2 Sheets--Sheet 1.

D. BICKFORD.

Knitting-Machine.

No. 168,216. Patented Sept. 28, 1875.

Fig. 1.

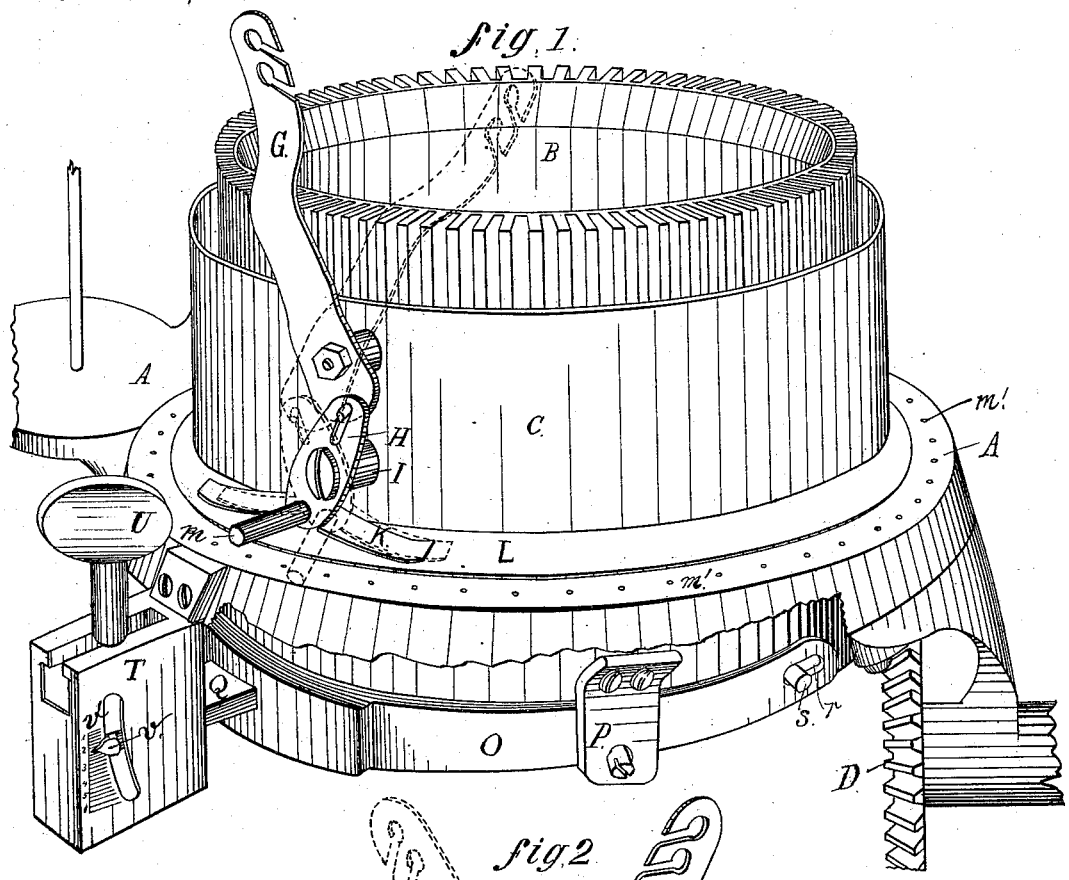
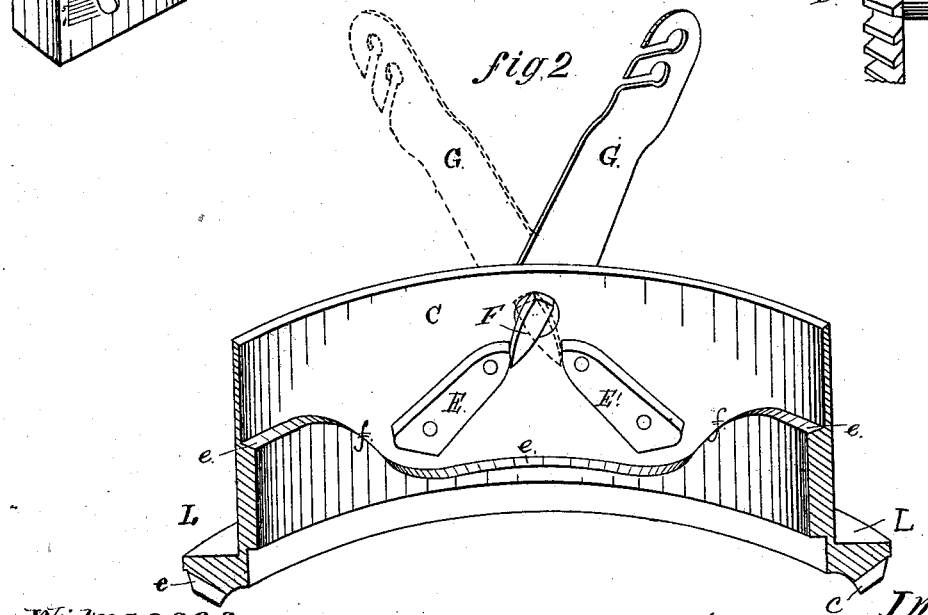


Fig. 2



Witnesses
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John Roby

Inventor.
Dana Bickford
by John J. Halsted
his Atty.

2 Sheets--Sheet 2.

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Fig. 3

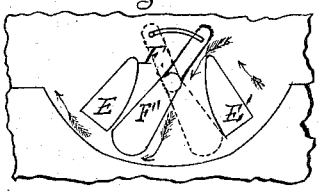


Fig. 4

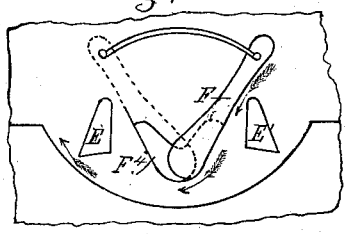
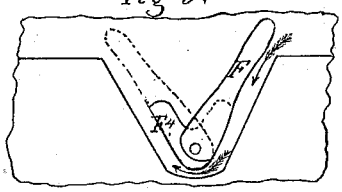


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE

DANA BICKFORD, OF NEW YORK, N. Y.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **168,216**, dated September 28, 1875; application filed December 19, 1874.

CASE A.

To all whom it may concern:

Be it known that I, DANA BICKFORD, of the city, county, and State of New York, have invented Improvements in Knitting-Machines, of which the following is a specification:

My present improvements relate to a novel construction and action of the needle-operating devices, and to a special means for lowering or raising at will the needle-cylinder, to shorten or lengthen the stitches.

Figure 1 represents the exterior of a Bickford rotary knitting-machine with my present improvements thereon; and Fig. 2 is a section of the cam-cylinder, showing the switch-pieces and the automatic swing-lever.

A is the bed of the machine; B, the needle-cylinder, and C the rotary cam-cylinder for actuating the needles, and which is provided with the usual gear-teeth *c*, whereby it is driven by means of the driving-gear D. E E′ are two stationary pieces secured to the inner side of the cam-cylinder. This cylinder is not grooved, but has a continuous ledge, *e*, which has a short downward curve or depression, *f e f*, and the pieces E E′ are located within this depressed part, as seen in Fig. 2. F is an automatic switch or swing-lever adapted to be swung so as to coact with either E or E′ according as the cylinder may be revolved either in the one or the other direction. This lever, as shown in Figs. 1 and 2, is secured rigidly to an axial pin, which passes through the cylinder, and to the outer end of which is rigidly affixed the yarn-carrier G, so that the lever and the carrier shift positively in unison upon every reversal of the machine, the axis of the carrier being equidistant from both pieces E E′. The carrier and lever can be separated and worked independently, when required, but yet automatically.

In order the better to give the lever and the carrier a sufficient steady position when shifted, I connect the lower end or arm of the carrier G, by means of a pin and slot or equivalent connection, to a lever, H, turning on a center, I, affixed to the cam-cylinder; and this lever bears upon a bow-spring, K, resting on the rim L of this cylinder, so that as the lever is moved to the right or left by the shifting of the yarn-carrier in the reverse direction the spring is slidden on the rim, and keeps the parts in place in whichever direction they may have been shifted. Other equivalent means may be used to steady the carrier, if desirable.

A pin, *m*, projecting from lever H is the direct means of shifting the carrier G and the swing-lever F, this pin, when the machine is to be reversed, coming into contact with any fixed part, or such removable pins as may be placed by the operator in any of the holes *m′*, to effect such shifting. By this means the carrier is shifted in the proper direction, which is the opposite of that which would be given it if not jointed to another piece.

It will now be seen that not only is this novel construction of changing-cam or shifting mechanism completely automatic, but that it is the perfection of simplicity; that it also of necessity moves the yarn-carrier in such manner that at every reversal of the direction of revolution of the cam-cylinder it is always brought to proper position for delivering the yarn to the needles.

By the same arrangement of the thread-carrier in connection with a switch or swing lever, F, it is manifest that many modifications may be made as to the form of the pieces E E′, and of the lever F, without departing from the spirit and essence of the invention.

The switch or swing piece or cam being, as shown and described, automatically operated, the needles, it will be seen, in some cases take care of themselves in making the changes backward and forward, and do not require to be drawn up by hand in order to be put out of action. This enables the operator to use all the needles as well as any lesser number in making a flat web, and, of course, to make a wider flat web than on machines of the same size, as heretofore constructed, with regard to their cams, and also to knit the heel or toe of a stocking or similar article without taking out or drawing up any of the needles.

In Fig. 3 the single switch-lever F is assisted by a lever, F″, both being centered at

the same point. In Fig. 4 the swing-piece F is made longer, and pivoted to a piece, F^4. In Fig. 6 the pieces E E′ are dispensed with.

It is evident that the swing-lever, by means of its pin projecting through the cylinder, may be operated by coming in contact with any stationary part of the machine, without being directly connected with the yarn-carrier.

The other part of my invention relates to the means of lowering or raising the needle-cylinder at will, to lengthen or shorten the stitches. These devices are shown in Fig. 1, a portion of the bed being shown as cut away to display the devices.

A lever or yoke, O, extending about halfway around the needle-cylinder, is fulcrumed or journaled at points upon two similar hangers depending from the bed-frame, one of which is shown at P, and has a central arm or projection, Q, and slots *r*, into which project pins *s* from the frame. The arm Q enters a stationary box, T, also depending from the frame or bed, and a thumb-screw, U, serves to raise and to lower, and to hold the needle-cylinder in place, and a pointer, *v*, and dial *v′*, serve to indicate the degree to which the arm Q and its lever has been raised or lowered; it being evident that, as the yoke is hung to act as a lever, of which the hanger P is the fulcrum, its rear end will lift the needle-cylinder, as its front end is lowered by the thumb-screw P, and vice-versa. This device shows the most simple means for operating the cylinder, but it is evident that it can be operated by other forms of levers, or by an eccentric, or many other means well known to the mechanics, and accomplish precisely what I have done by this arrangement.

I claim—

1. In combination with a knitting-machine cam-cylinder or cam-plate, provided with devices for raising and depressing the needles, a swing-lever adapted to operate as described, whereby it serves to deflect the needles downward in whichever direction the machine may be revolved.

2. In combination with the cam-cylinder of a knitting-machine, the automatic swing-lever F, swing yarn-carrier G, and connecting mechanism, as described, whereby both the lever and carrier shall be shifted in unison, substantially as and for the purpose set forth.

3. In a rotary reversible knitting-machine, the combination, with the bed and with the cam-cylinder, of a pivoted yarn-carrier, mounted on the cam-cylinder, located, with reference to the cams, or cams and switch, substantially as described, and connecting mechanism, whereby said yarn-carrier is automatically operated as the machine is reversed, substantially as set forth.

4. The combination, with the stationary needle-cylinder and with a revolving cam-cylinder, of the pivoted thread-carrier and lever H, both mounted on the cylinder and pin *m*, substantially as shown and described.

5. The combination, with the cam-cylinder, of a pivoted yarn-carrier, G, pivoted arm H, provided with projection *m*, and frictional piece or spring K, substantially as and for the purpose set forth.

6. The combination, with the needle-cylinder and with the bed of the machine, of an adjusting yoke-lever hung from and fulcrumed on the bed and pivoted to the needle-cylinder, and an adjusting device, substantially as and for the purpose described.

7. The combination, with the needle-cylinder, provided with journals and with the bed of the machine, of an adjustable lever, whereby the cylinder may be at will raised and lowered, substantially as described.

8. The combination of the yoke O, hangers P, arm Q, box T, and adjusting-screw U, substantially as and for the purpose set forth.

DANA BICKFORD.

Witnesses:
A. M. LAWSON,
F. HAWES.