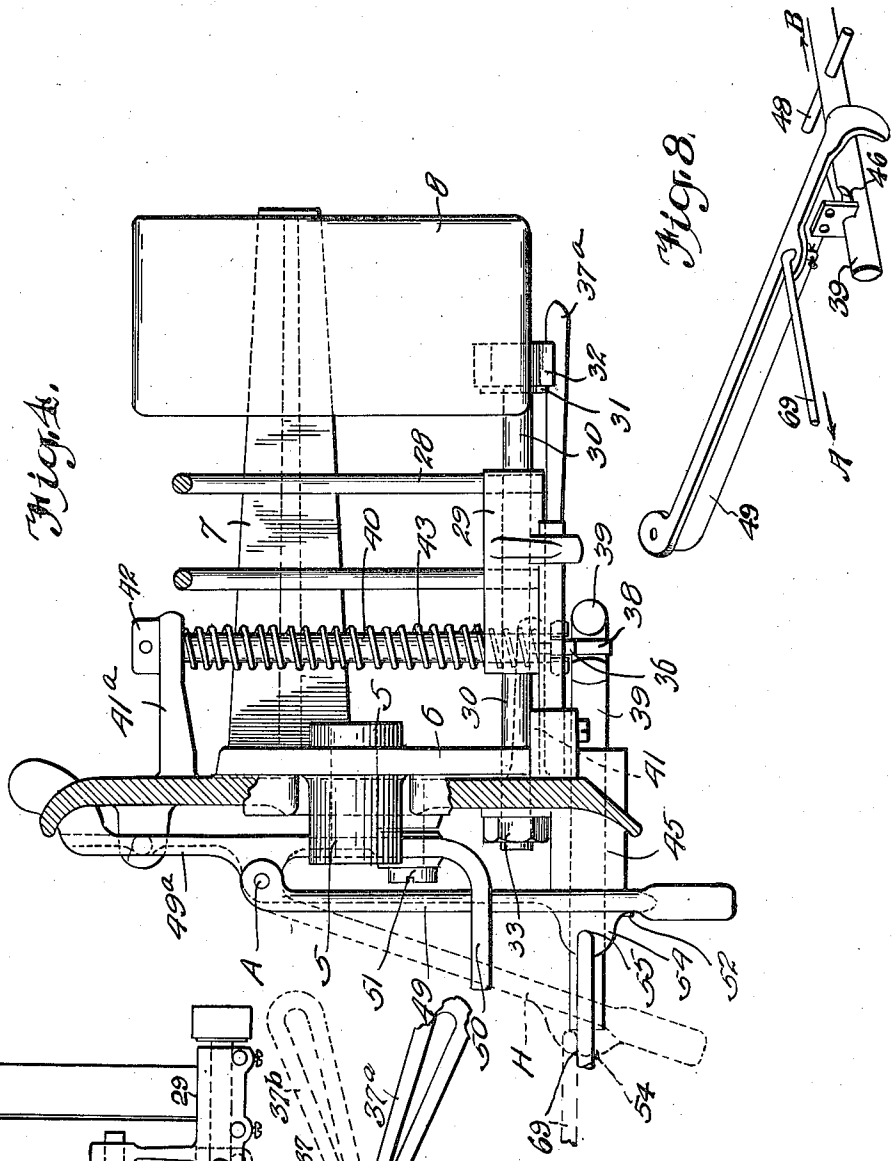
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Filed Sept. 14, 1920 4 Sheets-Sheet 3



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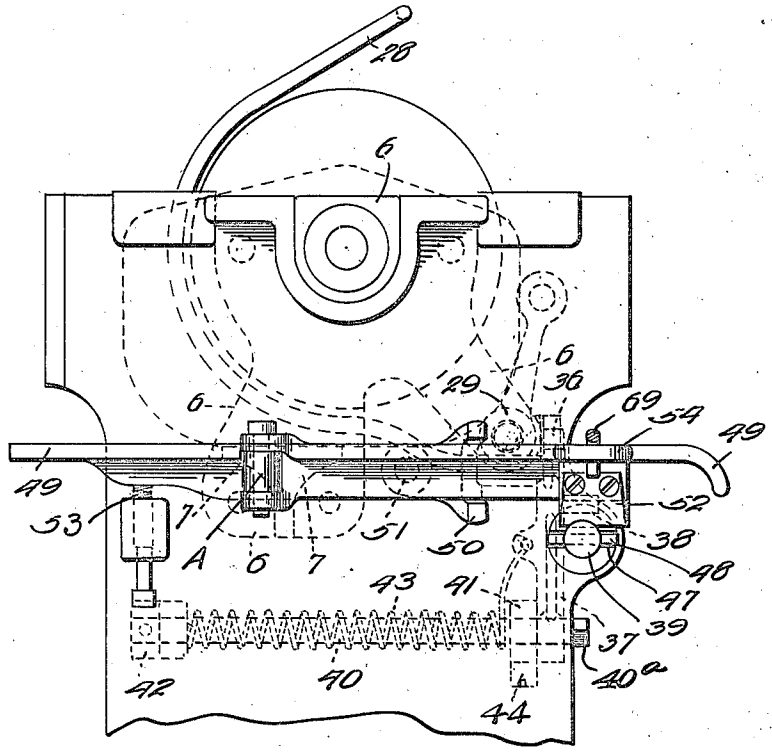


Fig. 5.

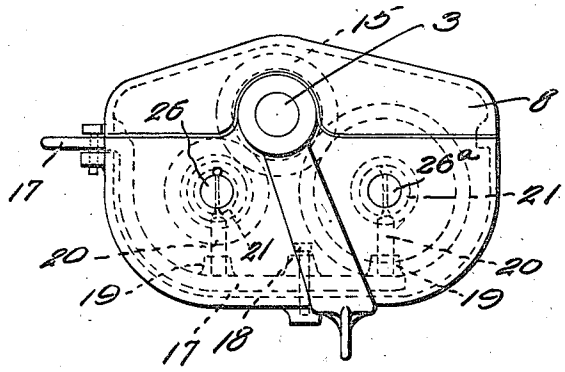


Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM HENRY SWARTZ, OF YORK, PENNSYLVANIA, ASSIGNOR TO THE GENERAL MACHINE WORKS, A CORPORATION OF PENNSYLVANIA.

SPEED-CHANGING MECHANISM.

Application filed September 14, 1920. Serial No. 410,313.

To all whom it may concern:

Be it known that I, WILLIAM H. SWARTZ, a citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Speed-Changing Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in speed changing mechanism.

The invention has for its object, first of all, to provide for automatically changing the speed of belt driven machines of various character, and more particularly textile machines. In this instance the invention is shown applied to what is known to the textile arts as a rib knitting machine, although I do not confine myself to this particular type of textile machines, as the mechanical equivalents of this invention can be easily applied to a great many types of machines.

The highest or greatest speed is used for the purpose of producing the plain or body portion of knitted fabrics in order to increase the output.

When producing welts, loose courses, or changing from one color to another, as in knitting striped fabrics, etc., a much slower speed is desired in order to eliminate the chances of the fabric being spoiled in knitting.

The strength and quality of the yarn used determine the speed at which the tedious portion e. g. striped fabric, etc. of the knitting can be safely performed.

In all present day machines the relation between the two speeds of the machine is fixed and cannot be changed. Thus, at times, the high speed is satisfactory for the yarn used, but the low speed happens to be too fast for the strength of the yarn during the tedious processes of knitting above mentioned.

In this event the speed of the driving belt must be reduced to a point that is safe to knit at low speed. This move or adjustment, of course, also reduces the high speed in the same relative proportion.

Since about 85% or more, by measurement, of the fabric is produced at high speed, it is obvious that in order to slow the high speed just to accommodate the low speed results in quite a loss in production to the manufacturer. This invention overcomes this difficulty by including an additional speed, making the device really three speeds, one high speed and two different low speeds, which low speeds are changeable irrespective of the high speed. This portion of the invention alone will result in the increase of production with a corresponding decrease in the cost of same.

A further object is to so design the whole that each unit is composed of a less number of parts than the other kinds of apparatus now in use for the same purpose.

A still further object is to shape and construct each separate one of the various parts so as to minimize the cost from a manufacturing standpoint.

A still further object is to combine the speed-changing portion, the driving portion, and the means for holding these two portions to their various positions all in one complete unit; first, in order to insure the bearings of the drive shaft remaining for all time in perfect alignment; and, second, because having the bearings and the supporting members of the unit all cast in one and the same piece reduces the cost of manufacture considerably by removing the difficulty of trying to align the bearings perfectly when said bearings are each in a separate piece, having been machined separately, fitted together, and held in place by screws, dowels, etc., as is now the common practice.

In the drawings:

Fig. 1 is a front view of the right hand or what may be termed the driving side.

Fig. 2 is a front view of the left hand or automatic side thereof.

Fig. 3 is a top view of the right hand side.

Fig. 4 is a top view of the belt shifting and stopping portion of the mechanism.

Fig. 5 is a view of the inside of the right hand side.

Fig. 6 is a view of the inside of the left hand side.

Fig. 7 is a side view of the speed-changing mechanism proper.

Fig. 8 is a detailed perspective view showing more fully the notch 46 of the plun-

ger 39 into which notch the plate 52 engages for controlling or restricting the movement of the plunger 39 adapted to function with the pattern wheel.

Fig. 9 is a detached enlarged side elevation of the shifter-fork and handle.

In the drawings, 3 is a drive shaft which extends through a bearing 4 in gear case, Fig. 3, and through a bearing 5, Figs. 1 and 3. This bearing 5 is cast solid with a boss 6, Figs. 1, 3 and 4. The boss 6 also has an arm or support 7, Figs. 4 and 5, cast thereon, being attached at one end. At the other end of arm 7 is attached, by casting thereon, the gear case 8, of which the bearing 4 is cast as a part thereof. This arrangement provides for casting all the parts designated 4, 5, 6, 7 and 8 in a single piece, thus insuring the machining the bearings 4 and 5 in perfect alignment, whereby they will be fixedly so retained for all time thereafter.

Said arrangement also provides for holding the lubricant used upon the shaft-gear bearings, also for accuracy of the machine work in the shop, eliminating the possibility of the bearing getting out of alinement during wear and providing for the removal of the entire unit without taking it apart.

9 designates a loose belt-pulley running idle when machine is not wanted in operation. 10 designates the low-speed pulley which is attached by a set-screw or other suitable means to the hub or sleeve 11 of the gear 12, this gear 12 running freely on shaft 3, and, when its teeth are meshed into those of gear 15, keyed to shaft 3, will cause gear driven rotary member 16 to drive the bevel gear at the head of the knitting machine.

A gear shift lever 17, Figs. 3 and 7, is pivotally mounted on the bottom of the gear case 8 by a pin 18, as shown, although other means may be used for that purpose. Lever 17 has two bosses 19 cast thereon, Fig. 7, into which are inserted hardened pins 20, Fig. 7. These pins 20 run freely in grooves 21 in bosses on the gears, Fig. 3. The end or handle of lever 17 projects through a slot in gear case 8 and has a hole 22. The gear case 8 has two projections 23, Fig. 3, also with holes therein, to provide for locking the lever 17 in place, or any other suitable means may be employed therefor.

13 and 14 designate gears which are made in one piece, or solidly connected together. Also 24 and 25 designate gears similarly formed, said gears 24 and 25 and 13 and 14 being slidably mounted on shafts 26 and 26ª respectively.

As gear shift lever 17 is moved to the other position shown by dotted lines 17ª, it will cause gears 24 and 25 to become engaged with gears 12 and 15, thus changing the speed of the shaft 3 from that which it had when the lever was in initial position.

A belt pulley 27 is attached fixedly to shaft 3, either by set-screw or otherwise, and is known as a direct or high-speed pulley.

A belt-shifting fork 28, Figs. 4 and 5, is attached to a shifter 29, Figs. 1 and 4, by any suitable means. This shifter 29 is slidably mounted on a shaft 30, one end of which is secured to gear case 8 and the other end is secured to boss 6.

The shaft 30 has a shoulder 30ª, Fig. 1, at one end, and inserted upon said shaft is a washer 31 of leather, rubber, felt or other sound-deadening substance. This washer acts as a shock absorber when the recoil of shifter 29 occurs.

By loosening set-screw 32 at one end of shaft 30 and drawing up a nut 33 threaded upon said shaft, Fig. 1, the shaft 30, with said washer 31, may be adjusted to the proper position to receive shifter 29.

Shifter 29 has an arm 34 integral therewith, one end of which arm has an eye which receives and slides upon a shaft 35, the end of which shaft 35 is secured to the boss 6. This prevents the shifter 29 from turning upon the shaft 30. The shifter 29 has a hardened pin 36, Figs. 1 and 5, which engages a fork 37, Figs. 1 and 5. This fork 37 has a hardened pin 38, Figs. 1 and 5, which engages a plunger 39. Fork 37 has a starting handle 37ª cast integral with same. Fork 37 is mounted on a shaft 40, Figs. 4 and 5, which in turn is supported by two bearings 41 and 41ª, Figs. 1, 4 and 5, cast integral with the framework (not shown).

The rear end of shaft 40 is provided with a collar 42, Figs. 4 and 5, or any other suitable means to prevent endwise movement of the shaft. One end of shaft 40 is square or angular, as at 40ª as clearly seen in Fig. 1 for applying a wrench thereto in order to get any desired tension of a coil or spring 43 arranged upon said shaft, one end of which is secured through a hole in shaft 40, the other end of said spring being secured through a hole in the fork 37.

When the desired tension of the spring 43 has been secured by rotating shaft 40, the shaft 40 is locked in position with set screw 42, or any other suitable means.

The plunger 39 extends through a bearing 45, Fig. 1. One end of plunger 39 is fork-shaped to engage pin 38, and the other end is notched out at 46, the purpose of which will be apparent later. The bearing 45 has a slot 47 in each side thereof for the reception of a guide-pin 48, which is passed through the plunger 39, the two extreme positions of the pin indicated by dotted lines at the right and left thereof as shown in Fig. 1, respectively.

A knock-off lever 49, Figs. 4 and 5, is composed of two parts hinged together at A. The rear part 49ª has the forward end 50 formed into a fork, allowing the handle part 49 to move freely in same, as shown by dot-

ted lines H, Fig. 4. Part 49a is pivoted at 51, allowing the entire lever to have a rocking motion.

At the front end of lever 49 a flat hardened steel catch plate 52 is attached, Figs. 4 and 5. This plate rides in the notch 46 in plunger 39, Fig. 1. At the rear end of lever 49 is a spring 53, Fig. 5, which, pressing on the under side of rear of lever, causes the front end to descend upon the pivot at 51 and thus insures the plate 52 always engaging the notch 46 during the combined movements of the plunger 39 and lever 49. The lever 49 is provided with an ear 54, Figs. 4 and 5, having a hole 55, the purpose of which will be seen later.

Reference being had particularly to Figs. 2 and 6, 56 indicates the automatic pattern-wheel whose functions are well known to the knitting industry. This pattern-wheel 56 is mounted on a revolving shaft 57, which passes through a bearing 58 cast integral with the frame 59 and which shaft 57 is provided with a set collar 60 suitably secured in position by a set-screw or otherwise.

Mounted upon shaft 57 immediately alongside the collar 60 is an adjustable cam mechanism or pattern wheel 61 consisting of three members or plates B, C and D, B being a true circle, while C and D are each a mutilation of a circle or a cam proper. See Fig. 6. By rotating these two cam-forming members, both the length of the travel and the starting and ending points of the cam may be adjusted to any position in the circle.

Mounted under this cam 61 is a rocking lever 62, centrally pivoted as at 63, one end carrying a roller 64, which is broad enough to engage and ride in contact with the edges of all three members of the cam 61 at the same time. The other end 65 of this lever 62 engages the under side of the end 66 of a crank-lever 67. The upper end of crank-lever 67 has a hole 68 through which is passed one end of a rod 69, the other end of rod 69 being passed through the hole 55 of the ear 54 of the lever 49. 70 is a lock washer and 71 and 72 are both lock nuts all to hold plates B, C and D of cam 61 rigidly in place on the shaft 57.

The operation of the device is as follows: The driven rotary member 16 drives a revolving head (not shown, but well known to all skilled in the art of knitting); this revolving head drives the pattern wheel 56 by means of a pawl (not shown). The revolving pattern wheel 56, being locked on shaft 57, causes cam 61 to revolve, which depresses roller end 64 of lever 62 and raises its opposite end, which in turn raises the end 66 of crank-lever 67, causing the upper end of lever 67 to draw the rod 69 to the right in Fig. 4. This rod, being connected to lever 49 at ear 54, causes the lever 49 to move to the position as shown by dotted lines H, Fig. 4, to move the shifter 29 which in turn will shift the belt to the required driving pulley.

The shifter 29 carrying the belt shifting forks is connected by pin 36 to fork 37 and the movement of fork 37 is held and controlled against the pressure of the coil spring 43 by means of pin 38 engaging the forked end of plunger 39, the plunger 39 being held back against the pressure of the coil spring 43 by means of the engagement of the plate 52 of lever 49 with the notch 46 of plunger 39.

When it is desired to stop the machine the hooked end of lever 49 is raised far enough to release plate 52 from notch 46 of plunger 39, thus releasing the latter. When the plunger 39 is released the coil spring 43 will throw the belt shifter 29 to the extreme limit, as shown by dotted line E, Fig. 1, which will move the belt to the loose pulley 9, resulting in the stopping of the machine.

To start the machine, handle 37a, Fig. 1, is raised, which causes the plunger to move backward to the left in said figure until a position is reached which will allow the plate 52 of lever 49 to drop into notch 46 of the plunger 39 when said plunger and all belt shifting apparatus will be held by means of the rod 69, lever 67, lever 62 and the roller 64 resting at all times upon the surface of the cam 61.

Having thus described my invention, I claim and desire to secure by Letters Patent:

1. In a knitting machine, the combination with a rotary driven member, of means to drive said member at high speed and low speed, automatic means for shifting between high and low speeds, and hand-operated means to vary said low-speed for the purpose of adapting it to irregularities in the yarn.

2. In a knitting machine, the combination with a rotary driven member, of means to drive said member at high speed and low speed, automatic means for shifting between high and low speed, hand-operated means to vary said low speed for the purpose of adapting it to irregularities in the yarn and driving connections for said elements comprising a knock-off lever, a belt-shifter, a plunger coupled to said belt-shifter, a pattern-wheel and means of connection between said knock-off lever and said pattern-wheel.

3. In a knitting machine, the combination with a rotary driven member, of means to drive said member at high speed and low speed, automatic means for shifting between high and low speeds and hand-operated means to vary said low speed for the purpose of adapting it to irregularities in the yarn, and driving connections for said elements comprising a knock-off lever, a belt shifter, a plunger having a notch, said lever having a catch-plate engaging said notch in said plunger.

4. In a machine of the type described, the combination of knitting mechanism elements, speed-gear mechanism for said elements, and means for interchangeably controlling the speed of said gear-mechanism from relatively high to low, and from low to high rate, including a knock-off lever, a belt-shifter, a plunger having a notch, a handled pivoted fork effecting connection between said belt-shifter and said plunger, a pattern-wheel means of connection between said knock-off lever and the pattern-wheel, and means for the retention of said knock-off lever in engagement with said plunger, said knock-off lever having a plate-member adapted to engage said notch in said plunger.

In testimony whereof, I affix my signature.

WILLIAM HENRY SWARTZ.