(No Model.) 3 Sheets—Sheet 1.

A. T. L. DAVIS.

STOPPING MECHANISM FOR KNITTING MACHINES, &c.

No. 457,307. Patented Aug. 4, 1891.

Fig. 1.

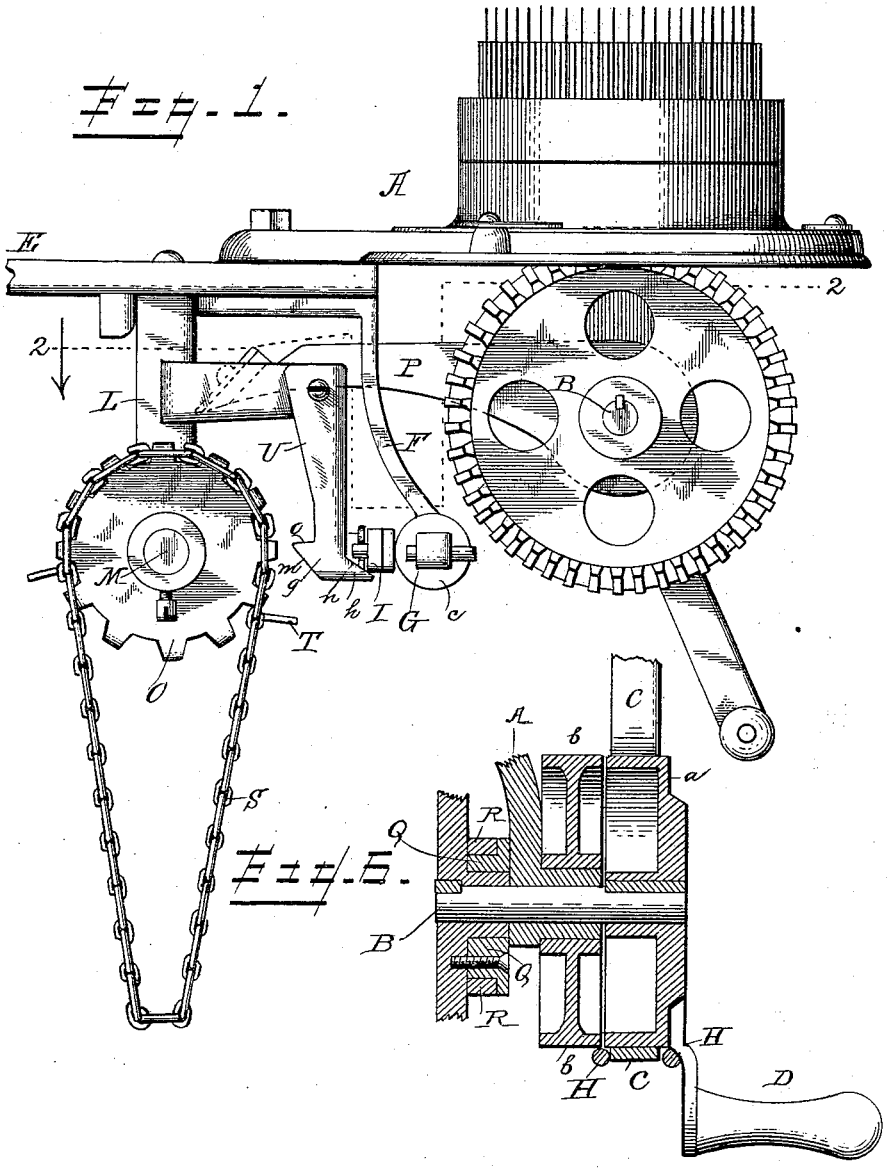

Fig. 5.

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Fig. 2.

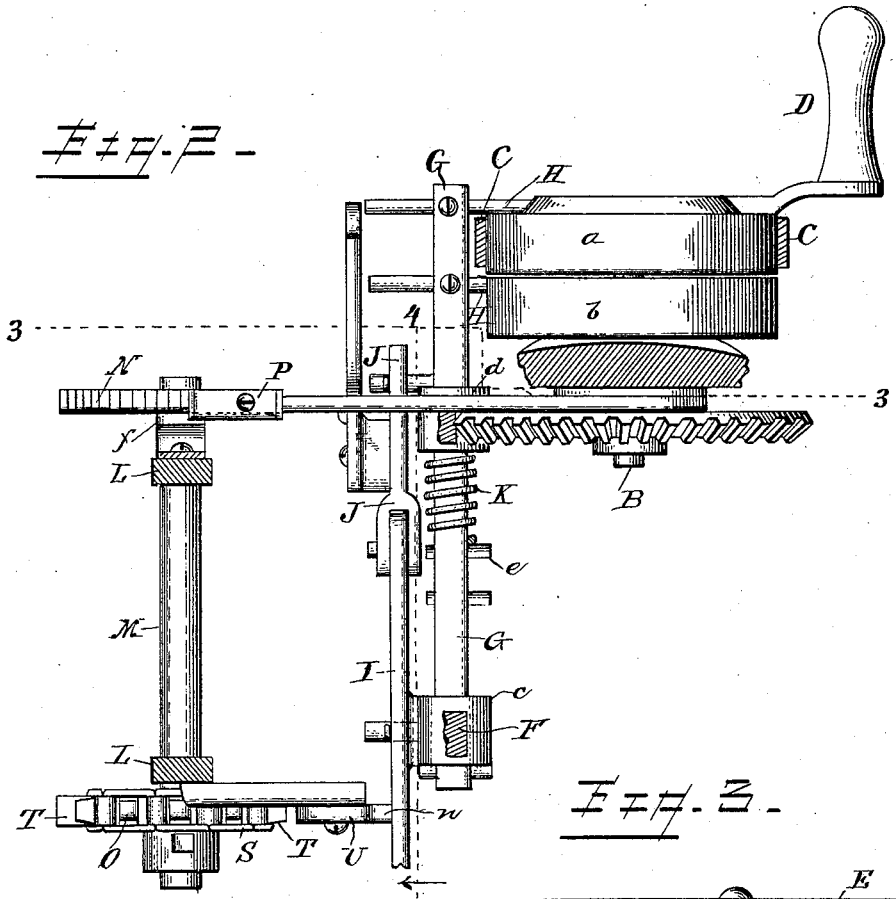
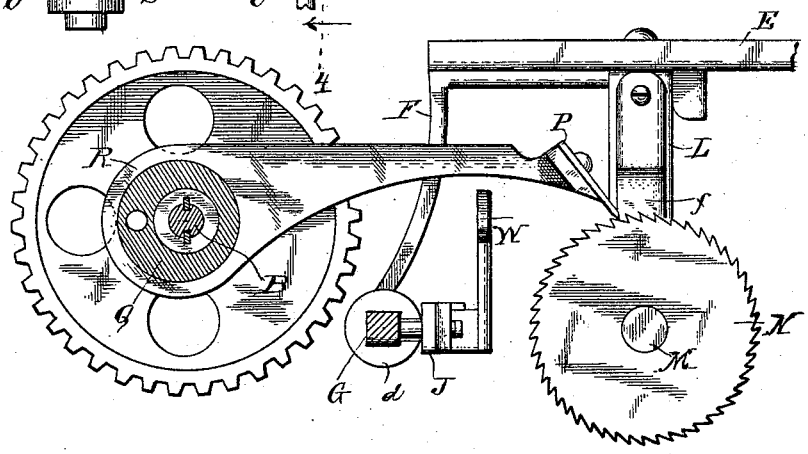


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

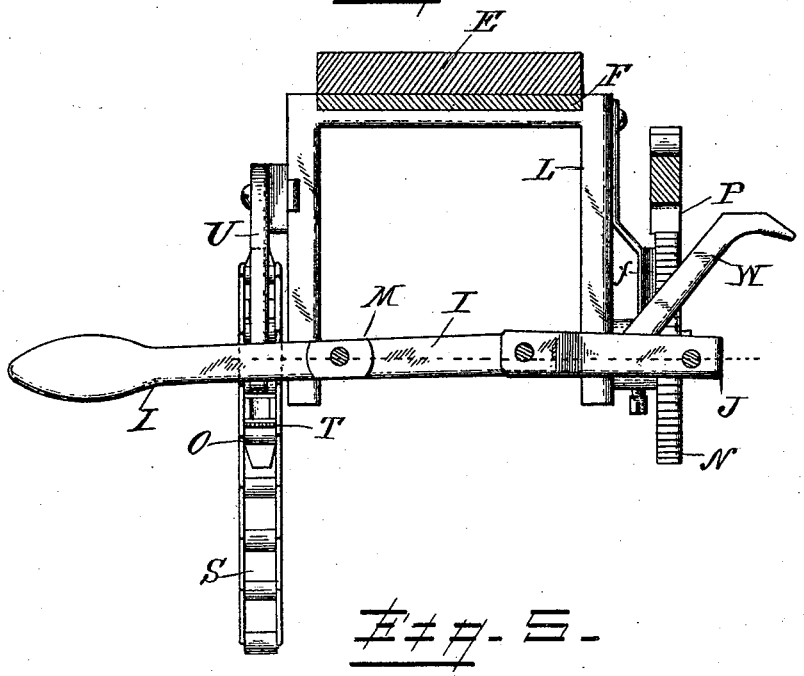
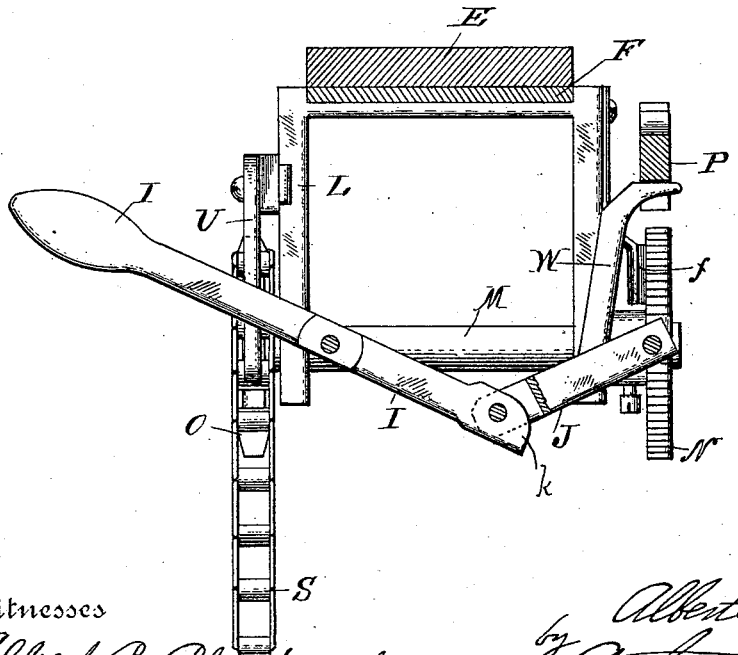


Fig. 5.



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UNITED STATES PATENT OFFICE.

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STOPPING MECHANISM FOR KNITTING-MACHINES, &c.

SPECIFICATION forming part of Letters Patent No. 457,307, dated August 4, 1891.

Application filed August 6, 1890. Serial No. 361,160. (No model.)

To all whom it may concern:

Be it known that I, ALBERT T. L. DAVIS, of Lake Village, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Stopping Mechanism for Knitting-Machines, &c., of which the following is a specification.

In many classes of machinery it is desirable to stop the machine automatically when it has completed a given amount of work. For example, in circular-knitting machines for knitting stockings it is customary to run the machine by power while the circular web constituting the leg and ankle of the stocking is being formed, and as soon as this portion of the stocking is completed the machine is stopped, certain of the needles are thrown out of action, and the foot is completed by operating the machine back and forth by hand. In such machines uniform lengths are essential to the stockings, and consequently it is essential to the proper operation of the machine that it should be automatically stopped when the leg and ankle are completed. Prior to the present invention automatically-acting stop-motion devices have been provided for this purpose. For example, a well-known stopping device consists in a weight, which is fastened to the web that is being knit, and when a proper length has been knit the weight, descending as the web lengthens, strikes a stop, which sets in operation the belt-shifting mechanism. This device is open to objection in that it is difficult without the exercise of great care to always secure the weight to the same relative position on the different webs, and different webs stretch to varying lengths under the strain of the weight.

Now the present improvements relate to a mechanism for setting in operation the usual belt-shifting mechanism with which knitting and other machines are commonly supplied. The object of the invention is to supply a device which shall act with uniformity and precision to set the belt-shifting mechanism in operation at exactly the proper intervals. This object is secured by the employment of a traveling pattern-chain, which is actuated by the machine, so that its speed of travel bears a definite fixed relation or proportion to the speed of the machine, said pattern-chain having projecting cams or tappets, which when brought to a given position set in operation the belt-shifting mechanisms.

While the improvements are applicable to different mechanisms wherein it may be desired to stop the machine automatically on the completion of a given amount of work, they will be described in detail in connection with a knitting-machine of the type already referred to. Such a machine is shown in the accompanying drawings, wherein—

Figure 1 is a side view of the machine with the present improvements applied thereto. Fig. 2 is a horizontal section on a plane indicated by the line 2 2 in Fig. 1. Fig. 3 is a vertical section in a plane indicated by the line 3 3 in Fig. 2. Fig. 4 is a vertical section in a plane indicated by the line 4 4 in Fig. 2, showing the parts in their normal positions. Fig. 5 is a similar view showing the parts in the position which they assume after the motion of the machine has been stopped. Fig. 6 is a detail sectional view along the main drive-shaft.

A is the head of an ordinary circular-knitting machine, and B is the drive-shaft thereof, carrying a fast pulley *a* and a loose pulley *b*, with which a drive-belt C co-operates. The shaft is also provided with a hand-crank D for operating the machine while doing back-and-forth knitting, as in footing the stocking.

The head of the machine is bolted to a suitable metallic supporting-standard E. Secured to the standard E is a downwardly-projecting forked bracket F, having at its lower ends guide-sleeves *c d*, in which slides a horizontally-reciprocating shipper-bar G. This bar carries at one end exterior to the sleeve *d* a belt-shipper fork H, which is secured to the bar G. This fork extends horizontally beneath the fast and loose pulleys *a b*, and through it the drive-belt C extends. The shipper-fork is held in position to co-operate with the fast pulley *a* by means of a shipper-lever I, which is pivotally connected to the sleeve *c*, so as to swing in a vertical plane, and a link J, which is pivotally connected at opposite ends to the lever I and the bar G, respectively, said link also swinging in a vertical plane. When the bar G is in

such position that the shipper-fork co-operates with the fast pulley, (which position will be here considered the normal position,) both the shipper-lever I and the link J occupy a substantially horizontal position, the pivotal point, however, between the link and lever being slightly above a center line drawn from the pivotal point between the lever and sleeve *c* to the pivotal point between the link and the bar G. When in this normal position, the outer handle end of the shipper-lever can only be swung upward, any suitable stop (such as a knuckle-joint *k* between the lever and link J) preventing its downward movement, and it is held from accidentally moving upward by reason of its described connection with the link J.

In order to ship the shipper-fork so as to carry the drive-belt from the fast to the loose pulley and so stop the machine, it is only necessary to swing the free end of the shipper-lever I up just far enough to bring the pivotal point between the lever and the link J below the center line, the movement of the shipper-bar G and the fork H being then automatically effected by a coiled spring K, which encircles the bar G between the sleeves *c d*, and which bears at opposite ends against the inner face of sleeve *d* and against a pin *e*, extending through the bar G. The movement of the shipper-fork in the opposite direction is effected by the manipulation of the shipper-lever I. It will thus be noted that the lever I and link J constitute a locking mechanism for holding the several parts in their normal positions.

The belt-shifting mechanism as thus described is all old and well-known, and constitutes no part of the present invention except in so far as it enters into combination and co-operates with the improvements constituting the essential features of the present invention. The mechanism as described is merely introduced as being a suitable and convenient belt-shipping or belt-shifting mechanism with which the present improvements may be employed.

Adjacent to the bracket F there is secured to the standard E a second downwardly-extending forked bracket L, in the lower ends of which is journaled a horizontal shaft M, parallel with the main shaft B and the bar G, the bar G being between the main shaft B and the shaft M. On its end adjacent to the shipper-fork the shaft M carries a ratchet-wheel N, and on its opposite end, adjacent to the free end of the shipper-lever, it carries a sprocket-wheel O. The ratchet-wheel is rotated by means of a co-operating gravity-pawl P, the inner end of which is formed with a circular aperture or strap R, which encircles an eccentric Q on the drive-shaft B. The throw of the eccentric Q thus determines the rate of rotation of the ratchet-wheel and its shaft M, so that there is a definite and fixed relation or proportion between the speed of the knitting mechanism and that of shaft M. The ratchet-wheel is held from backward movement, or from forward movement due to momentum, by a spring-brake *f*, which bears against its inner face. The sprocket-wheel O, at the other end of shaft M, carries a sprocket or pattern chain S of any desired length and having at properly disposed intervals any desired number of outwardly-projecting cams or tappets T. This pattern-chain, as shown in the drawings, travels in a vertical plane perpendicular to the vertical plane in which the shipper-lever I swings, and the path of the pattern-chain is adjacent to the free end of the shipper-lever.

Pivoted at its upper end to a projection on the bracket L is a swinging downwardly-hanging dog U, the lower end of which occupies a position between the pattern-chain and the shipper-lever. This dog swings in a vertical plane parallel to that in which the pattern-chain travels, and consequently perpendicular to that in which the shipper-lever swings. The free lower end of the dog is provided with two oppositely-projecting cams *g h*, the cam *g* projecting toward the pattern-chain and the cam *h* projecting toward the shipper-lever I. The cam *g* is normally out of contact with the pattern-chain. Since the adjacent portion of the pattern-chain travels upwardly, (in the direction of the arrow in Fig. 1,) the lower inclined cam-face *m* of the cam *g* is in the path of the cams or tappets T on the pattern-chain. Consequently, when in the rotation of the shaft M one of the tappets T encounters the inclined cam-face *m* of cam *g*, it forces the cam *g* and the lower end of the dog U away from the pattern-chain and toward the shipper-lever. Now in the normal position of the parts the lowest and outermost point of the upper inclined cam-face *n* of the cam *h* is located just below the lower edge of the shipper-lever. When, however, the lower end of the dog is swung out by one of the tappets T, the inclined cam-face *n*, coming in contact with the shipper-lever I, forces the same upward. The extent of the movement of the dog U is sufficient to force the shipper-lever I far enough to unlock the same and to release the spring K, which effects the shipping of the belt to the loose pulley *b*, thereby stopping the machine. After the machine has been thus stopped certain of the knitting-needles are thrown out of action in the usual well-known manner, and then the foot of the stocking is completed by back-and-forth knitting, the machine being operated by the hand-crank D. When the machine is thus being operated by hand, there is no necessity for operating the pattern-chain S, and accordingly to avoid the work of operating it means are employed for automatically throwing and holding the gravity-pawl P out of action. For this purpose a pawl-lifting arm W is secured to the link J, which is normally located beneath the pawl P and out of contact with it. When, however, in the operation of shipping the belt the

link J is swung downward and retracted, the lifting-arm W is moved upward into contact with the pawl P, lifting the latter out of cooperation with the ratchet-wheel N and holding it in its inoperative position as long as the driving-belt runs on the loose pulley. Accordingly the shaft M and the parts carried thereby remain stationary during the back-and-forth knitting.

Another object of throwing the pawl P out of action is that thereby the shaft M can be turned freely by hand in either direction, so as to set the pattern-chain for the next knitting operation. The square upper shoulder *o* of the cam *g* on the dog U affords a convenient gage-stop for setting the pattern-chain. By bringing one of the tappets T against this stop a uniform length of the pattern-chain can be set for each knitting operation. The pattern-chain can be made of any length and provided with any number of tappets disposed at any desired intervals, so that different lengths of web may be knit.

When it is desired to run the machine again by the drive-belt, the parts are restored to their normal positions by depressing by hand the free end of the shipper-lever I.

It will be evident that the pattern-chain and its operating adjuncts can be applied to any machine provided with a belt-shipping mechanism wherein the automatic stopping of the machine after the completion of predetermined amounts of work is desired.

I claim as my invention—

1. A belt-shifting mechanism and a traveling pattern-chain having cams or tappets thereon, in combination with a swinging dog between said chain and a movable operating part of said belt-shifting mechanism, said dog being acted upon by said cams or tappets and said dog in its turn acting upon said movable operating part of said belt-shifting mechanism, substantially as set forth.

2. The lever I and a traveling pattern-chain having cams or tappets thereon, in combination with a swinging dog between said chain and said lever, said dog being acted upon by said cams or tappets and said dog in its turn acting upon said lever, substantially as set forth.

3. The lever I and a traveling pattern-chain having cams or tappets thereon, in combination with a swinging dog between said chain and said lever, said dog having cam *g* in the path of said tappets, whereby said tappets swing said dog toward said lever, and having cam *h*, which acts upon said lever, substantially as set forth.

4. The lever I and a traveling pattern-chain having cams or tappets thereon, in combination with dog U, having a gage-stop *o* in the path of said cams or tappets, substantially as set forth.

5. The belt-shifting mechanism of a machine, a ratchet-wheel which controls the operation of said belt-shifting mechanism, mechanism between said ratchet-wheel and said belt-shifting mechanism, and a pawl which actuates said ratchet-wheel, in combination with a lifting-arm, the movement of which is controlled by the action of said belt-shifting mechanism, said lifting-arm acting (when said belt-shifting mechanism operates to stop the machine) to throw said pawl out of engagement with said ratchet-wheel, substantially as set forth.

6. The drive-shaft of a machine, fast and loose pulleys thereon, a drive-belt which runs on said pulleys, a sliding shipper-rod, a shipper-fork carried by said shipper-rod, said fork embracing said belt, a spring which acts on said shipper-rod to move the same in a direction to stop the machine, a locking mechanism for holding said shipper-rod in position with the drive-belt running on the fast pulley, said locking mechanism consisting of a shipping-lever pivoted to a fixed support, so as to swing in a vertical plane, and a link pivotally connected at opposite ends to said shipper-lever and said shipper-rod, respectively, in combination with a shaft carrying a sprocket-wheel and a ratchet-wheel, an eccentric on said drive-shaft, a gravity-pawl actuated by said drive-shaft and engaging said ratchet-wheel, a pattern-chain carried by said sprocket-wheel, said pattern-chain having a plurality of cams or tappets disposed thereon and said pattern-chain traveling in a vertical plane perpendicular to the vertical plane in which said shipper-lever turns, and a swinging dog, the lower free end of which is located between said pattern-chain and said shipper-lever, said dog having two cams on its free end, one cam being located in the path of the cams or tappets on the pattern-chain and the other cam adapted to engage said shipping-lever to turn the same on its pivot, substantially as set forth.

7. The drive-shaft of a machine, fast and loose pulleys thereon, a drive-belt which runs on said pulleys, a sliding shipper-rod, a shipper-fork carried by said shipper-rod, said fork embracing said belt, a spring which acts on said shipper-rod to move the same in a direction to stop the machine, a locking mechanism for holding said shipper-rod in position with the drive-belt running on the fast pulley, said locking mechanism consisting of a shipping-lever pivoted to a fixed support, so as to swing in a vertical plane, and a link pivotally connected at opposite ends to said shipper-lever and said shipper-rod, respectively, in combination with a shaft carrying a sprocket-wheel and a ratchet-wheel, an eccentric on said drive-shaft, a gravity-pawl actuated by said drive-shaft and engaging said ratchet-wheel, a pattern-chain carried by said sprocket-wheel, said pattern-chain having a plurality of cams or tappets disposed thereon and said pattern-chain traveling in a vertical plane perpendicular to the vertical plane in which said shipper-lever turns, a swinging dog, the lower free end of

which is located between said pattern-chain and said shipper-lever, said dog having two cams on its free end, one cam being located in the path of the cams or tappets on the pattern-chain and the other cam adapted to engage said shipping-lever to turn the same on its pivot, and a pawl-lifting arm carried by said link, said arm being normally located beneath said pawl but arranged to lift said pawl out of engagement with said ratchet-wheel on the stopping of the machine, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALBERT T. L. DAVIS.

Witnesses:
HENRY B. QUINBY,
A. C. MOORE.