

(No Model.)

7 Sheets—Sheet 1.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.

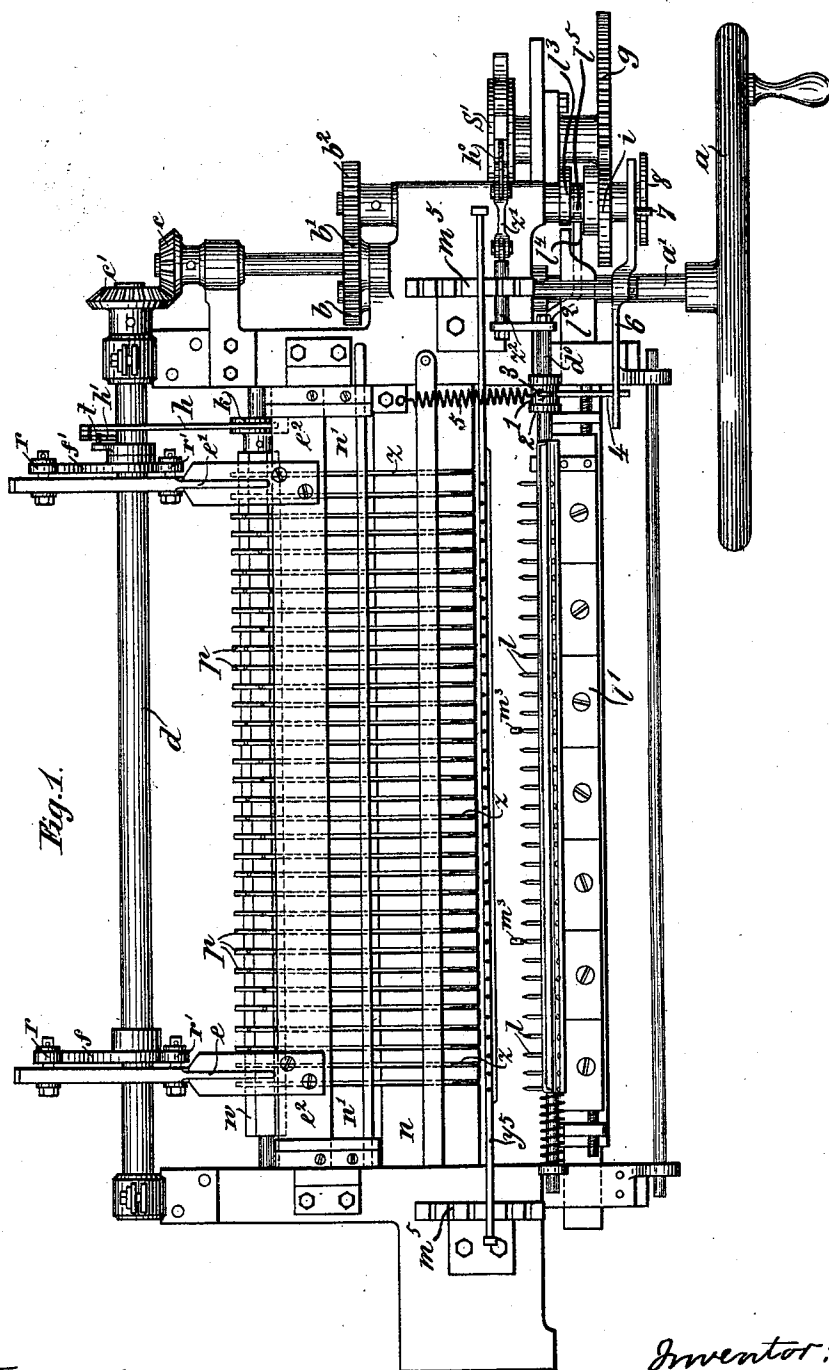


Fig. 1.

Witnesses:
G. W. Rea
Jno. B. Hopper

Inventor:
Carl B. Sander
By James L. Norris
Atty

(No Model.)

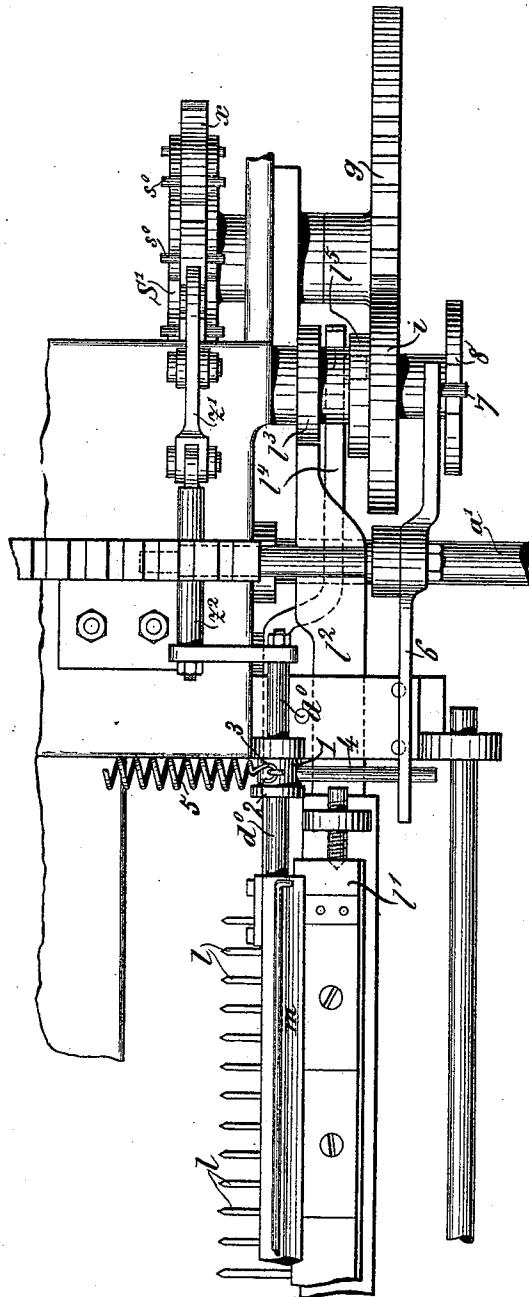
7 Sheets—Sheet 2.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.

Fig. 1a.



Witnesses:
G. H. Rea.
Jno. B. Kopper.

Inventor:
Carl B. Sander
By James L. Norris.
Atty.

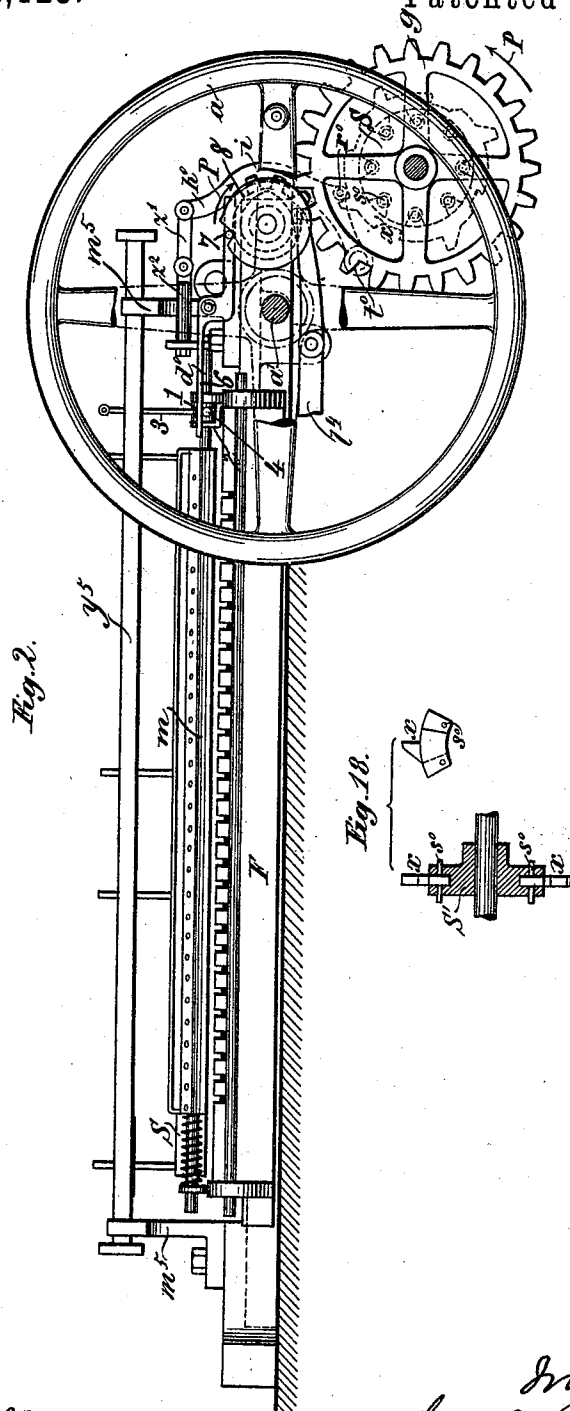
(No Model.)

7 Sheets—Sheet 3.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.



Witnesses;
G. W. Rea.
Jno. B. Hopper.

Inventor;
Carl B. Sander
By James L. Norris,
Atty.

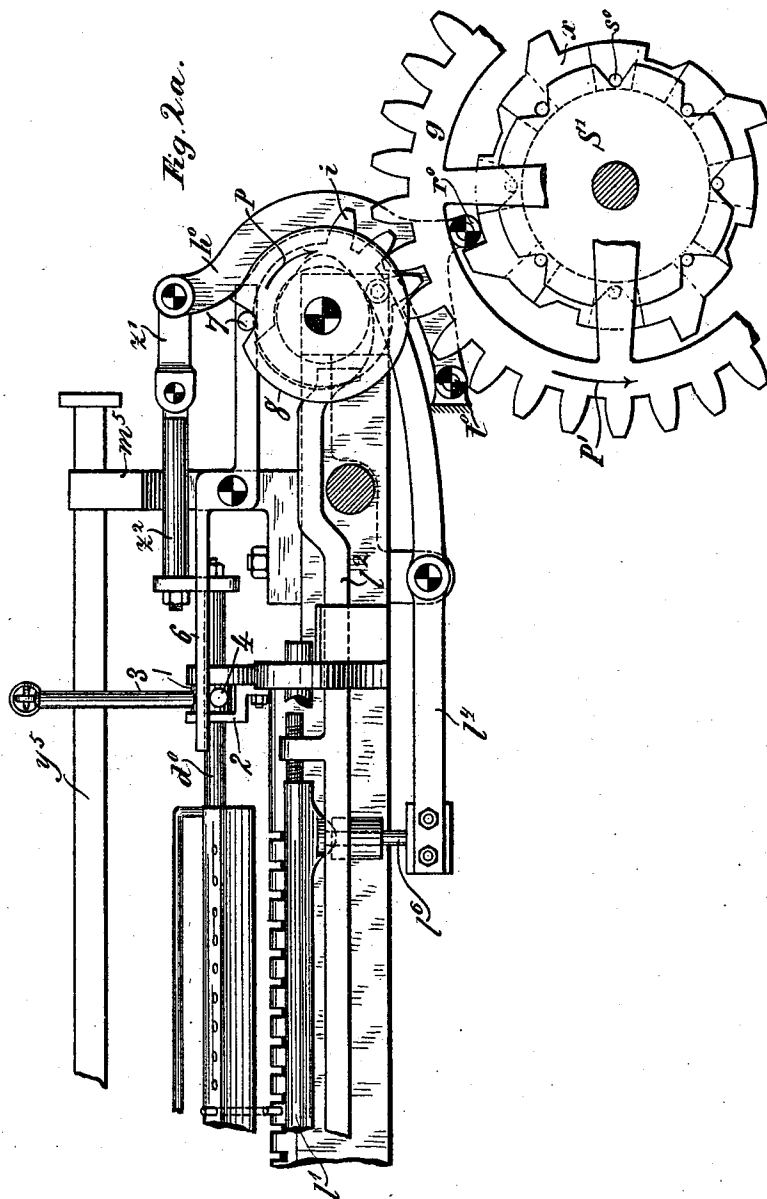
(No Model.)

7 Sheets—Sheet 4.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.



Witnesses:

G. W. Kea.

Ino. B. Kappur.

Inventor;
Carl B. Sauder,
By James L. Norris.

Atty.

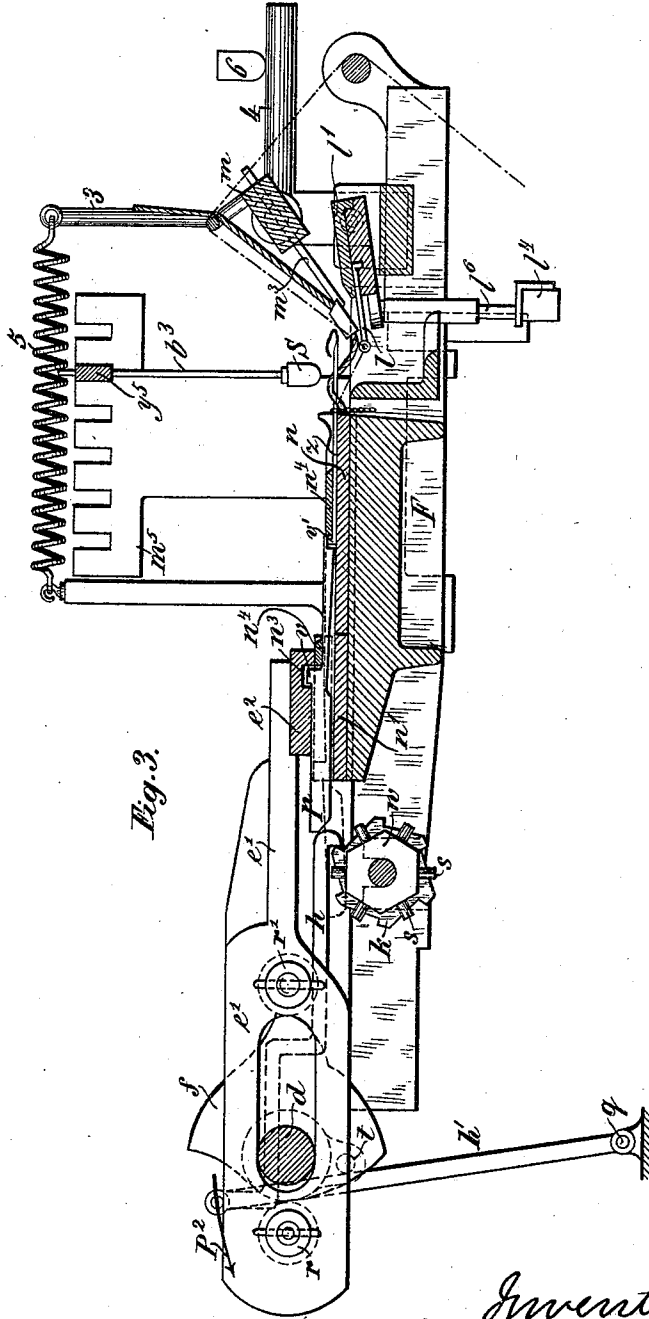
(No Model.)

7 Sheets—Sheet 5.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.



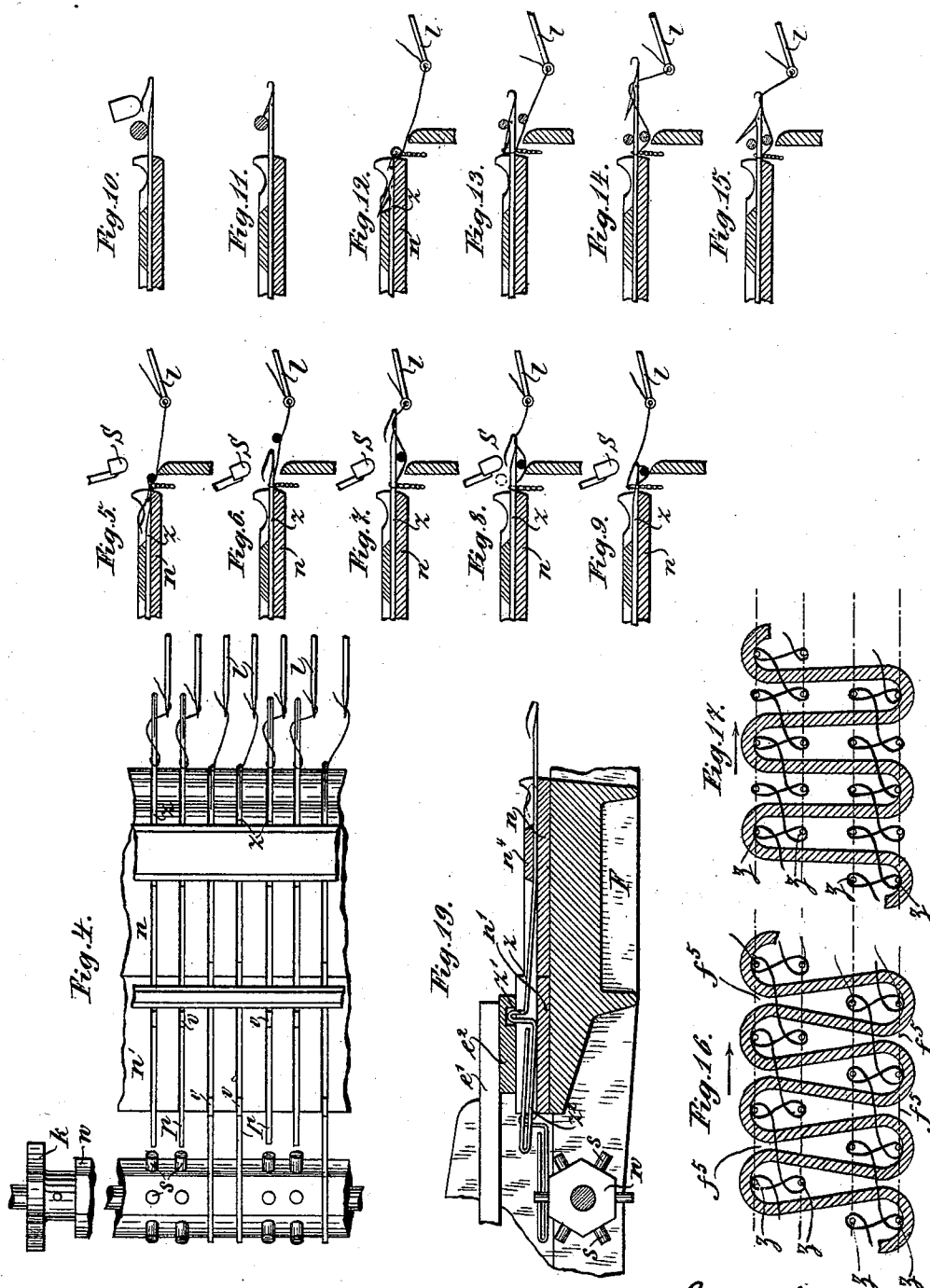
Witnesses:
G. W. Rea.
Jno. B. Kopper.

Inventor:
Carl B. Sander
By James L. Norris
Atty.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.



Witness:
G. H. Rea.
Jno. B. Hopper.

Inventor:
Carl B. Sander
By James L. Norris
Attor.

C. B. SANDER.
WARP KNITTING MACHINE.

No. 522,123.

Patented June 26, 1894.

Fig. 20.

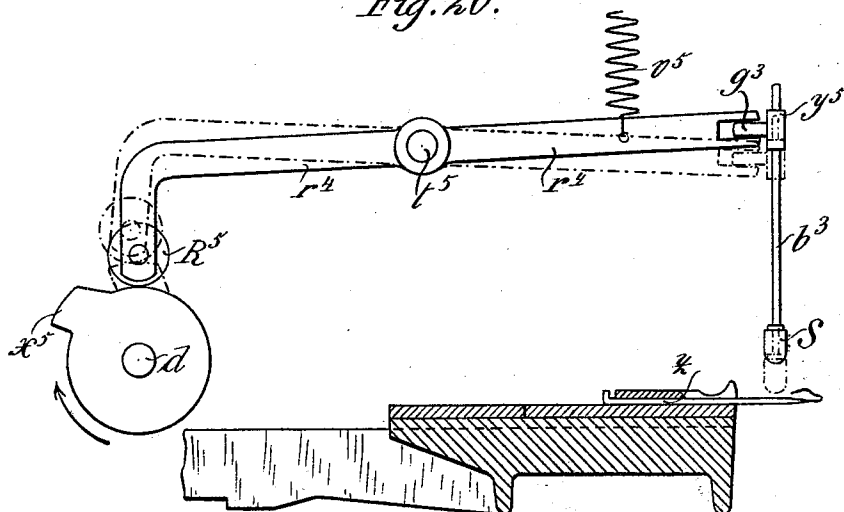
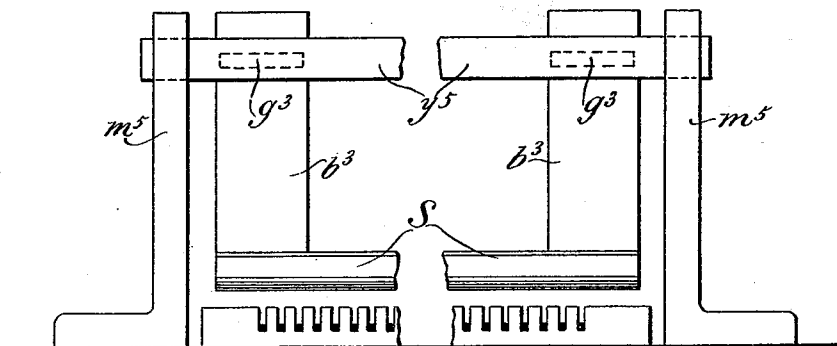


Fig. 21.



Witnesses;
G. W. Rea.
Jno. B. Hopper.

Inventor;
Carl B. Sander
By James L. Norris
Atty.

UNITED STATES PATENT OFFICE.

CARL BRUNO SANDER, OF CHEMNITZ, GERMANY.

WARP-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 522,123, dated June 26, 1894.

Application filed November 11, 1891. Serial No. 411,563. (No model.)

To all whom it may concern:

Be it known that I, CARL BRUNO SANDER, a subject of the King of Saxony, and a resident of Chemnitz, Germany, have invented certain new and useful Improvements in Warp-Knitting Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to a knitting machine by which ornamental threads are entwined in the knitted fabric.

The improvements consist in the first place of devices for operating the needles consisting of a peculiar pattern apparatus acting similarly to a Jacquard apparatus, and which is distinguished by the sure manner in which it works. This pattern apparatus causes the knitting thread to take in the ornamental thread in a definite manner, inasmuch as the needles not actuated by the pattern apparatus remain at rest and are not surrounded either with cord or with knitting threads. By modifying the pattern apparatus the ornamental thread is also introduced in a different manner.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 shows a plan of a knitting machine constructed according to the present invention. Fig. 2 is a front elevation of the same; and Fig. 3 shows a section of the knitting machine. Figs. 1^a and 2^a represent parts of Figs. 1 and 2 to a larger scale. Fig. 4 shows the arrangement of the needles and of the pattern apparatus, which leaves the needles alternatively in the position of rest and places them in the operative position. Figs. 5 to 9 show the several positions of the hooked needles during the production of a loop. Figs. 10 to 11 show the difference between the employment of hooked needles and tumbler needles, the former enabling the use of thicker ornamental cords. Fig. 12 to 15 show the several positions of the ordinary tumbler needles during the production of a loop which binds the cord placed over and under the needle. Fig. 16 shows part of an ornamental fabric which is produced by the machine constructed according to the present invention. Fig. 17 shows part of an ornamental fabric such as it is possible to produce by the knitting machines heretofore used. Fig. 18

shows the pattern roller *S'* for the entwining apparatus in transverse section, and a link of the pattern ring provided with elevations and depressions. Fig. 19 shows a needle made of one piece with the jack belonging thereto. Figs. 20 and 21 show the device for actuating the bar pressing down the points of the needles.

This knitting machine is actuated by means of the hand wheel *a* or by means of a driving pulley when use is made of mechanical power. The shaft *a'* which is thereby caused to rotate carries the toothed wheel *b* which engages with the toothed wheel *b'*. By the bevel wheels *c, c'*, the movement of the shaft of the toothed wheel *b'* is further transmitted to the shaft *d* which is supported in the two side frames of the machine. Upon the shaft *d* are arranged two cams *f* and *f'*, Figs. 1 and 3. Each cam presses in its rotation against two rollers *r* and *r'*, one of which is arranged in front and the other at the rear of the cam in the jack slides *e e'*. In this manner the jack slides *e e'* receive a reciprocating movement the extent and mode of which depend upon the shape of the aforesaid cams. At their front ends the slides *e, e'* are connected to a cross-bar or slide *e²* which is parallel with the shaft *d* and is displaced by the slides *e, e'* parallel with this shaft *d*.

Upon the base plate designated by *F* rests the needle bar which consists of two plates *n* and *n'*, as shown in Figs. 1, 3 and 4. In the grooves of the front plate *n* are the needles 3, and in the grooves of the rear plate *n'* are the jacks *p*. Transverse bars *n⁴* which are fixed over the said plates prevent the needles and jacks from rising from the grooves. At *v'* the needles 3 and the jacks *p* are hooked together, so that the needles are actuated by the jacks *p* when these move to and fro. This is effected by the slide or cross bar *e²* which moves to and fro in the above described manner in the longitudinal direction of the jacks. In the cross-bar *e²* is provided a groove *n³* with which the noses *v* on the jacks engage to enable the latter to be reciprocated. The jacks *p* are so arranged that after every backward movement their rear ends fall down from the plate *n'* to such an extent that the noses *v* will leave the groove *n³* in the cross bar *e²*. In order that the lat-

ter shall then be able to push to the front the jacks and therefore also the needles the several jacks must be raised so that their noses v enter the groove n^3 . This is effected by a roller w provided with pins and supported in the sides of the machine frame parallel with the shaft d , Figs. 1, 3 and 4. The pins s are so arranged that they will raise intermittently a definite number of the jacks and thereby establish the connection of the same with the cross bar e^2 to actuate the corresponding needles.

The roller w , Figs. 3 and 4, is hexagonal in the present case. Upon each surface are provided the number of pins s corresponding to the pattern to be produced. On the shaft of the pattern roller w is moreover provided a ratchet wheel k having six teeth, Figs. 1 and 3, with which engages the ratchet hook h ; the latter is in connection with the lever h' , which has its fulcrum at q . In every rotation of the shaft d the eccentric pin t causes a movement of the lever h' , whereby the ratchet hook causes the ratchet wheel and therefore the roller w to perform one-sixth of a revolution.

The mode of operation of the pattern apparatus is as follows:—When all the jacks are drawn back the pattern roller w makes one-sixth of a revolution, and the pins s thereby brought into action raise a number of the jacks p which are above the pins s and in the grooves of the plate n' . Then the noses v of the jacks pass into the groove n^3 of the cross bar e^2 which at this moment is in the rear position. The raised jacks are then pushed forward by the cross bar e^2 , the latter being moved by the cams f, f' . As soon as the needles are in the front position the formation of the loops and the laying over of the ornamental thread are effected. The jacks which are not raised by the pattern roller in each operation remain in their depressed position so that these jacks are not moved forward and the corresponding needles cannot operate.

The mode in which the guides l lay the binding thread over and round the needles is represented in Figs. 5 to 9 and Figs. 12 to 15, and also in Fig. 3. In Fig. 3 the cord guide is also shown which lays the ornamental cord over and under the needle. The formation of the loops does not present any new feature. At the end of the forward movement the cams f, f' force the jack slides e, e' together with the cross bar e^2 back again. When tumbler needles are used, as in Figs. 12 to 15, the cord and binding loop cause the closing of the tumbler during the backward movement by slipping over the same. With tumbler needles it is however not possible to introduce thick cords into the fabric, because then, as clearly shown in Fig. 11, the tumbler would pierce into the cord as the needles move backward and thereby cause derangements. For enabling thicker cords to be entwined I employ hooked needles of the kind

shown in Fig. 10 in combination with the pressing bar S . Adapting these needles for the present purpose by arranging above the hooked part of the needles in front of the knocking over comb of the plate n along the entire width of the machine said bar S which is adjusted by suitable devices. This bar has for its object to force down the hooks of the needles in their backward movement and to prevent the point of the needle penetrating into the cord thereby enabling the binding loop and the cord to be knocked over, as shown in Figs. 5 to 9.

The device for actuating the pressing bar is represented separately in Figs. 20 and 21. The pressing bar S is connected by plates b^3 with the flat bar y^5 which extends over the entire length of the machine. This bar y^5 is suspended in vertical slots of the blocks m^5 fixed on the two sides of the machine frame (see also Figs. 1 to 3), and can be displaced therein vertically. At its rear side the bar y^5 has projections g^3 which engage with the forked ends of the levers r^4 . These levers are adapted to turn upon the axis t^5 and carry the rollers R^5 at their other ends which are bent downward; these rollers are forced against the periphery of a cam x^5 by the spring v^5 pulling the front arm of the lever r^4 upward. The cam x^5 is arranged upon the shaft d . In each revolution of the shaft d the roller R^5 is raised once, in consequence of which the front arm of the lever r^4 is lowered and together with it, through the medium of the projections g^3 , the bar y^5 and the pressing bar S . This takes place at the moment when the needle z in its return movement occupies the position shown in Fig. 20. The bar then presses the downwardly bent needle point upon the needle so that the loop previously formed can be pushed over the point of the needle.

Figs. 16 and 17 show how an ornamental cord is bound or entwined between the meshes into the knitted fabric produced by the machine. The entwining of the ornamental cord in the case of the older machines of this kind could be effected without a pattern apparatus only in the manner indicated in Fig. 17. Fig. 16 is an example of the binding in of the ornamental cord by means of the pattern apparatus, in which of four juxtaposed needles z the two on the left and right hand side remain alternately at rest at the points marked f^5 . The direction in which the fabric is produced and passes downward from the machine is shown by arrows. The working path of the needles z is indicated by the lines — — —. The working path is of course perpendicular to the working plane of the needles.

The arrangement of the pattern roller w may be modified at will, and may have other than a hexagonal shape.

Of the mechanism for operating the cord guide m^3 of the entwining apparatus, which is secured to the bar m it is necessary to con-

sider in the present case only the device which displaces the entwining apparatus in the transverse direction during the operation of the machine. This is effected by a chain composed of several links. The links x are provided with elevations and depressions and may be exchanged at will according to the kind of the ornamental looping to be produced.

In the arrangement represented the links x are fixed to the periphery of a disk S' Fig. 18. The periphery of the disk S' is provided with a series of transversely arranged V-shaped notches, Fig. 2^a, that intersect a central circumferential groove, Fig. 18, in which the links x are placed. These links x are hinged or jointed at their ends where they are connected by hinge pins s^0 , the ends of which project beyond the opposite sides of the links and lie closely in the notches of the disk, thereby holding the links onto the disk and yet permitting them to be removed and exchanged for others whenever required. The disk S' is turned step by step. With this object it is arranged upon the same shaft as the toothed wheel g which engages with a disk i provided at its circumference with only a few teeth and adapted to receive by means of toothed wheels b , b' and b^2 , (the latter being on the shaft of the disk i) continuous motion from the driving shaft a' as shown in Fig. 1. The disk i imparts to the wheel g and therefore also to the disk S' a jerky or step by step movement.

The arrows P and P' indicate the direction of the rotary movement of the disks i and j . By the step by step motion of the disk S' a lever h^0 , Figs. 2 and 2^a, is actuated which has at t^0 its fulcrum and bears by means of the roller r^0 continually upon the elevations and depressions of the links x . The oscillations of the lever, which owing to the step by step movement of the disk S' , also take place by steps, are communicated to the draw rod z' which consequently moves to and fro. By the link z^2 the draw rod z' is connected with the rod d^0 of the entering apparatus, which therefore likewise receives a step by step reciprocating movement, such as is needed for shifting the ornamental cord.

The mechanism for moving the thread guides is clearly shown in Figs. 1^a and 2^a. The thread guides 1 are secured in the bar 1' and are displaced with the latter laterally and also raised and lowered. The bar 1' adapted to turn and to be displaced on the frame of the machine is connected with the rod 1² forced by a spring against the periphery of the cam 1³. In the turning movement of the cam the bar 1' is therefore moved to and fro together with the thread guides 1. The upward and downward movement of the thread guides is effected by the lever 1⁴, one end of which is connected with the bar 1' by a rod 1⁶ guided in the frame. The other end of the lever, which is provided with a roller, is pressed by the weight of the bar 1' against the

periphery of a cam 1⁵. The complete formation of the loop around the needles therefore takes place by the combined lateral displacement and the upward and downward movement of the guides. The cord guides swing upon the journals of the bar m which is supported and journaled at both sides of the machine by means of a rod d^0 that is bolted or riveted to the bar m as shown in Fig. 2^a. On the rod or journal d^0 of the bar m , is splined a collar 1 that is held from endwise movement by a clip or bracket 2 on the bearing. This collar is provided with arms 3 and 4. To the upper end of the vertical arm 3 is attached one end of a spiral spring 5, the other end of which is secured to a fixed part of the machine frame. A centrally fulcrumed two-armed lever 6 has one of its ends bearing on the horizontal arm 4, of the collar 1, while its other end is provided with a laterally projecting pin 7 adapted to be engaged by a notched disk 8 on the shaft of the disk i , which is actuated from the main driving shaft a' through the toothed wheels b , b' , b^2 , hereinbefore described. Through the spring 5 and lever 6 the cord guides m^3 are thus given the required swinging movements.

As any desired needle may be set in operation or allowed to rest by means of the above described pattern apparatus, great variety is obtained in the production of patterns, and in connection with the simple displacement of the entwining apparatus which may also take place in various manners the possible number of the patterns is considerably increased.

In lieu of the separable connection of the jacks with the needles in the described manner, use may be made of needles Z made in one piece, as shown in Fig. 19. The rear end of these needles is raised from the pattern roller in the same manner as the jacks, there being however the advantage that the needles are somewhat elastic. The needle is provided with a bend Z' which replaces the carrier nose v (Fig. 3) and the rear part Z^2 of the needle is placed somewhat lower. In this manner the bend Z' formed in the needle and extending into the groove of the cross bar e^2 is moved more easily and rapidly downward on leaving the plate, so as to become disengaged from the cross bar e^2 . As shown in Fig. 19 the needle during the forward movement in the raised position receives a certain friction by the cross bar n^4 , thereby rendering the operation safer and more reliable.

What I claim is—

1. The combination of the needles, the slide, its actuating means, the needle bed, the pattern roller and means to actuate it, the needles and slide having provisions in virtue of which the former are disengaged from the latter after each backward movement of the same.

2. In combination, the needles, the slide which actuates the same, devices for reciprocating the slide, the pattern roller, and de-

vices for turning the same at each operation through a defined distance, the pattern roller being provided with elevations for raising the needles into engagement with the slide.

5 3. The combination of the hooked needles, the slide for actuating the needles, a pressing-bar adapted to force the hook of a needle downward during the backward movement of the needle, a pattern roller provided with
10 elevations for raising the needles into en-

gagement with the slide, the cord-guides, and mechanism for actuating said cord guides, substantially as shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing
15 witnesses.

CARL BRUNO SANDER.

Witnesses:

PAUL E. LOOP,

EUGEN FRAISSINET.