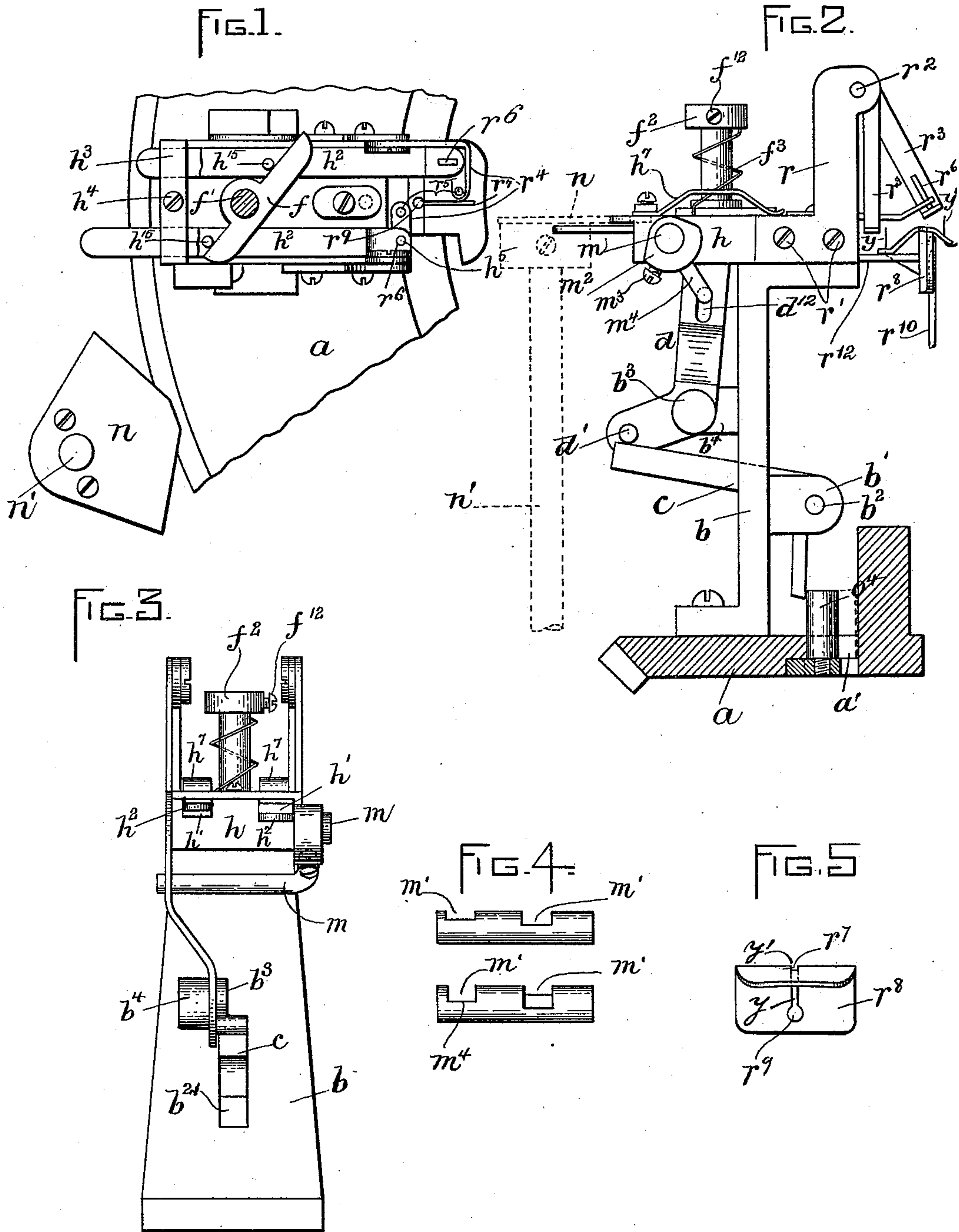


(No Model.)

W. H. STEWART.
AUTOMATIC YARN CHANGING ATTACHMENT FOR KNITTING MACHINES.
No. 557,168. Patented Mar. 31, 1896.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WALTER H. STEWART, OF FRANKLIN, NEW HAMPSHIRE.

AUTOMATIC YARN-CHANGING ATTACHMENT FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 557,168, dated March 31, 1896.

Application filed May 6, 1895. Serial No. 548,328. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. STEWART, of Franklin, in the county of Merrimac and State of New Hampshire, have invented certain new and useful Improvements in Automatic Yarn-Changing Attachments for Knitting-Machines, of which the following is a specification.

This invention relates to a new and improved automatic yarn-changing attachment for knitting-machines; and it consists in the novel features of construction and relative arrangement of parts hereinafter fully described in the specification, clearly illustrated in the drawings, and particularly pointed out in the claims.

Reference is to be had to the accompanying sheet of drawings, forming a part of this application, in which like characters indicate like parts wherever they occur.

Figure 1 represents a top plan view of my invention in place upon the cam-ring, only so much of the latter being shown as is necessary to illustrate the connection of my invention therewith. Fig. 2 represents a side elevation of my invention. Fig. 3 represents a front elevation of my invention. Fig. 4 represents a detail view of the rock-shaft. Fig. 5 represents a detailed view of the yarn-guide, taken at right angles to this part, as shown in Fig. 2, and looking toward the left of the said figure.

My improved yarn-changer is designed for use in connection with automatic knitting-machines organized to knit stockings, and particularly to a machine of this class shown in Patent No. 529,509, granted to me November 20, 1894, although it may be used in connection with other machines.

In the knitting of stockings it is very desirable to change the yarn at the heel and toe portions, so that said parts will be knit with a differently-colored yarn from the yarn employed to knit the main part of the stocking. To be commercially successful this changing of yarns should be done automatically. The second yarn should be introduced to the needles before the first yarn is removed, and vice versa. These ends are all accomplished by my invention, which, as stated above, I prefer to use in connection with machines constructed as shown in my former patent, where-in there is a pin protruding through the cam-

ring that is automatically shifted at the beginning and end of the heel and toe portion to operate a yarn-thickening attachment that is mounted upon the cam-ring adjacent to said pin.

In carrying out my present invention I substitute my yarn-changer for the yarn-thickener shown in the said patent and utilize the pin lettered o^4 in the patent as the means for operating the same.

a represents the portion of the cam-ring to which my invention is applied, the rest of the cam-ring and the machine not being shown, as they form no part of this invention. o^4 represents the pin protruding from said cam-ring through a slot a' in the latter. This pin is connected to and operated by parts that are clearly shown in my former patent, and need not be here described or shown.

b represents a bracket secured to the cam-ring a just outside of, and in the same radial line as, the pin o^4 . This bracket is provided with ears b' , between which, by a pin b^2 , is pivoted a bell-crank lever c , the short arm of which is arranged to be kept in engagement with the pin o^4 . The long arm of this bell-crank lever extends through a slot b^{21} in the bracket and engages a pin d' in the short arm of a bell-crank lever d , that is pivoted by a pin or bolt b^3 to an ear b^4 on the bracket, as shown in Fig. 2. The long arm of the bell-crank lever d is arranged to engage the long arm of a lever f , pivotally mounted upon a stud f' integral with or secured to a block h , that in turn is secured to or formed integral with the top of the bracket b . A collar f^2 is secured to the stud f' by a set-screw f^{12} . A spring f^3 arranged about the stud f' in helical form has one of its ends secured to the collar f^2 and its other end secured to the lever f in such manner as to force the long arms of levers f and d outward. In other words, the levers f and d are operated in one direction—that is, inward or toward the center of the needle-cylinder—by the pin o^4 and in the opposite direction—that is, outward or away from the center of the needle-cylinder—by the spring f^3 . The block h is provided with a slot h' on each side of the stud f' , and in these slots are mounted slides h^2 , the outer ends of which are rounded, while their inner ends are bent upward and provided with holes h^5 . These slides are retained in the slots h' by

means of the arms of the lever f and by means of a bar h^3 that extends across said slots and is secured to the block h by a screw h^4 . The slots are formed deep enough to permit a vertical movement of the slides hereinafter described. Pins h^{15} , projecting upward from their slides, are engaged by the arms of lever f and serve as means for communicating motion from said lever to said slides, whereby the latter may be alternately drawn outward by said lever, the inward movement of the slides being controlled by means hereinafter described.

m represents a rock-shaft mounted in the block h immediately below the slots h' and provided with slots m' , which, when the shaft is in position in the block, register with the slots h' in the block. These slots are formed at different angles, so that when the bottom of one slot is horizontal the bottom of the other slot will be in an inclined position. A collar m^2 , secured to the end of this shaft by a set-screw m^3 , has an arm m^4 arranged to extend through a slot b^{12} in the long arm of the lever d .

The construction and arrangement of the parts just described are such that as the long arm of the lever d is moved inward to the position shown to operate the lever f and force outward the slide beneath the short arm of lever f the rock-shaft m will be turned so as to cause the part m^4 of said shaft to engage the other slide and raise its outer end, as shown in Figs. 2 and 3. When in their raised positions, the outer ends of these slides are arranged to be engaged by a cam n secured by a standard n' to some stationary part of the machine and forced inward. The cam n is so located that it just clears the path of the rotary movement of the slides, except when the latter are raised. Each time the lever d is operated one slide is drawn outward and the outer end of the other slide raised to be immediately engaged by the cam n to force said slide inward. The lever f moves the slides alternately outward, while the cam n moves them alternately inward. The slides are held down by the free ends of springs h^7 , that are secured at their other ends to the bar h^3 . r represents supports extending upward from the bracket b . These supports may be secured to the bracket by means of screws r' , or may be formed integral therewith. These supports are located at the opposite end of the slots from the rock-shaft. Secured to the top of each one of these supports, by means of screws or rivets r^2 , are pivoted yarn-guides r^3 . These yarn-guides are formed at their free ends with inwardly-projecting arms r^4 provided with holes r^5 to be used as yarn-guides. Arms r^4 project toward each other and are made of such a length that they will pass each other, as shown. Pins r^6 extend upward from the arms r^4 and engage the holes in the inner ends of the slides, so that as either slide is moved inward or outward a corresponding motion is com-

municated to the yarn-guide to which said slide is connected. The yarn is passed through the hole r^5 in the outer end of the arm r^4 of each yarn-guide and extends down through the slot r^7 in the yarn-guide r^8 to the needles. This yarn-guide r^8 is secured by an arm r^{12} to the bracket in proper position over the needles. The slot r^7 is elongated and provided at a point over the needles with a circular enlargement r^9 . When the yarn or yarns are in the circular enlargement, they are in position to be knit; but when they are thrown or carried through to the opposite end of the slot by means of the yarn-guide they are then thrown out of action.

In Fig. 2 the yarn-guide, which is shown in a vertical position, has its hole r^5 in the vicinity of the circular enlargement r^9 , while the yarn-guide shown at an inclined position has carried its yarn to the opposite end of the slot r^7 , and hence away from the needles.

I will now describe the operation of my yarn-changer. The parts are represented in the position that they will occupy when knitting the heel or toe portion of the stocking—that is, doing back-and-forth knitting. During round-and-round knitting the pin o^4 would be in its dotted-line position, and the relative positions of the slides and their connected yarn-guides would be reversed. Supposing now that the heel or toe portion is completed and the machine is to be started automatically to knit the round-and-round work, the pin o^4 will be automatically thrown inward to its dotted-line position, and the contiguous ends of the levers d and f thrown outward by the spring f^3 , thus drawing outward the slide that is under the long arm of the lever f , and drawing the end of the yarn-changer that is shown in full lines in an inclined position outward with its yarn, and drawing its yarn into the enlargement r^9 in position to be knitted. The outward movement of the long arm of the lever d by means of the rock-shaft has raised the outer end of the slide that is under the short arm of the lever f , when it is immediately, by means of the rotation of the cam-ring, made to engage the cam n and be forced inward, carrying its yarn-guide inward, and the yarn that had been used for the heel out of engagement with the needles. When the heel or toe portion is to be knit, these operations will be reversed, and the parts thrown into position, as shown in the drawings, by means of the outward movement of the pin o^4 . It will be observed that both yarns are not withdrawn from the needle at the same time, but that before one yarn is removed the other yarn has been brought in position to be knit by the needles. This is an important point. It will, of course, be borne in mind that while one slide is in its outward position the other slide will be in its inward position, and their connected yarn-guides correspondingly situated. The yarn-guide shown in the drawings in an inclined position is the yarn-guide which carries the

yarn for the leg portion, while the yarn-guide that is shown in a vertical position is the one that carries the yarn for the heel and toe portion, or, in other words, the yarn that is used in back-and-forth knitting.

The cam can be made of any desired material, preferably of thin metal, and is arranged, as hereinbefore stated, to just clear the ends of the slides, except when the latter are raised, and also to just clear the ends of the slides when they have been pushed inward by said cam, so that as the cam-ring is reciprocated or rotated the outer end of one slide will pass under the cam, while the end of the slide that has been pushed in will just clear said cam. The cam is so positioned that it will engage the slide just in advance of the beginning of the back-and-forth and round-and-round knitting.

Particular attention is called to the yarn-guide r^3 and the location of the needle r^{10} in respect to the slot r^7 and to the shape and arrangement of the several parts of the said guide.

Referring to Figs. 2 and 5, it will be noted that the needle r^{10} is situated beneath the said slot and between its ends. The extremity y of the slot occupied by the enlargement r^9 is in a lower plane than that occupied by the opposite extremity y' of the slot. Thus when the yarn-guide r^3 is carried inward to remove the yarn from the action of the needle the yarn is also raised. When, however, the yarn-guide r^3 is drawn outward into the vertical position shown in Fig. 2, the yarn is brought from the plane occupied by the right-hand end of the slot in Fig. 2 to the plane occupied by the enlargement r^9 , which is sufficiently below the plane of the right-hand or inward end of the slot to insure the yarn being brought into the path of the hooks of the needles r^{10} . This is an important feature, since otherwise the yarn is apt to miss the hooks of the needles, but with the construction and arrangement shown, as above described, the yarn is removed beyond and above the action of the hooks of the needles when it is carried inward, and it is brought below and into line with the path of movement of the needles when it is carried outward by the guides r^3 .

While but two slides and their associated parts are shown, there might be any desired number, the lever f throwing into action a predetermined yarn or yarns and the cam n throwing out of action a predetermined yarn or yarns. In place of the pivot-guides r^3 the yarns may be passed through the apertures of the ends of the slots; but I prefer the construction shown.

Having thus explained the nature of my invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim, and desire to secure by Letters Patent, is—

1. In a yarn-changer in combination, a slide, a lever mechanism, connections between said slide and mechanism, a movable part adapted to operate the said mechanism to move said slide in one direction, a stationary part n arranged to be engaged by said slide to move the latter in the opposite direction and means for moving said slide into and out of the plane of said part n , substantially as and for the purpose set forth.

2. In a yarn-changer in combination a plurality of slides, a lever mechanism, connections between said slides and mechanism, a movable part arranged to operate said mechanism to move a predetermined slide outward, a stationary part n normally out of the path of movement of said slides, and means connected with said mechanism for throwing a predetermined slide into position to engage the said part n whereby said slide may be moved inwardly, substantially as and for the purpose set forth.

3. In a yarn-changer in combination a slide carried by a movable member, a lever mechanism connected to said slide, a movable part arranged to operate said mechanism to move said slide in one direction, a fixed part n normally out of engagement with one end of said slide and means to operate the said mechanism for moving said end into the plane of said part n whereby said slide may be moved in the opposite direction, substantially as and for the purpose set forth.

4. In a yarn-changer in combination a plurality of slides carried by a movable member, a mechanism for alternately moving a predetermined slide in one direction, means operated by said mechanism for alternately raising a slide not so moved, a stationary part n arranged to be engaged by the raised slide to operate the latter, substantially as and for the purpose set forth.

5. In combination a cam-ring carrying a movable part o^4 , a yarn-changer carried by said ring comprising a plurality of pivoted yarn-guides, a lever mechanism arranged to be operated by said part o^4 , slides connecting said yarn-guides with said mechanism, a rock-shaft provided with slots in which said slides rest, means for operating said shaft to raise a predetermined slide, and a fixed part n arranged to be engaged by the end of said raised slide, substantially as and for the purpose set forth.

6. In combination a yarn-changer and a movable part o^4 , carried by a cam-ring, a plurality of slides carried by said changer, lever mechanism operated by said part o^4 , for alternately moving a predetermined slide in one direction, a cam for moving a predetermined slide in the opposite direction, and a rock-shaft for moving said slides into the path of said cam, substantially as and for the purpose set forth.

7. In a yarn-changer in combination a plurality of slides carried by a movable member, a pivoted yarn-guide connected at one end to

each of said slides, mechanism for moving a
predetermined slide in one direction, means
for operating said mechanism for moving said
predetermined slide, a stationary part *n* ar-
5 ranged to be engaged by the free end of the
raised slide to operate the latter, a stationary
yarn-guide provided with a slot arranged
across the path of the needles, the extremi-
ties of said slot being in different planes
10 whereby a predetermined yarn may be low-
ered into position to be knit, and a predeter-
mined yarn may be raised out of reach of the
needles, substantially as and for the purpose
set forth.

8. A yarn-guide comprising in its construc- 15
tion a plate having a slot, said plate being
bent so that the ends of said slot will be in
different planes, substantially as and for the
purpose set forth.

In testimony whereof I have signed my 20
name to this specification, in the presence of
two subscribing witnesses, this 22d day of
April, A. D. 1895.

WALTER H. STEWART.

Witnesses:

ROBT. W. BENNETT,
SALLY H. PROCTOR.