(No Model.) 4 Sheets—Sheet 1.

J. FRELLOEHR & L. TISCH.

KNITTING MACHINE.

No. 457,265. Patented Aug. 4, 1891.

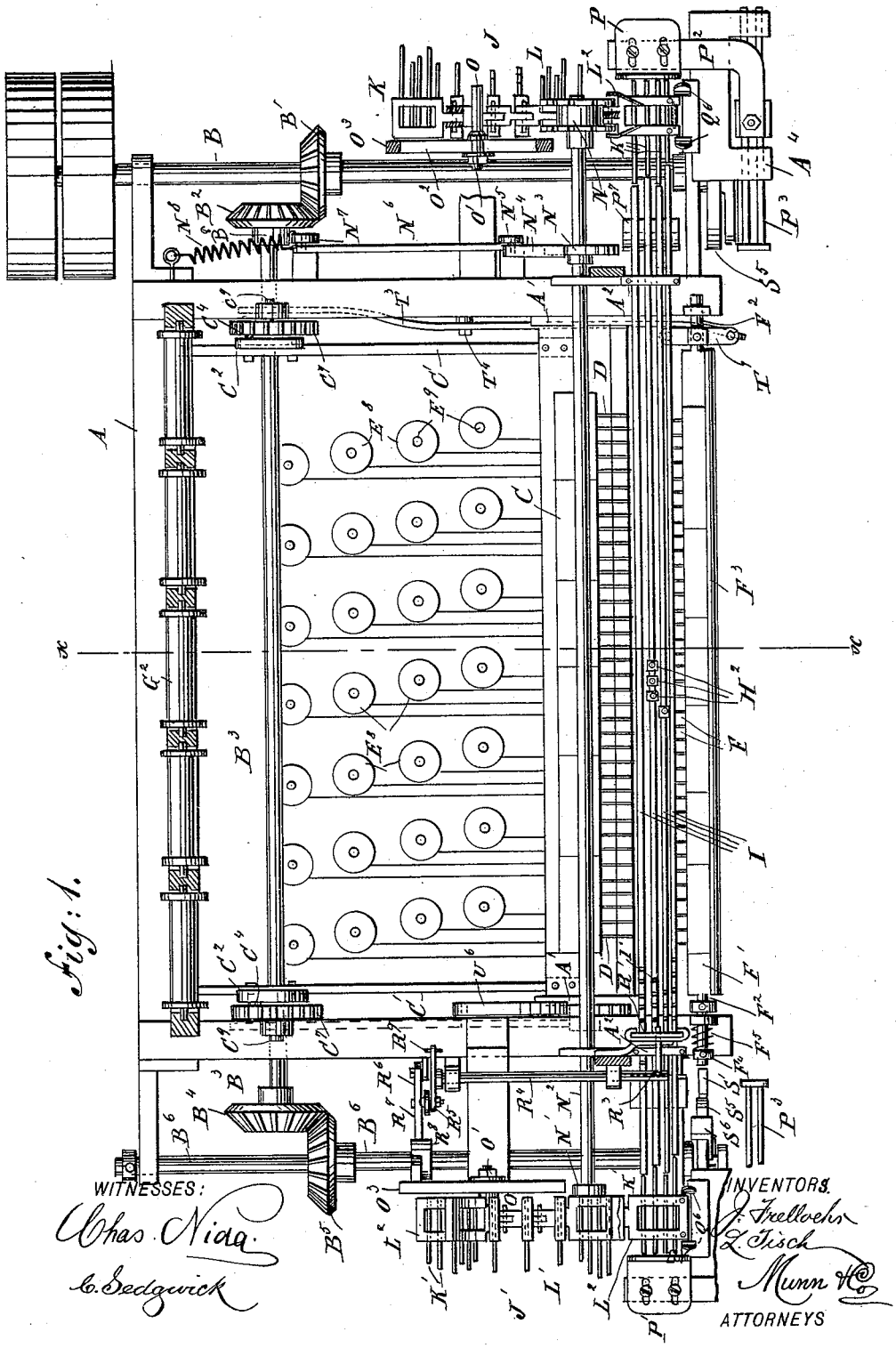


Fig: 1.

WITNESSES:
Chas. Nida.
C. Sedgwick

INVENTORS.
J. Frelloehr.
L. Tisch
Munn & Co
ATTORNEYS

(No Model.) 4 Sheets—Sheet 2.

J. FRELLOEHR & L. TISCH.

KNITTING MACHINE.

No. 457,265. Patented Aug. 4, 1891.

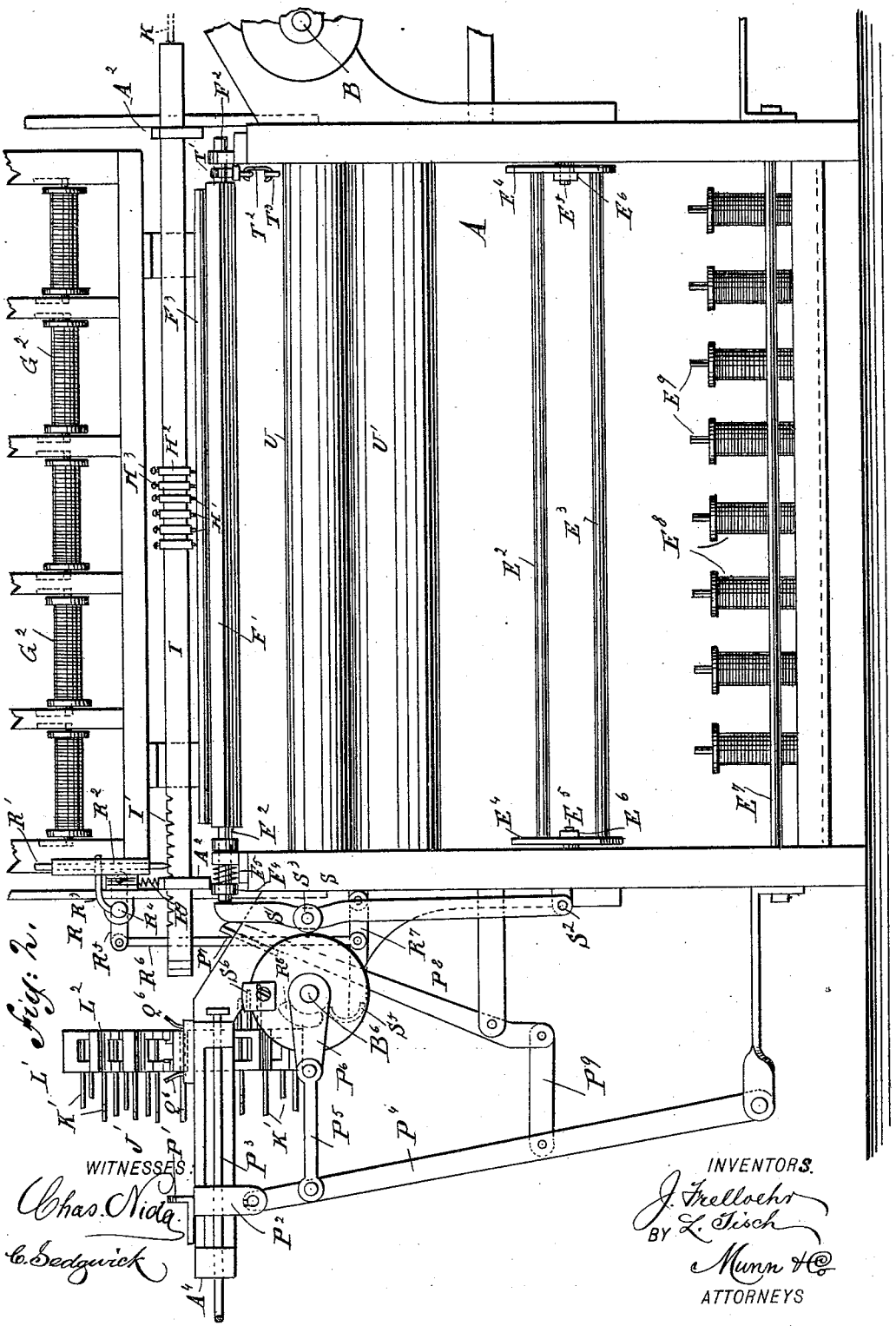


Fig. 2.

WITNESSES:
Chas. Nida.
C. Sedgwick

INVENTORS.
J. Frelloehr
BY L. Tisch
Munn & Co.
ATTORNEYS

(No Model.) 4 Sheets—Sheet 3.

J. FRELLOEHR & L. TISCH.

KNITTING MACHINE.

No. 457,265. Patented Aug. 4, 1891.

Fig: 3.

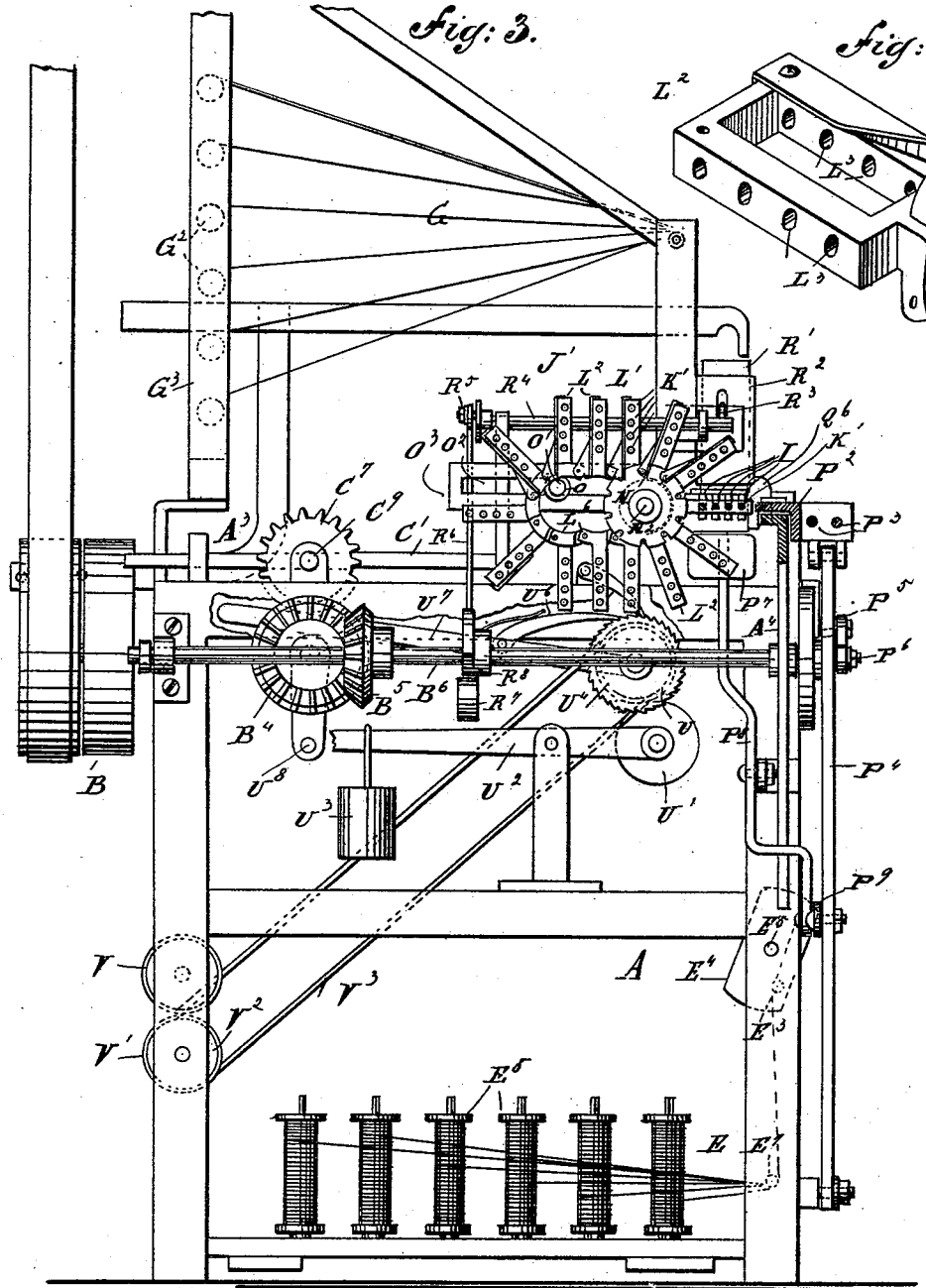
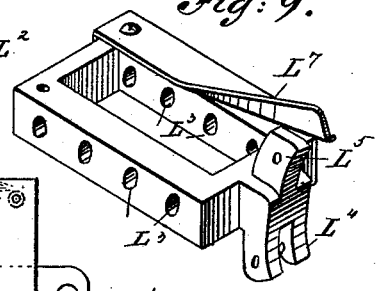


Fig: 9.



WITNESSES:

Chas. Nida.

C. Sedgwick

INVENTORS.

L. Frelloehr

BY L. Tisch

Munn & Co.

ATTORNEYS

(No Model.) 4 Sheets—Sheet 4.

J. FRELLOEHR & L. TISCH.

KNITTING MACHINE.

No. 457,265. Patented Aug. 4, 1891.

Fig: 4.

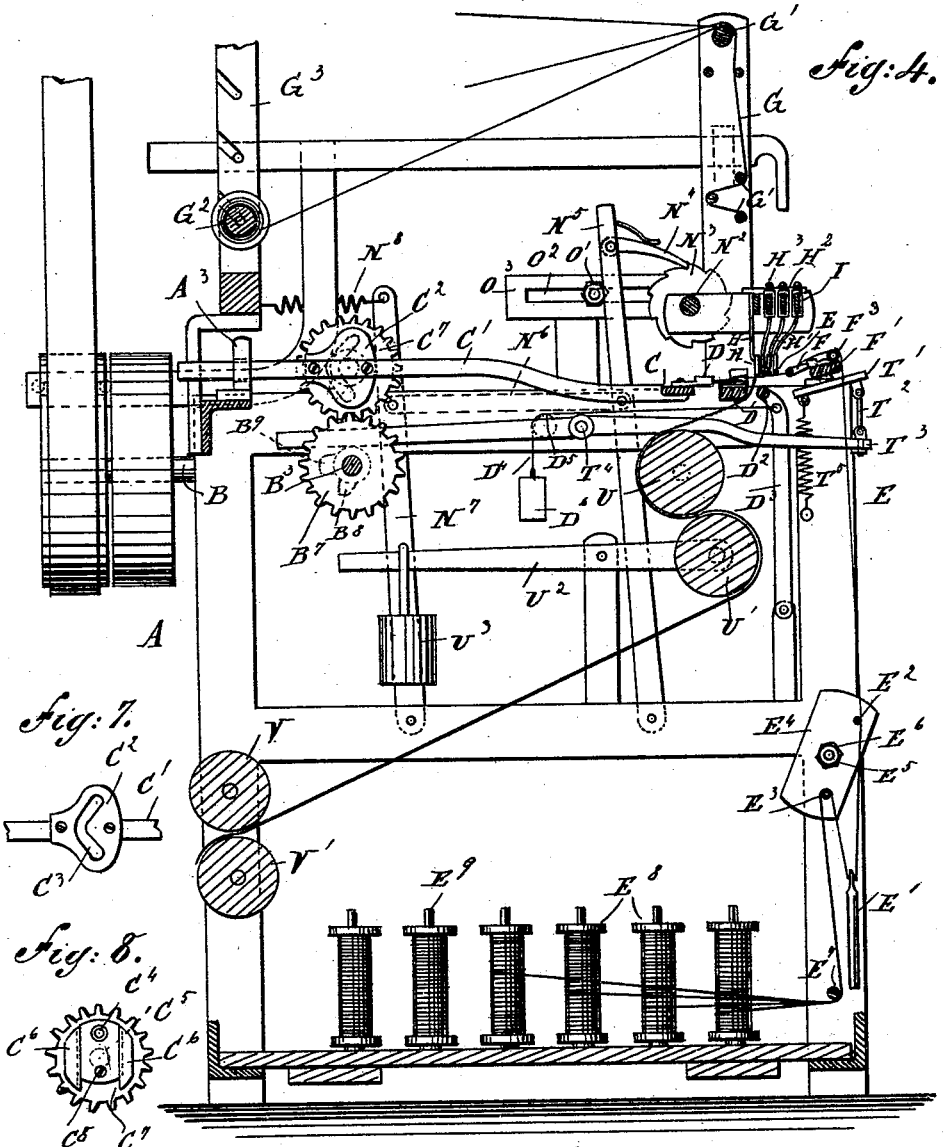


Fig: 7.

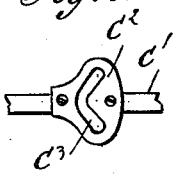


Fig: 8.

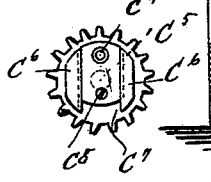


Fig: 5.

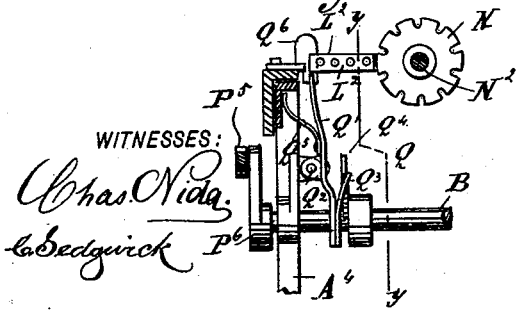
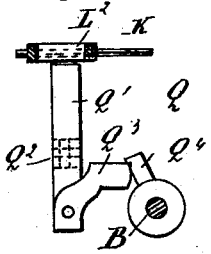


Fig: 6.



WITNESSES:

Chas. Nida.

Sedgwick

INVENTORS.

J. Frellwehr

BY L. Tisch

Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

JULIUS FRELLOEHR, OF NEW YORK, N. Y., AND LOUIS TISCH, OF HOBOKEN, NEW JERSEY.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 457,265, dated August 4, 1891.

Application filed January 31, 1891. Serial No. 379,758. (No model.)

To all whom it may concern:

Be it known that we, JULIUS FRELLOEHR, of the city, county, and State of New York, and LOUIS TISCH, of Hoboken, in the county of Hudson and State of New Jersey, have invented a new and Improved Knitting-Machine, of which the following is a full, clear, and exact description.

The invention relates to machines for forming knitted fancy trimmings; and its object is to provide a new and improved knitting-machine which is simple and durable in construction, very effective in operation, and requires no Jacquard mechanism to control the pattern of the fabric.

The invention consists of a series of pins acting on the thread-guide bars to reciprocate the same.

The invention also consists of certain parts and details and combinations of the same, as will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the improvement with parts in section. Fig. 2 is a front elevation of the same. Fig. 3 is an end elevation of the same with parts in section. Fig. 4 is a transverse section of the same on the line $x\,x$ of Fig. 1. Fig. 5 is an end elevation with parts in section of the locking device for the chain carrying the pins. Fig. 6 is a sectional rear view of the same on the line $y\,y$ of Fig. 5. Fig. 7 is a face view of the cam and bar carrying the needle-bar. Fig. 8 is a face view of the gear-wheel and crank-pin for reciprocating the needle-bar, and Fig. 9 is an enlarged perspective view of one of the chain-links carrying the pins.

The improved knitting-machine is provided with a suitably-constructed frame A, on one end of which is mounted to turn in suitable bearings the transversely-extending main driving-shaft B, provided with fast and loose pulleys connected by belt to suitable machinery for imparting a rotary motion to the said shaft B. On the latter is secured a bevel gear-wheel B', meshing into a like gear-wheel B^2, secured on one end of a shaft B^3, extending longitudinally and mounted to turn in suitable bearings secured on the main frame A at or near the rear, as is plainly shown in Fig. 1. On the other end of the shaft B^3 is secured a bevel gear-wheel B^4, meshing into a like gear-wheel B^5, secured on a transversely-extending shaft B^6, mounted to turn in suitable bearings on the end of the frame A, opposite the end on which the shaft B is mounted. The bevel gear-wheels B', B^2, B^4, and B^5 are so proportioned that the shafts B^3 and B^6 make one revolution to each revolution of the driving-shaft B.

The longitudinal shaft B^3 is connected by a mechanism, presently to be described, with the needle-bar C, carrying the knitting-needles D, on which the fabric is formed. The needle-bar C receives a reciprocating motion from the shaft B^3, and is mounted to slide laterally in suitable bearings A', formed on the ends of the main frame A. The needle-bar C is rigidly connected near its ends with two rearwardly-extending bars C', fitted to slide at their rear ends in bearings A^3, erected on the main frame A. Each of the bars C' is provided with a cam C^2, (see Fig. 7,) provided with an L-shaped slot C^3, engaged by a pin C^4, projecting from a plate C^5, held adjustable in guideways C^6, formed on one face of a gear-wheel C^7. The plate C^5 is fastened in place on the said gear-wheel C^7 by a set-screw C^8, screwing in the plate C^5 and against the face of the gear-wheel C^7, as plainly shown in Fig. 8. The two gear-wheels C^7 are secured on longitudinally-extending short shafts C^9, mounted to turn in suitable bearings on the main frame A, the said shafts C^9 being located directly above the shaft B^3, previously mentioned. The gear-wheels C^7 are in mesh with corresponding gear-wheels B^7, secured on the shaft B^3, so that when the latter is rotated the gear-wheels B^7 impart a rotary motion to the gear-wheels C^7, and the latter, by their crank-pins C^4 engaging the cams C^2, impart a sliding motion to the bars C', and consequently to the needle-bar C and the knitting-needles D.

Into the knitting-needles D pass the binding-threads E, guided to the said needles by guide-bars F, through which pass the said binding-threads. The eyed guide-bars F for the said binding-threads E are secured to and

project from a longitudinally-extending rod F′, provided on its ends with trunnions F², mounted to turn and to slide longitudinally in suitable bearings formed on the ends of the main frame A. On the top of the rod F′ and near its front edge is arranged a longitudinally-extending round rod F³, over which pass the threads previous to entering the eyes of the guide-bars F.

The binding-threads E carry the usual weights E′ and pass over the longitudinally-extending rods E² and E³, secured in arms E⁴, mounted to turn on studs E⁵, secured on the ends of the main frame A. The arms E⁴ are locked in place by nuts E⁶, screwing on the said studs E⁵ and abutting against the arms E⁴, so that the rods E² and E³ are held in proper position after the arms E⁴ are adjusted—that is, by turning the same on the studs E⁵ and then locking the same in place by the nuts E⁶. The binding-threads, after passing over the lowermost rod E³, pass under a rod E⁷, extending longitudinally and held in the lower part of the main frame A. The threads E come from the spools E⁸, held on vertical spindles E⁹, arranged vertically and secured on a board supported in the lower part of the main frame A. The weights E′ are preferably hung onto the threads E between the rods E² and E³, so as to give the threads the proper tension.

To the knitting-needles D also pass from above the pattern-threads G, also passing over a series of longitudinal rods G′, arranged in suitable standards erected on the main frame A directly above the needles D. The pattern-threads G unwind from spools G², arranged horizontally on a suitable spool-frame G³, supported on the rear end of the main frame A. The pattern-threads G, previous to passing to the needles D, pass through tubes H, arranged above and in front of the needles D, between the latter and the eyed thread-guide bars F. Each tube H is supported by an arm H′ from thread-guide bars I, arranged longitudinally and fitted to slide in suitable bearings A², formed on the ends of the main frame A. One or more guide-bars I may be employed. As shown in the drawings, four of the said guide-bars are employed. The arms H′ are rigidly secured on the rear thread-guide bar I. The other three thread-guide bars I carry the sleeves H², fitted to slide longitudinally and held adjustably therein by set-screws H³, to which sleeves are attached the arms H′ of the tubes supported by the said three bars I. The arms H′ on the rear thread-guide bar I are close together, so that a desired number of threads can be passed through the corresponding tubes to form the groundwork of the fabric. The other three thread-guide bars only carry a few sleeves and corresponding tubes for the threads necessary to produce the configuration of the pattern. The thread-guide bars I are caused to slide longitudinally by a special mechanism, made in two identical parts J and J′, located at the ends of the machine and actuated from the shafts B and B⁶, respectively.

Each of the mechanisms J and J′ is provided with sets of pins K K′, respectively, each set containing as many pins as there are thread-guide bars I. Each set of pins is mounted to slide longitudinally in a link L² of endless sprocket-chains L and L′, passing over sprocket-wheels N and N′, secured on a longitudinally-extending shaft N², mounted to rotate in suitable bearings, arranged in the main frame A above the needle-bar C, as is plainly shown in the drawings. The center of the shaft N² is in a horizontal plane with the center of the thread-guide bars I, so that when one of the links L² of the said chains L and L′ stands in a horizontal position at the front of the respective sprocket-wheel N or N′. Then the respective pins K or K′ are in line with the thread-guide bars I, as is plainly illustrated in Figs. 1 and 3.

The shaft N² receives an intermittent rotary motion from the shaft B³, and for this purpose the shaft N² is provided with a ratchet-wheel N³, engaged by a spring-pressed pawl N⁴, pivoted on an upwardly-extending lever N⁵, fulcrumed at its lower end on the main frame A. The lever N⁵ is pivotally connected by a link N⁶ with a second lever N⁷, arranged similarly to the lever N⁵, and acted on by a cam projection B⁸, secured on the hub of the bevel gear-wheel B². A spring N⁸ presses the lever N⁷ rearwardly, so as to hold it in contact with the hub of the gear-wheel B² to be acted on by the cam projection B⁸. When the projection B⁸ on the revolving of the shaft B³ presses on the lever N⁷, then the latter swings forward and by the link N⁶ imparts a similar motion to the lever N⁵, which, by the spring-pressed pawl N⁴ engaging the ratchet-wheel N³, turns the shaft N² such a distance that the sprocket-wheels N and N′ move the next following link into a horizontal position onto the front of the said sprocket-wheels. Thus the two corresponding sets of pins K and K′ always stand in line with the thread-guide bars I. The pins K in each set of pins may be of the same length or of different lengths, or some of the same length and others of different lengths, as required by the pattern to be produced in the fabric.

Each thread-guide bar is acted on by two opposite pins in the respective horizontal links. The longest pin is acted on first by its respective striking-plate, so that the thread-guide bar is shifted by this longest pin. The short pin on the other link, and corresponding in position to the long pin, has a shorter movement—that is, it moves inward to meet the thread-guide bar when at the end of the movement caused by the longest pin. Thus some of the thread-guide bars may move to the right, while the others move to the left, and the remaining bars may be at a standstill in case the opposite pins at the ends of the respective thread-guide bars are

of the same length. The mechanism for this movement is hereinafter more fully described. Each set of pins K or K′ passes through apertures L^3 formed in the sides of the link L^2, the said pins being fitted to easily slide in the said links. Each of the latter, as illustrated in Fig. 9, is provided with segmental lugs L^4 and L^5, of which the lug L^4 is forked to engage the lug 5 of the next following link. Pivot-pins L^6 pass through the engaged lugs L^4 and L^5 on adjacent links, the said pivot-pins extending on the sides of the said forked lug L^4 to engage correspondingly-shaped notches formed in the periphery of the respective sprocket-wheel N or N′. (See Fig. 3.)

The rear part of each sprocket-chain is supported on a stud O, held adjustably in a slotted bracket O^3, secured on the main frame A. The inner end of each stud O passes through the transversely-extending slot O^2 in the bracket O^3, and the said stud is secured in place when adjusted by a nut O′. (See Fig. 1.) The studs O are made transversely adjustable in the brackets O^3 for supporting longer or shorter sprocket-chains L or L′. According to the pattern to be produced, more or less links are required in each sprocket-chain, as each set of pins carried by the respective sprocket-chains forms one particular part of the design produced in the fabric. Hence if the design is greatly varied a larger number of links with corresponding pins K or K′ are necessary and required in the endless sprocket-chains L and L′. The sets of pins K and K′ are acted on at their outer ends by striking-plates P and P′, respectively, when the said sets of pins are in a horizontal position in the front of the sprocket-wheels N or N′. Each of the plates P and P′ is of sufficient width to engage all the pins in a link L^2. The plates P and P′ are each secured on its respective arm P^2, extending to the front of the machine and rigidly connected with two sliding bars P^3, fitted to slide longitudinally in suitable brackets A^4, arranged on the main frame A. Each of the arms P^2 is pivotally connected with a lever P^4, extending downwardly and having its fulcrum on a bracket projecting from the main frame A, as is plainly illustrated in Figs. 2 and 3.

Each of the levers P^4 on the ends of the machine is pivotally connected by a link P^5 with a crank-arm P^6, each when revolving imparting a swinging motion to the respective lever P^4, so as to move the striking-plate P or P′ forward and backward. The crank-arm P^6 on the right-hand end of the machine is secured on the main shaft B, while the other crank-arm P^6 on the left-hand end of the machine is secured on the shaft B^6. The two crank-arms on the shafts B and B^6 are arranged in opposite directions, so that the striking-plates P and P′ move simultaneously with each other and in opposite directions.

In order to cause a return or outward sliding motion of each set of pins K or K′, a second set of striking-plates P^7 is provided, arranged on the inside of the endless sprocket-chains L and L′, and adapted to engage the inner ends of the pins when the respective link is in an angular position, as illustrated in Fig. 3. Each of the striking-plates P^7 is secured on a lever P^8, pivotally connected by a link P^9 with the respective lever P^8, actuating the striking-plate P or P′, respectively. When the lever P^4 swings inwardly on the rotation of the respective shaft B or B^6, then the respective striking-plate P or P′ moves in an inward direction to move the corresponding set of pins K or K′ onto the thread guide-bars I. At the same time the said lever P^4 by the link P^9 imparts a swinging motion to the lever P^8, so that its striking-plate P^7 swings outward to return the respective set of pins to an outward position on the respective sprocket-chain L or L′. It is understood that the striking-plates P^7 act on the set of pins which had previously stood in a horizontal position on the front of the respective wheel N or N′, and by the rotation of the shaft N^2 had been moved into an angular position, as is previously mentioned, so as to bring its pins in line with the striking-plates P^7.

In order to prevent the pivot-pins L^6 from becoming disengaged from the lugs L^4 or L^5, a spring-plate L^7 is provided, secured on each of the links L^2 and abutting against one outer end of the said pivot-pin.

In order to hold the links L^2 in a horizontal position on the front of the sprocket-wheels N and N′, respectively, a locking device Q is provided, (shown in detail in Figs 5 and 6,) and provided with a lever Q′, extending vertically and adapted to engage with its upper end the under side of the front end of the respective link L^2, when the latter moves into a horizontal position.

The lever Q′ is fulcrumed at Q^2 on the bracket A^4, the lower end of the said lever being provided with a sidewise-extending arm Q^3 slightly inclined, as shown in Fig. 5, and adapted to be engaged by a projection Q^4, secured on the respective shaft B or B^6. When the latter is rotated, the projection Q^4 presses on the arm Q^3 so as to impart a swinging motion to the lever Q′, whereby the upper end of the said lever swings outward away from under the respective link L^2. This movement takes place previous to the rotation of the shaft N^2, which actuates the sprocket wheels and chains, as above described. The respective link L^2 is then free to swing downward, after which the spring Q^5 on the lever Q′ returns the latter to its normal position, so that the next link swinging into a horizontal position again rests with its outer end on the upper end of the lever Q′.

In order to prevent sidewise motion of each link L^2 at the time it stands in a horizontal position, two guide-arms Q^6 are provided, secured on top of the bracket A^4 and adapted to engage the sides of the respective link.

In order to hold the thread-guide bars I in

position during the knitting process, a locking device R is provided having a vertically-arranged locking-bar R′, pointed at its lower end and adapted to engage notches I′ placed equidistant apart and formed in the top of the said thread-guide bars I and arranged to register transversely directly under the sharp edge of the locking-bar R′. The locking-bar R′ is mounted to slide vertically in a bearing R^2, secured on the main frame A. An arm R^3 passes through a vertical slot in the said bearing R^2 to engage the bar R′, so that when the arm R^3 swings upward the bar R′ is withdrawn from the respective notches I′ in the top of the thread-guide bars I. The arm R^3 is secured on a shaft R^4, mounted to turn in suitable bearings in the main frame A, one end of the said shaft being provided with a crank-arm R^5, pivotally connected by a link R^6 with an arm R^7, pivoted on the main frame A. The outer end of this pivoted arm R^7 is adapted to be engaged by a cam R^8 held on the shaft B^6, so that when the latter is rotated the said arm R^7 is swung downward, so that the crank-arm R^5 is moved in the same direction, and the arm R^3 swings upward to disengage the locking-bar R′ from the thread-guide bars I. A spring R^9 is secured to the crank-arm R^5, so as to insure a return movement of the shaft R^4, the arm R^3, and the locking-bar R′ after the cam R^8 has disengaged the pivoted arm R^7.

The binding-thread-guide bar F has a slight longitudinally-sliding movement and a rocking motion. In order to accomplish the sliding movement a device S is provided having an upright lever S′, fulcrumed at its lower end at S^2 to one end of the main frame A, the upper free end of the said lever abutting against one end of one of the trunnions F^2. A friction-roller S^3 is held on the lever S′, and travels on the periphery of a wheel S^5, secured on the shaft B^6 and provided on one face with a projection S^6, adapted to engage the said friction-roller S^3, so as to move the lever S′ inwardly to shift the thread-guide bar F to the right. The return movement of the guide-bar F is accomplished by a spring F^5 coiled on one of the trunnions F^2 and abutting with one end on one of the bearings of the said trunnion while the other end rests against the collar F^4, secured on the said trunnion. This spring F^5 is pressed when the lever S′ swings inward, as before described, the spring serving to return the guide-bar to its normal position after the projection F^6 has left the friction-roller S^3.

A rocking device T for the thread-guide bar F is provided with a bar T′, secured to one of the trunnions F^2 of the said bar F, the outer end of the bar T′ being pivotally connected by a link T^2 with a lever T^3, pivoted at T^4 on one end of the main frame A. The lever T^3 extends transversely and is adapted to be engaged at its rear end by a projection B^9, secured on the shaft B^3. When the latter is rotated, this projection B^9 raises the rear end of the lever T^3, so that its front end swings downward, thereby pulling on the bar T′, thus turning the guide-bar F so that the eyes of the said guide-bar swing upward to lift the thread onto the needles. The return motion of the guide-bar F is accomplished by a spring T^5, connected at one end with the inner end of the bar T′ and with its other end secured on the main frame A. (See Fig. 4.)

In order to hold the fabric in place below the needles D, a longitudinally-fixed bar D′ is provided, secured in the ends of the main frame A. In front of this bar D′ is arranged a rod D^2, secured to arms D^3, extending downwardly and pivoted at their lower ends on the ends of the main frame A. One of the arms D^3 is connected with one end of a cord D^4, passing over a pulley D^5, held on one end of the main frame A, the downwardly-extending part of the cord D^4 supporting a weight D^6. The latter has the tendency to draw the arms D^3 and the rod D^2 inwardly, so as to press the rod D^2 onto the front of the fabric to clamp the latter between the bar D′ and the rod D^2. The fabric afterward passes from the bar D′ and the rod D^2 onto a roller U, journaled in fixed bearings in the ends of the main frame A. A second roller U′ is arranged below the roller U and over which passes the fabric after leaving the roller U. The roller U′ is journaled in arms U^2, pivoted on the main frame A, and supporting at their rear ends a weight U^3, so as to press the roller U′ toward the roller U. From the roller U′ the fabric passes under a roller V and then around the cloth-beam V′, on which the fabric is wound. The cloth-beam V′ is provided with a pulley V^2, over which passes a belt V^3, also passing over a pulley U^4, held on the roller U, as is plainly shown in Fig. 3. The roller U receives an intermittent rotary motion from the shaft B^3, the said roller being provided for this purpose with a ratchet-wheel U^4, engaged by a spring-pressed pawl U^6 on a lever U^7, fulcrumed on the axis of the roller U. The lever U^7 extends rearwardly over the shaft B^3, which latter is provided with a projection U^8 for raising the said lever U^7 to cause the pawl U^6 to impart an intermittent rotary motion to the ratchet-wheel U^4, and consequently to the roller U and the cloth-beam V. The projection U^8 is so arranged that motion is imparted to the roller U and the cloth-beam V after the knitting has taken place by the needles D.

The operation is as follows: When the several parts are in position and the main shaft B is rotated, then motion is imparted to the several devices. The needle-bar C receives a reciprocating motion, so that the needles D knit the binding-threads E with the pattern-threads G to form the desired fabric. The sets of pins K and K′ in the several links, and the sprocket-chains L and L′, respectively, have previously been selected in respect to their length to shift the thread-

guide bars I, so as to change the position of the pattern-threads G relative to the needles D and the binding-thread-guide bar F to produce the desired design on the fabric. When the needle-bar C is on its return movement—that is, moving rearward—the respective thread-guide bars I are shifted longitudinally by the respective set of pins K or K′ being driven inward by the respective striking-plates P or P′, it being understood that the set of pins acted on are in a link which stands in a horizontal position on the front of the sprocket-wheels N or N′, respectively. By this shifting of the thread-guide bars I the position of the respective pattern-threads G, passing through the tubes H supported from the said thread-guide bars I, is changed relative to the needles D, so that at the next outward movement of the needles other threads are knitted with the binding-threads E, according to the fabric, the design of which is represented by the different sets of pins K and K′. As soon as the guide-bars I are shifted longitudinally the locking-bar R′ moves downward to engage the respective notches in the bars I, to lock the latter in place. Previous to the striking-plates P and P′, operating on their respective sets of pins K and K′, the said locking-bar R′ is moved upward to unlock the thread-guide bars I, as previously described.

It is understood that the several movements of the devices mentioned are so timed as to produce the desired result.

Having thus fully described our invention, we claim as new and desire to secure by Letters Patent—

1. In a knitting-machine, the combination, with one or more thread-guide bars fitted to slide, of sets of sliding pins for moving the said thread-guide bars, substantially as shown and described.

2. In a knitting-machine, the combination, with one or more thread-guide bars fitted to slide, of sets of pins adapted to engage the ends of the said thread-guide bars, and means, substantially as described, for imparting a sliding motion to the said sets of pins to engage the latter with the said thread-guide bars in order to shift the latter, substantially as shown and described.

3. In a knitting-machine, a mechanism comprising thread-guide bars and sets of pins of varying lengths adapted to shift the said thread-guide bars, substantially as shown and described.

4. In a knitting-machine, a mechanism comprising thread-guide bars, a traveling endless sprocket-chain, and a set of pins fitted to slide in each link of the said chain, the said pins being of varying lengths and adapted to engage the ends of the said thread-guide bars, substantially as shown and described.

5. In a knitting-machine, the combination, with the thread-guide bars fitted to slide, of two devices for shifting the said thread-guide bars and located at the ends of the latter, each device being provided with sets of movable pins engaging the ends of the said thread-guide bars, substantially as shown and described.

6. In a knitting-machine, the combination, with the thread-guide bars fitted to slide, of two devices for shifting the said thread-guide bars and located at the ends of the latter, each device being provided with sets of movable pins, engaging the ends of the said thread-guide bars, and means, substantially as described, for simultaneously imparting a sliding motion to the corresponding sets of pins of the two devices, substantially as shown and described.

7. In a knitting-machine, the combination, with a reciprocating needle-bar carrying the knitting-needles, of pattern-thread-guide bars mounted to slide, and the devices J and J′ for shifting the said pattern-thread-guide bars, substantially as shown and described.

8. In a knitting-machine, the combination, with the reciprocating needle-bar carrying the knitting-needles, of pattern-thread-guide bars mounted to slide, the devices J and J′ for shifting the said pattern-thread-guide bars, and a binding-thread guide mounted to slide and to oscillate and operating in conjunction with the said needles and pattern-thread-guide bars, substantially as shown and described.

9. In a knitting-machine, the combination, with thread-guide bars, of devices for shifting the said thread-guide bars, and each comprising a traveling sprocket-chain having an intermittent motion, and a set of pins fitted to slide in each link of the said chain, the pins of one set standing in line at a time with the said thread-guide bars, substantially as shown and described.

10. In a knitting-machine, the combination, with thread-guide bars, of devices for shifting the said thread-guide bars, and each comprising a traveling sprocket-chain having an intermittent motion, a set of pins fitted to slide in each link of the said chain, the pins of one set standing in line at a time with the said thread-guide bars, and a locking device for holding the link carrying the set of pins arranged in line with the thread-guide bar in place, substantially as shown and described.

11. In a knitting-machine, the combination, with thread-guide bars, of devices for shifting the said thread-guide bars, and each comprising a traveling sprocket-chain having an intermittent motion, a set of pins fitted to slide in each link of the said chain, the pins of one set standing in line at a time with the said thread-guide bars, and a striking-plate for each shifting device having a reciprocating motion and adapted to shift the set of pins in line with the thread-guide bars to actuate the latter, substantially as shown and described.

12. In a knitting-machine, the combination,

with thread-guide bars, of devices for shifting the said thread-guide bars, and each comprising a traveling sprocket-chain having an intermittent motion, a set of pins fitted to slide in each link of the said chain, the pins of one set standing in line at a time with the said thread-guide bars, a striking-plate for each shifting device having a reciprocating motion and adapted to shift the set of pins in line with the thread-guide bars to actuate the latter, and a locking device for holding the link carrying the set of pins acted on by the striking-plate in place, substantially as shown and described.

13. In a knitting-machine, the combination, with thread-guide bars mounted to slide and provided with transversely-registering notches, of a locking-bar arranged transversely over the said thread-guide bars and adapted to engage with its lower sharp edge the registering notches of the said guide-bars, and sets of sliding pins of varying length adapted to shift the said thread-guide bars to move the latter in registering position for engagement by the said locking-bar, substantially as shown and described.

14. In a knitting-machine, the combination, with the thread-guide bars mounted to slide and provided with notches adapted to register transversely, of a locking-bar fitted to slide vertically over the said thread-guide bars and adapted to engage with its lower sharp edge the registering notches, means, substantially as described, for lifting the said locking-bar out of engagement with the said notches, and sets of sliding pins of varying length adapted to shift the said thread-guide bars at the time the locking-bar is raised and suspended, substantially as shown and described.

15. In a knitting-machine, the combination, with a sprocket-chain, of pins fitted to slide in the links of the said chain, means, substantially as described, for imparting a forward motion to a set of said pins, and a striking-plate adapted to engage the set of pins in a link at a time to return the pins previously moved forward, substantially as shown and described.

16. In a knitting-machine, the combination, with the thread-guide bars, of devices for shifting the said thread guide-bars, and each comprising a traveling sprocket-chain having an intermittent motion, a set of pins fitted to slide in each link of the said chain, the pins of one set standing in line at a time with the said thread-guide bars, a locking device for holding the link carrying the set of pins arranged in line with the thread-guide bar in place, the said device comprising a spring-pressed lever adapted to engage with its upper end the under side of the respective link, a cam-arm projecting from the said lever, and a revoluble shaft carrying a projection adapted to engage the said cam-arm, substantially as shown and described.

17. In a knitting-machine, the combination, with a traveling endless sprocket-chain and a series of pins fitted to slide in each of the links of said chain, of two striking-plates moving simultaneously at opposite sides of the said chain to move at each stroke different sets of the said series of pins forward and backward in their links, substantially as shown and described.

18. In a knitting-machine, the combination, with a traveling endless sprocket-chain and a series of pins fitted to slide in each of the links of said chain, of two striking-plates moving simultaneously at opposite sides of the said chain to move at each stroke different sets of the said series of pins forward and backward in their links, means for imparting an intermittent motion to said chain, and means, substantially as described, for moving the said striking-plates, as described, and for the purpose set forth.

JULIUS FRELLOEHR.
LOUIS TISCH.

Witnesses:
THEO. G. HOSTER,
C. SEDGWICK.