(No Model.) 3 Sheets—Sheet 1.

C. E. DREW.

KNITTING MACHINE.

No. 342,339. Patented May 25, 1886.

Fig. 1.

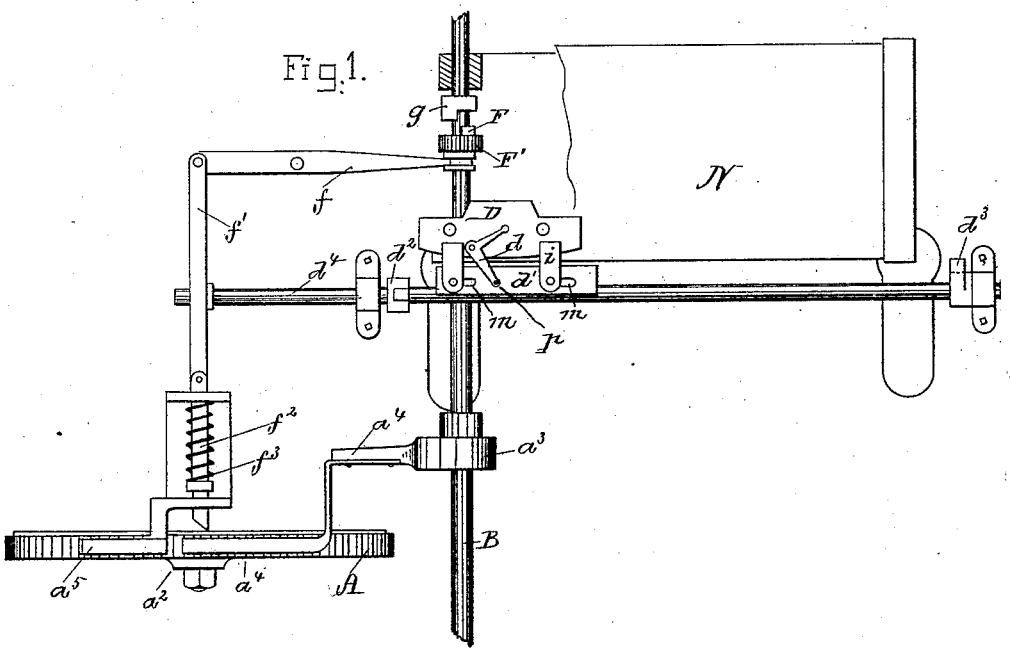
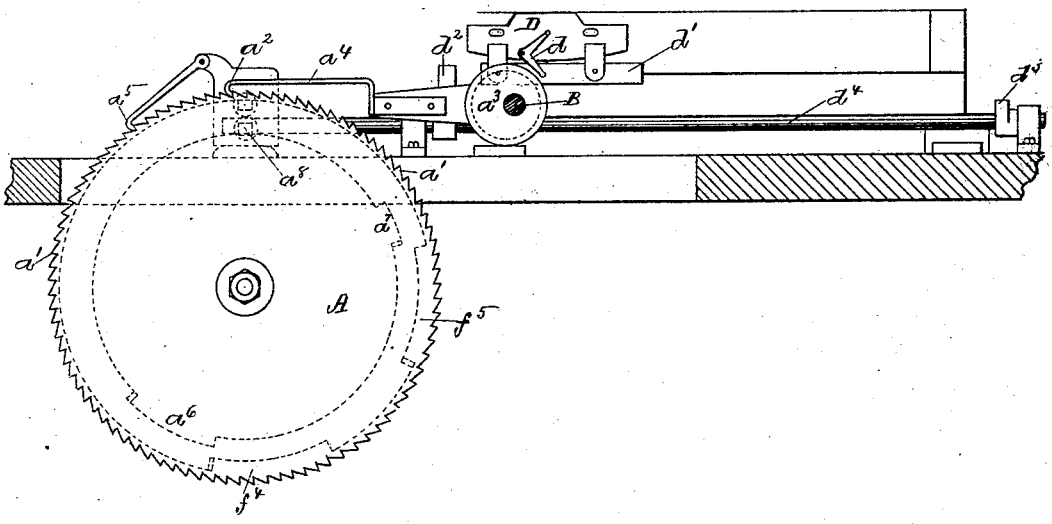


Fig. 2.



Witnesses.

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John R. Snow.

Inventor.

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(No Model.) 3 Sheets—Sheet 2.

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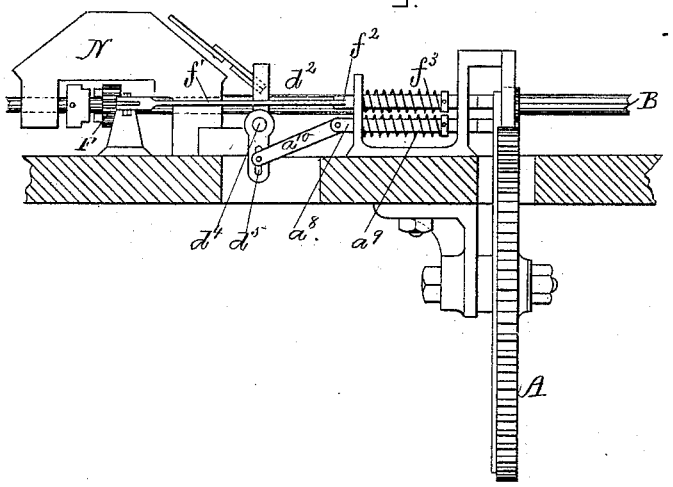
Fig. 3.



Witnesses.

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(No Model.) 3 Sheets—Sheet 3.

C. E. DREW.

KNITTING MACHINE.

No. 342,339. Patented May 25, 1886.

Fig. 4.

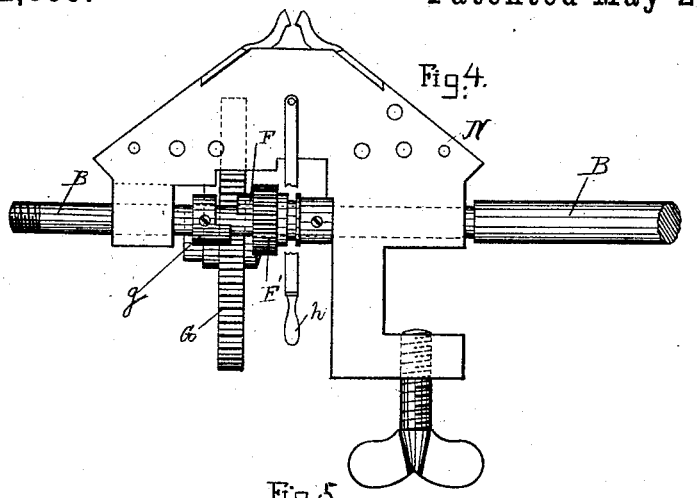


Fig. 5.

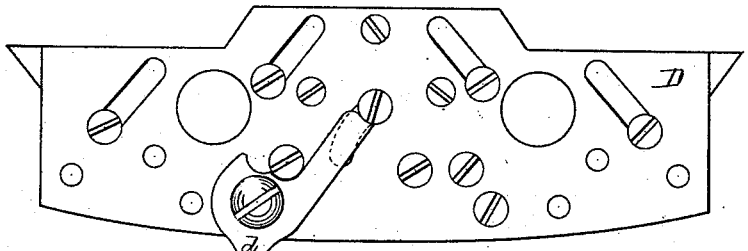


Fig. 6.

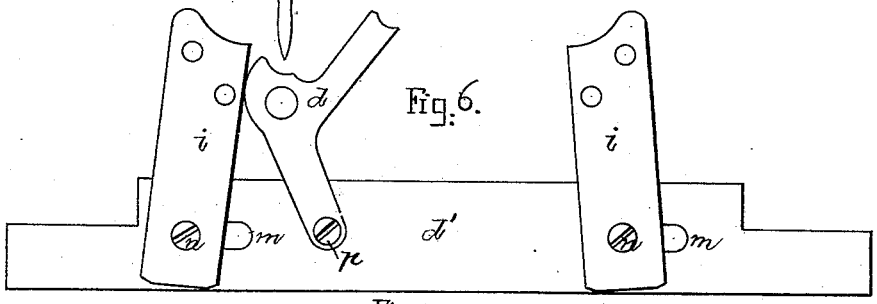
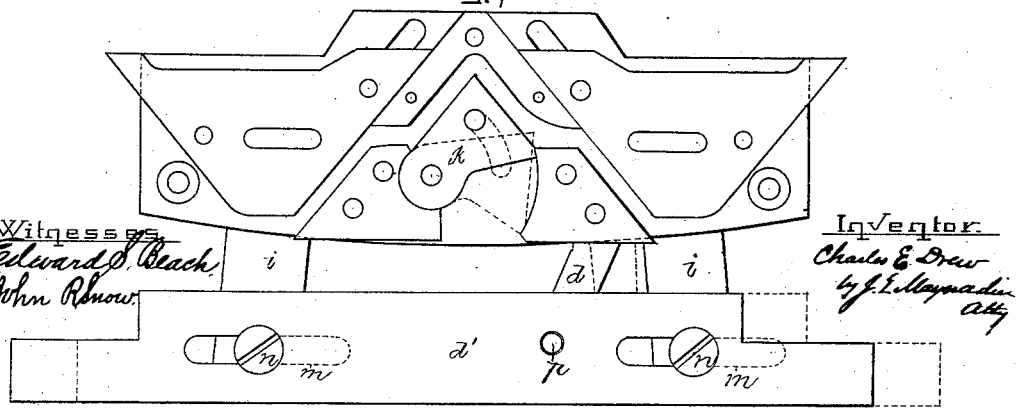


Fig. 7.



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Atty

UNITED STATES PATENT OFFICE.

CHARLES E. DREW, OF WOONSOCKET, R. I., ASSIGNOR OF ONE-HALF TO GEORGE H. BAKER AND AMOS A. PEVEY, BOTH OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 342,339, dated May 25, 1886.

Application filed October 17, 1884. Serial No. 145,788. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. DREW, of Woonsocket, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view representing my improvements, parts being represented as broken away and other parts in section. Fig. 2 is a side view thereof, partly in section. Fig. 3 is an end view thereof, partly in section. Fig. 4 is an end view of a part of a knitting-machine provided with a racking attachment. Fig. 5 is a front view of the cam-plate, as heretofore constructed. Fig. 6 shows a part of my devices for automatically shifting the tumbler-cam. Fig. 7 is a rear view of the cam-plate with my slide-plate attached.

The Lamb knitting-machine described in Letters Patent No. 39,934, dated September 15, 1863, and No. 50,369, dated October 10, 1865, is often provided with the racking attachment described in Letters Patent No. 248,795, dated October 25, 1881, and the cam attachment described in Letters Patent No. 267,982, dated November 21, 1882. Thus provided the Lamb machine is both practical and useful, but as the racking attachment as well as the cam attachment have hithereto been operated by hand an attendant has ordinarily been required for each machine. Hitherto it has been customary to connect a counter-dial to the sliding frame of the knitting-machine to inform the operator when to shift the finger-piece *d* of Fig. 5, that moves the tumbler-cam, and when to shift the finger-piece *h* of Fig. 4 that throws the racking attachment into or out of gear, as either or both are employed in the knitting of the courses.

The object of my invention is to control automatically the racking attachment referred to and the tumbler-cam of the cam attachment referred to.

By means of my invention, hereinafter described, a single operator may attend to a large number of knitting-machines.

My invention consists in a controlling-cam adapted by connecting parts to shift the tumbler-cam, and also to throw into and out of gear the racking attachment.

The shaft B is the cranked driving-shaft usual in machines of this class, and its crank is connected by a pitman-rod to the cam-carriage in the usual way. Each revolution of shaft B corresponds to a course of stitches, except in knitting the Derby stitch, where it corresponds to a double course—that is, a course of Derby is knitted when the carriage is moved from left to right, and another course when it is moved back; but in the Cardigan stitch a full stroke of the carriage in both directions is required to make one course. Consequently for each double course of Derby or single course of Cardigan stitches the controlling-cam A, having ratchet-teeth on its circumference, is revolved by means of eccentric a^3 on shaft B, arm a^4, and pawl a^2 a required distance, pawl a^5 preventing controlling-cam A from turning in an opposite direction when pawl a^2 is thrown back. The recesses a^6 and a^7 are formed in the face of the controlling-cam, and in turn receive the end of the rod a^8, when, by the rotation of the controlling-cam A the recesses are successively presented, the rod a^8 being then pushed forward by its spring a^9. As rod a^8 enters either recess a^6 or a^7, it draws link a^{10} toward the controlling-cam A. As the other end of link a^{10} is connected with arm d^5, rigidly fixed to the rock-shaft d^4, the movement of link a^{10} causes the rock-shaft d^4 to rock in one direction. The rock-shaft d^4 is provided with the projections or stops d^2 and d^3, which are not, however, in line with each other. When this rock-shaft is turned by rod a^8 entering a recess in the controlling-cam, one of the stops d^2 d^3 is brought into the path of the sliding plate d'. This sliding plate d' is provided with the slots *m*, through which pass the studs *n*. These studs are secured in the arms *i*, which are secured to the cam-plate D, plate d' sliding on the studs. The cam-plate D, to which the sliding plate d' is thus connected, reciprocates over the needle-bed N in a well-known way, and of course carries with it the sliding plate d'. When one end of sliding plate d' comes in contact with either of the stops d^2 or d^3 presented by the rock-shaft, the

movement of the sliding plate is arrested, though cam-plate D travels on. This continued movement of part D after part d' is brought to rest moves the tumbler-cam shifter d, one end of which is connected to the sliding plate d' by screw p. Thus the tumbler-cam k is automatically set in one of its two well-known positions—one its position for making the Derby, the other its position for making the Cardigan stitch. (See Patent No. 267,982, above referred to.) In this position it is retained until the rod a^8 is pushed out of recess by the rotation of controlling-cam A, whereby tumbler-cam k is caused to be set in its other position by a reversed motion of all the parts connecting it to the controlling-cam. The tumbler-cam remains in the position given it so long as rod a^8 remains unmoved, and this depends on the construction of controlling-cam A, as hereinafter explained. When rod a^8 is pushed out of recess a^6 or a^7, it is forced back against its spring, and so remains with one end bearing against the plane surface of cam A until one of the recesses is again presented.

When the racking attachment described in Patent No. 248,795, above referred to, is attached to a Lamb knitting-machine and thrown into gear, the stitches knitted are "racked." In Fig. 4 is seen the main gear-wheel G of this racking attachment, which has hitherto been thrown into and out of action by means of pinion F', clutch portion F, gland g, and finger-piece h, which are also seen in Fig. 4. To throw this racking attachment into and out of gear automatically, and also to properly relate its operation to the action of sliding plate d', I have recessed the face of controlling-cam A at f^4 and f^5, into which recesses in turn rod f^2 is pushed by its spring f^3 when either recess is presented. As rod f^2 is connected to one end of link f' and link f' is fast to one end of the lever f, which is adapted to move the clutch portion F both against and away from its gland g, the movement of rod f^2 toward controlling-cam A throws pinion F' on clutch portion F into gear with the gear-wheel G of the racking attachment, which is thereby brought into operation. When rod f^2 is moved against the action of the spring f^3, (by the recesses f^4 and f^5 traveling past the end of rod f^2,) its link f' causes lever f to move portion F away from its gland g, and to throw pinion F' out of gear with gear-wheel G; and when either recess f^4 or f^5 is brought again into place, the end of rod f^2 is thrown into it by the spring f^3, and thereby pinion F' thrown into gear with gear-wheel G.

In order to properly relate the operation of the racking attachment and of the cam attachment to each other, to enable the machine provided with these attachments to knit automatically at the proper moment the style of stitch produced by the use of these attachments, and to dispense with the counter-dial, I make the controlling-cam A of various sizes and with a varying number of teeth. As each tooth corresponds to a course of stitches, it is necessary to make the recesses a^6 a^7 f^4 f^5 bear a certain relation to each other and to the teeth. What this relation should be depends, of course, on the article to be knitted. For example, if ten courses of the style of stitch knitted when rod a^8 is in recess a^7 are wanted, then recess a^7 must embrace ten teeth; and if fifty courses of the style of stitch knitted when rod a^8 is out of recess a^7 are next wanted, then there must be fifty teeth between recess a^7 and recess a^6. When the tumbler-cam k is in the position indicated by the solid lines in Fig. 7, the needles are so guided as to knit a Derby stitch, and when in the position indicated by the broken lines, the needles are so guided as to knit a plain half-Cardigan stitch. When the racking attachment is in gear, a plain half-Cardigan stitch is racked. Thus it is seen that with my improved devices the tumbler-cam is automatically shifted and the racking attachment automatically thrown into or out of gear at intervals, to change the stitch after knitting any desired number of courses, the count being effected by the number of teeth embraced by the recesses on the controlling-cam and by the number of teeth between the recesses.

The description of the knitting of a mitten-blank, for example, will further discover the object and utility of my invention.

Beginning at the finger end (though it may as well be begun at the wrist end) there are usually knitted in all sizes of mittens eight (8) courses of Derby, or one and one rib stitches; then follow, say, one hundred and eighteen (118) courses of half-Cardigan or plain stitches composing the hand; sixteen (16) courses of Derby stitches, which are so highly elastic that this part of the mitten hugs the wrist closely; then twelve (12) courses of racked, next twelve (12) of plain, and in a long wrist, eight (8) racked and twelve (12) of plain additional. The wrist end of the mitten is ended off with, say, twelve (12) courses of racked stitches—that is, a half-Cardigan stitch is made—one needle-plate reciprocating so that each needle in that plate passes up first to the right and then to the left of the corresponding needle in the other plate. This racked stitch will not ravel from the upper part of the wrist toward the hand, and therefore an endless web of mitten-blanks or the like may be made, which, when cut apart, will have what is called a "selvage edge" on the upper part of the wrist. The length of wrist and hand vary with the size, but the small part of the wrist varies only a course or two, fourteen (14) courses of Derby being usual for the smaller sizes, fifteen (15) for intermediate, and sixteen (16) for large. It has already been noted that the tumbler-cam, when in one position, causes the half-Cardigan stitch and when in the other position the Derby.

The advantages arising from the use of my devices effecting automatic action of the machine will be obvious on considering the op-

eration as heretofore carried out—for example, in the knitting of a mitten.

The operator would first note on the counter-dial or keep count mentally of the number of courses knitted—say eight (8)—with the tumbler-cam in position to make the desired stitch for the small end of the mitten; then stop the machine and shift the tumbler-cam to its second position, in which, say, one hundred and eighteen courses would be knitted, count being kept as before; then stop the machine and again shift the tumbler-cam to knit a few courses; then move the clutch to throw the racking attachment into or out of gear by moving the clutch the other way, and so on, always keeping count of the stitches.

The mechanism for intermittently rotating the controlling-cam and the mechanism for connecting the controlling-cam with the tumbler-cam or with the moving member of the clutch of the racking attachment may obviously be varied to suit the taste of the constructor.

What I claim as my invention is—

1. The tumbler-cam k and the controlling-cam A, in combination with the actuating mechanism $a^3\ a^2\ a^4$ B and the connecting mechanism $a^8\ a^9\ a^{10}\ d\ d'\ d^2\ d^3\ d^4\ d^5$, substantially as described.

2. The pinion F′ and clutch portion F of the racking attachment and the controlling-cam A, in combination with the actuating mechanism $a^2\ a^3\ a^4$ B and the connecting mechanism $f\ f'\ f^2\ f^3$, substantially as described.

C. E. DREW.

Witnesses:
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