

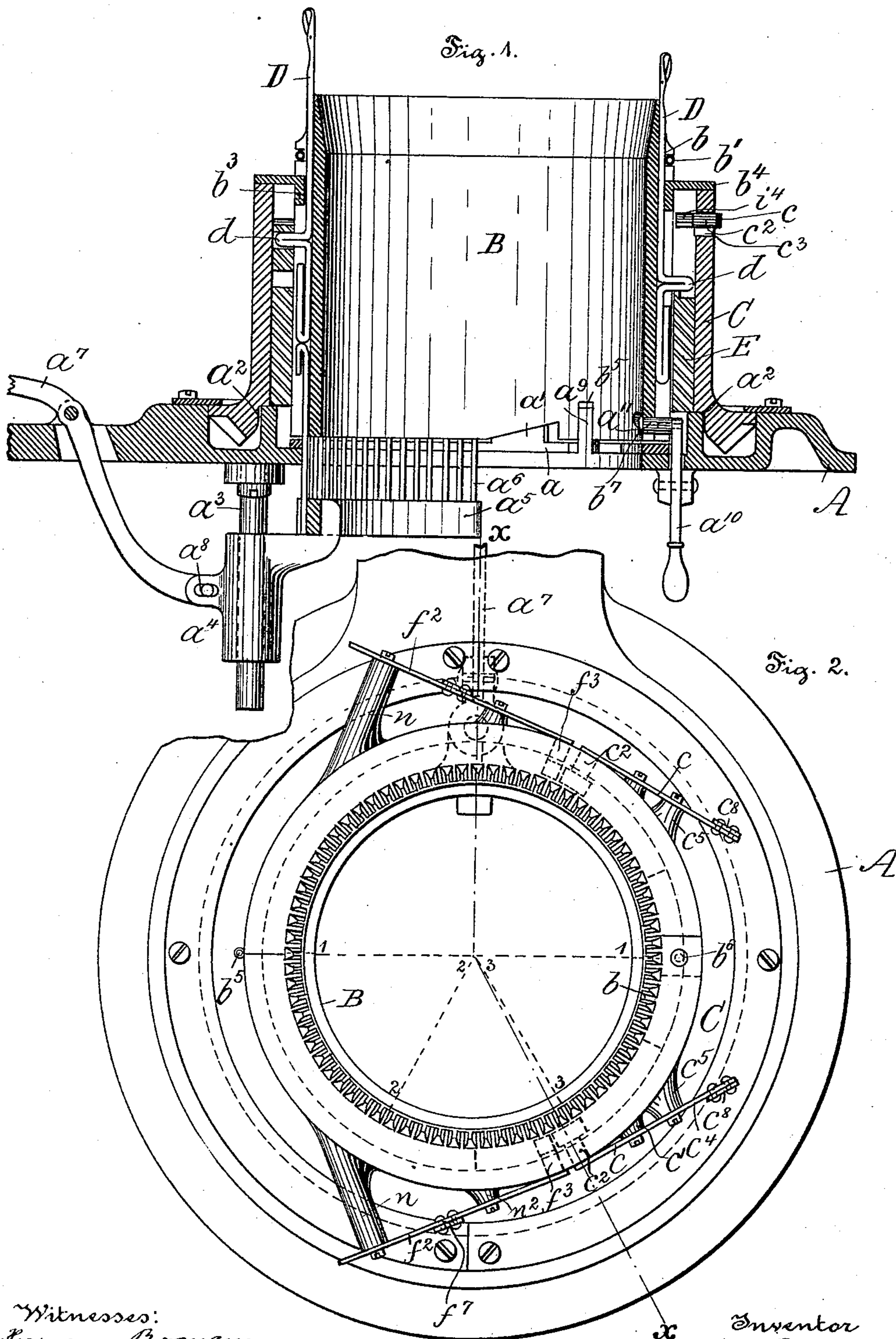
(No Model.)

2 Sheets—Sheet 1.

F. MALSCH.
CIRCULAR KNITTING MACHINE.

No. 465,938.

Patented Dec. 29, 1891.



Witnesses:
Hermann Bornmann.
Thomas M. Smith.

Inventor
Frank Malsch.
by J. Walter Douglass.
att'y.

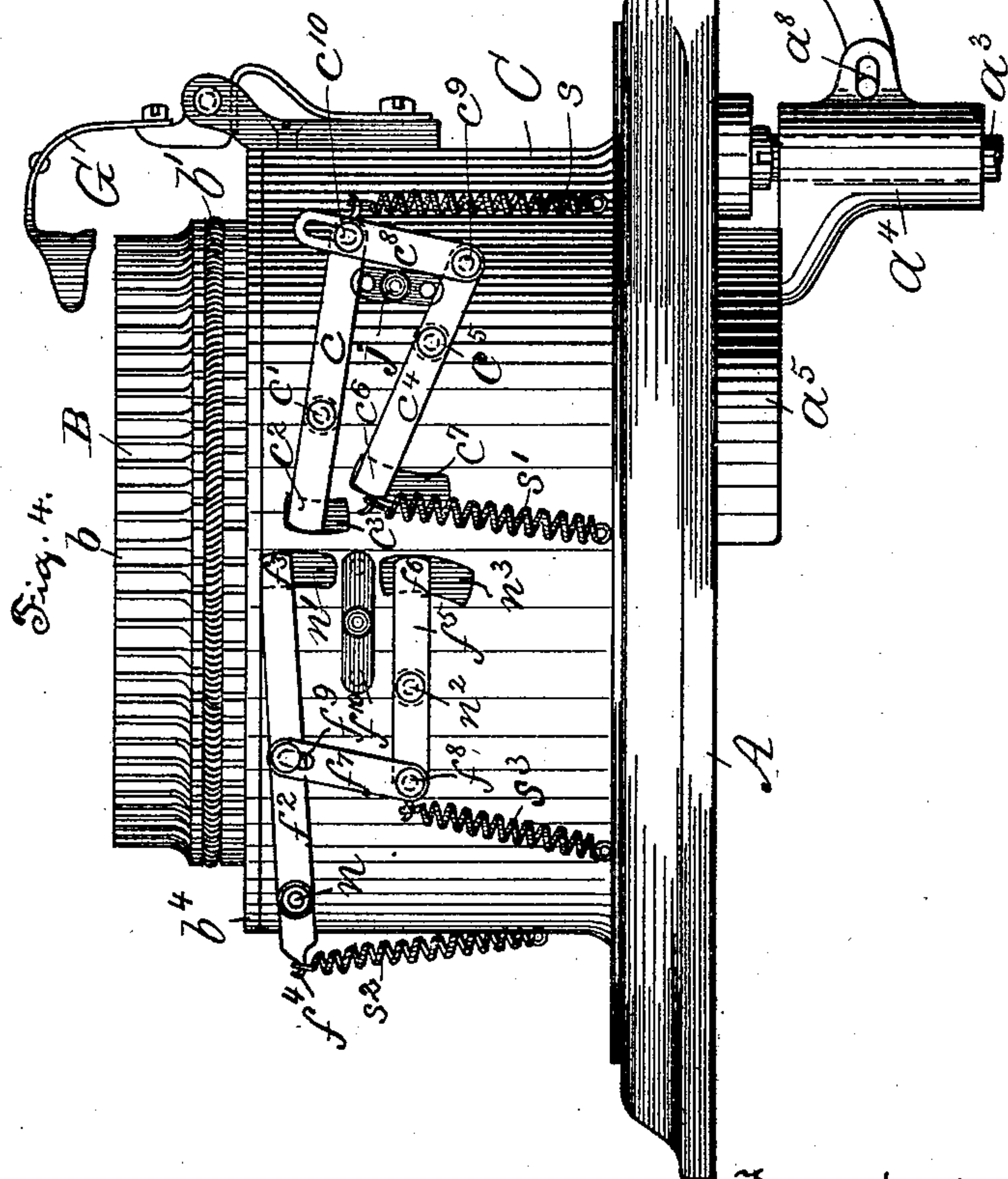
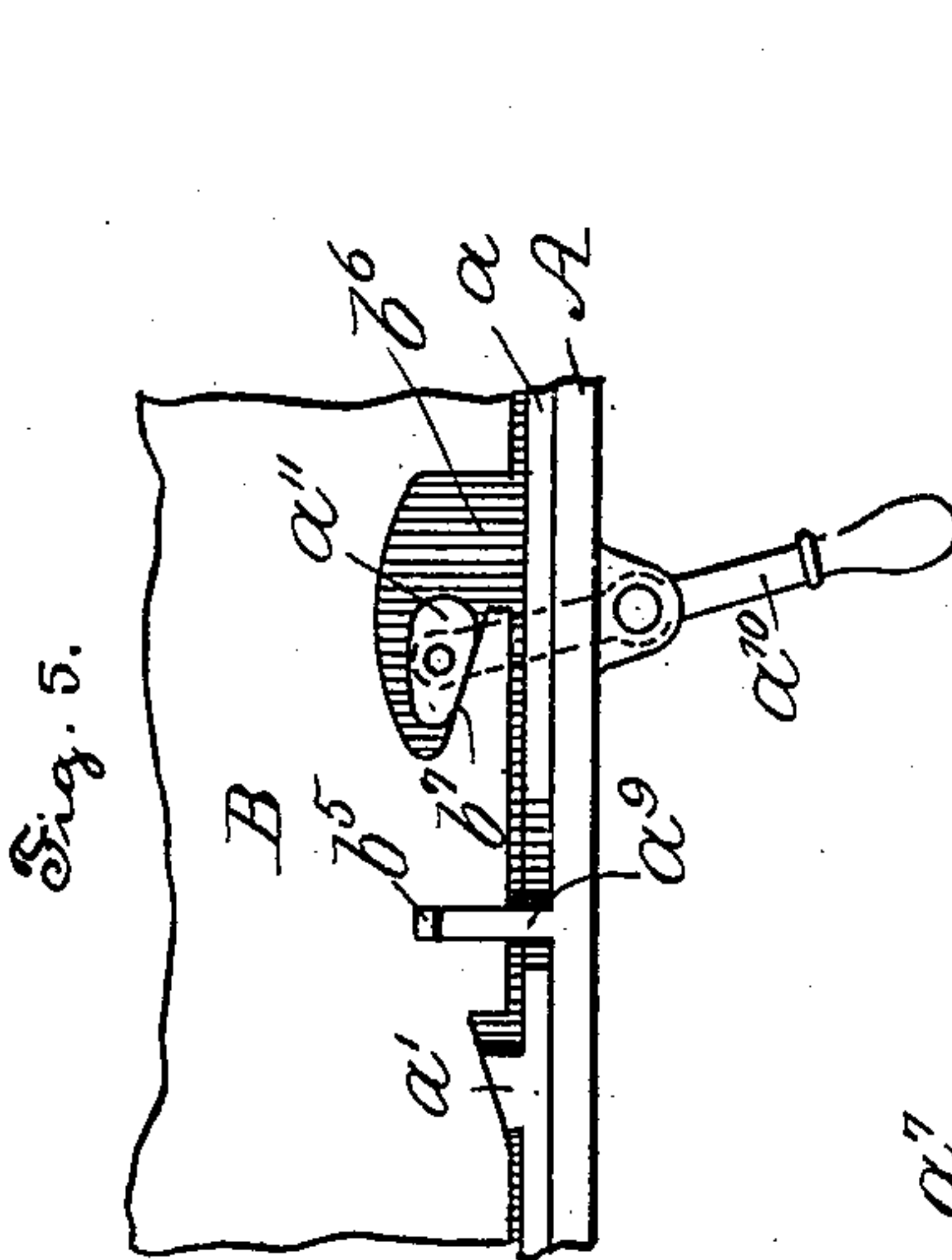
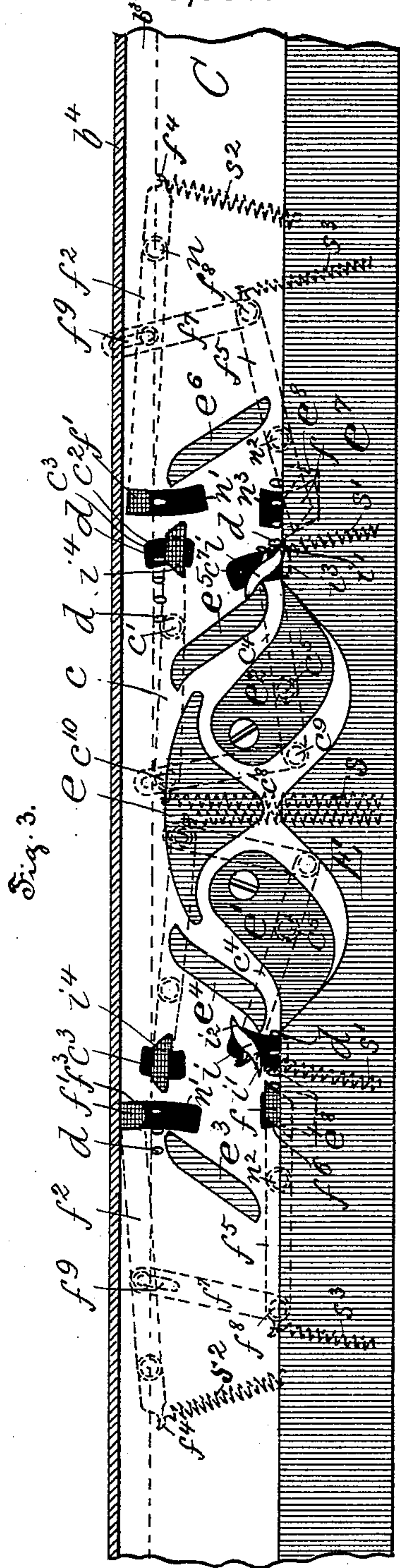
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UNITED STATES PATENT OFFICE.

FRANK MALSCH, OF PHILADELPHIA, PENNSYLVANIA.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 465,938, dated December 29, 1891.

Application filed October 2, 1891. Serial No. 407,518. (No model.)

To all whom it may concern:

Be it known that I, FRANK MALSCH, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a specification.

In knitting certain articles—for example, the heels or toes of socks or stockings or the breast-pockets of ladies under-vests—it is customary to shape or fashion the article by narrowing or widening the web during the process of its manufacture and according to the requirements of the article being knit. This result is usually accomplished by dividing the needles of the machine into two sets or divisions and throwing one of these sets or divisions out of or into action, and then throwing certain of the needles constituting the other set into or out of action, thus narrowing or widening the web during its formation.

The present invention relates in general to knitting-machines, and more particularly to simple, durable, and efficient mechanism for automatically controlling the operation of the needles as well as to certain improvements in the construction and arrangement of the devices for clamping the needle-cylinder to place.

The principal objects of the present invention are, first, to provide a knitting-machine in which the operations of throwing certain of the needles successively out of or into action are automatically controlled and regulated by the needles previously thrown out of or into action; second, to provide simple, durable, and efficient mechanism for throwing one set or division of the needles collectively out of action in order to permit of the accomplishment of the operations of narrowing and widening the web being formed by the other set or division of the needles; third, to provide positively-operated mechanism for automatically and successively throwing certain of the needles out of or into action in order to accomplish the operation of narrowing or widening the web during its formation; fourth, to provide comparatively inexpensive means for retaining the bits of the needles that are thrown out of action in proper position for engagement by the automatic

needle-controlling mechanism, and, fifth, to provide convenient devices for permitting of the adjustment of the needle-cylinder and for clamping and unclamping the same.

My invention consists of a knitting-machine provided with needles, a needle or operating cam, a traveler normally engaging with the hubs or bits of the needles previously thrown out of range of said cam, a finger engaging successively the hubs or bits of the needles in range of said cam, and means connected with said finger and traveler and operating at the release of the latter to cause the former to throw the needles successively out of range of the cam.

My invention further consists of a knitting-machine provided with needles, a needle or operating cam, a traveler normally engaging with the hubs or bits of the needles in range of said cam, a hammer engaging singly the hubs or bits of the needles out of range of said cam, and means connected with said hammer and traveler and operating when the traveler engages the needles to cause the former to throw the needles singly into operative position.

My invention further consists of a knitting-machine provided with a bed-plate, a movable ring having a crown-cam, a needle-cylinder having a crown-cam, and a clamping device interposed between said bed-plate and cylinder and comprising a recess, a wedge, and an operating-lever.

My invention further consists of a knitting-machine provided with needles, a needle-cylinder, a cam-cylinder, and a sectional ring having the parts thereof united by hinge and screw connections and interposed between said cylinders above the needle-bits.

My invention further consists in the improvements hereinafter fully described and claimed.

The nature and characteristic features of the present invention will be more fully understood from the following description, taken in connection with the accompanying drawings forming part hereof, and in which—

Figure 1 is an elevation on the line $x x$ of Fig. 2, showing a knitting-machine having a sectional ring interposed between the needle and cam cylinders for limiting the range of motion of the needles in an upward direc-

tion and also showing at the left-hand side thereof a carrier provided with stems or rods adapted to engage the shanks of certain of the needles in order to shift them collectively
 5 out of range of the operating-cam. Fig. 2 is a top or plan view of a knitting-machine showing two systems of needle-operating levers embodying features of my invention in application thereto. Fig. 3 is a development
 10 of the interior of the cam-cylinder, showing two sets of travelers, fingers, hammers, and two systems of spring-controlled levers or links connecting the fingers with one set of travelers and the hammers with the other set
 15 of travelers. Fig. 4 is an elevation of a knitting-machine showing a side view of two systems of levers embodying features of my invention, and Fig. 5 is a detail view on an enlarged scale, showing the devices for clamp-
 20 ing the needle-cylinder in position.

In the drawings, A is the bed-plate of a knitting-machine provided with a rotatable ring a , having crown-cams a' engaging crown-cams on the needle-cylinder, by means of
 25 which the needle-cylinder B is adjusted up and down, and with circular ways a^2 for the reception of the cam-cylinder C.

D are knitting-needles adapted to work in suitable axially-disposed recesses b , formed
 30 upon the needle-cylinder B, and provided, respectively, with bits or hubs d for normally engaging the operating-cams upon the interior face of the cam-cylinder C.

b' is a spring fitted into a groove at or near
 35 the top of the needle-cylinder B and adapted to retain the needles D in the respective recesses b in such manner that the needles may be shifted up and down vertically by the operating-cams in order to perform the opera-
 40 tion of knitting in the ordinary or in any preferred manner.

Referring now more particularly to Figs. 1 and 4, a^3 is a bracket depending from the under side of the bed-plate A, and adapted to
 45 support a collar a^4 in such manner that the latter may be shifted up and down thereon. a^5 is a carrier attached to or formed integral with the collar a^4 and provided with stems or rods a^6 projecting into certain of the recesses
 50 b , so that when the carrier a^5 is shifted upward the rods or stems a^6 engage the lower extremities of certain of the needles and thus cause the needles themselves to be shifted upward, as shown at the left-hand side of
 55 Fig. 1, out of range of the operating-cams E. b^3 is a sectional ring provided with a flange b^4 , and having the parts thereof united by a hinge-joint b^5 and removable screw b^6 , so that the ring may be readily placed in position
 60 upon or removed from the cylinder B in order to remove or insert the needles or for any other purposes. The ring b^3 itself is fitted into an annular groove formed upon the exterior of the needle-cylinder, so that portions
 65 of the ring in effect form projections that lie in the recesses of the needle-cylinder and are engaged by the bits of the needles when the

same are elevated and are out of action, and the flange b^4 of the ring b^3 serves a purpose to be presently described and also protects
 70 the interior working parts of the machine from dust. a^7 is a hand-lever pivoted upon the bed-plate A and having one extremity extended through a slot in the bed-plate and connected with the collar a^4 by a slotted con-
 75 nection a^8 , so that the carrier a^5 may be shifted upward in order to throw certain of the needles out of action or downward in order to permit these needles to be returned manu-
 80 ally to operative position. The object in throwing certain of the needles out of or into action is to permit of the accomplishment of the operations of narrowing or widening the web during its formation, so that the number
 85 of needles that are collectively thrown out of action by means of the carrier a^5 will vary in different instances, and in all instances there will be one stem or rod a^6 for each needle D that is to be thrown out of action by the carrier a^5 . In the present instance thirty-six
 90 stems are shown, so that thirty-six needles, or one-half of all the needles of the machine, may be thrown collectively out of action by means of the hand-lever a^7 .

Referring now to Figs. 1 and 5, a^9 are lugs
 95 projecting upward from the bed-plate A and working in grooves b^5 in the needle-cylinder B, in order to prevent accidental rotation of the latter. The needle-cylinder B may be ad-
 100 justed up and down in the usual manner—that is, by rotating the ring a in one direction or the other by means of a handle attached to the lower face of the ring and working in a recess in the bed-plate and operated
 105 from the exterior of the machine. Such a handle is well known and common in circular-knitting machines, and hence is not shown upon the drawings. The rotation of the ring a causes the cams a' to be shifted with refer-
 110 ence to each other, and the wedge-like shape of the working-surfaces of these cams effects the required movements of the needle-cylinder. After the needle-cylinder B has been adjusted upward or downward by means of
 115 the cams a' , and in the manner hereinabove described, it may be clamped in place by means of a lever a^{10} , connected with the base-plate A and provided at its upper extremity with a pivotal jaw a^{11} , adapted to engage the
 120 inclined side wall b^7 of a recess b^6 , cut or otherwise formed in the needle-cylinder, so that the needle-cylinder B may be adjusted up and down by means of the ring a and then clamped to place by means of the operating-
 125 lever a^{10} . In the drawings only one operating-lever a^{10} , provided with a movable jaw a^{11} , is shown; but it must be understood that more than one such operating-lever and its accessories may be employed.

In the ordinary operation of a knitting-
 130 machine certain of the needles D—for example, the twelve needles located diametrically opposite the bracket a^4 , that is between the lines 2 2 and 3 3 in Fig. 2—are not thrown

out of action, and the widening and narrowing operations are performed upon the two sets of needles between the lines 1 1 and 2 2 and 1 1 and 3 3, Fig. 2, which are thrown singly and successively out of action, beginning with the needles nearest the line 1 1 and proceeding in the following order, first, a needle on one side of the machine—for example, the left side—and then a needle on the other side of the machine, the right side, and so on until all the needles of these two sets of needles are out of action and only the twelve needles between the lines 2 2 and 3 3 in Fig. 2 remain in action. In widening the web the same needles are thrown into action singly and in a reverse manner.

Referring now to Fig. 3, e , e' , and e^2 are the ordinary cams for engaging the hubs or bits of the needles. e^3 , e^4 , e^5 , and e^6 are auxiliary cams located upon the interior of the cam-cylinder C, and disposed upon opposite sides of the heart-shaped cam e . The auxiliary cams e^3 and e^6 serve to transfer needle-bits from near the upper portion of the cam-cylinder C into range of the cam e^7 , and the auxiliary cams e^4 and e^5 serve to transfer the needle-bits from the cam e^7 to positions near the upper portion of the cam-cylinder C. Of course the needle-bits are ordinarily out of range of all the auxiliary cams, but are shifted into range thereof by means of mechanism presently to be described. It may be remarked that the bits or hubs of the needles in operative position rest normally upon the upper edge of the portion e^7 of the knitting-cams E, and the bits of the needles that are out of action rest normally upon the ring b^3 .

In throwing needles out of action use is made of the following mechanism:

i are fingers located upon opposite sides of the cams e^4 e^5 , and provided respectively with curved extremities i' and i^2 . The extremities i' of these fingers are shifted in a manner to be presently described into cavities i^3 , formed in the top surface of the cam e^7 , and thus are caused to engage a needle-bit d , as shown at the right-hand side of Fig. 3. Subsequently the fingers i are shifted into the position shown at the left-hand side of Fig. 3, so that the rotation of the cam-cylinder C causes the needle-bits d to travel along the upper surfaces of the fingers i into range of the cams e^4 and e^5 , and these latter direct the needle-bits into contact with the ring b^3 , as shown in Fig. 3, and consequently out of range of the knitting-cams. The movements of the fingers i are controlled and regulated by means of travelers i^4 , adapted to slide under the bits d of the needles D that are in contact with the ring b^3 , which in most instances includes all the needles previously thrown out of action by the carrier a^5 , plus the needles previously thrown out of action in the process of narrowing. When the travelers i^4 are under the needle-bits d , the fingers i are in contact with the recesses i^3 in the cams e^7 , as shown at the right-hand side of Fig. 3, and when the trav-

elers i^4 escape from the needle-bits and consequently come into contact with and ride on the ring b^3 , the fingers i are shifted out of contact with the recesses i^3 into the position shown at the left-hand side of Fig. 3, and thus by properly adjusting the movements of the fingers i the needles D are thrown out of action singly and successively on opposite sides of the machine.

c are levers supported at or near their centers by means of studs c' , formed upon or connected with the exterior of the cam-cylinder C and provided at their outer ends with lugs or shanks c^2 , working in oblong slots c^3 in the cam-cylinder C. The extremities of these shanks c^2 extend through to the interior of the cam-cylinder C and support the travelers i^4 . The ends of these travelers i^4 are beveled upward and inward, as shown, in order to permit them to be depressed by the needle-bits when the cam-cylinder is rotated back and forth during the operation of fashioning.

c^4 are levers connected at or near their centers with studs c^5 upon the exterior of the cam-cylinder C, and having at their ends shanks c^6 , extending through oblong slots c^7 into the interior of the cam-cylinder C. These shanks c^6 are connected with and carry the fingers i .

s are small springs connected with the outside of the cam-cylinder C and with the levers c and adapted to shift the travelers i^4 upward into contact with the ring b^3 or with the bits d of the needles D that have previously been thrown into contact therewith.

s' are springs connected with the outside of the cam-cylinder C and with the levers c^4 near the shanks c^6 thereof, in order to maintain the fingers i normally in contact with the cavities i^3 .

c^8 are links connected with the levers c^4 by pivotal connections c^9 and with the levers c by slot-connections c^{10} . The object of the slot-connection c^{10} is to permit the fingers i to slide over the needle-bits d in one direction without shifting the levers c and travelers i^4 , and also to insure the operation of the fingers i by the travelers i^4 .

j are keys pivotally connected with the outside of the cam-cylinder C and provided with pins for engaging the levers c and c^4 . These keys j serve to shift and lock the levers in such position that the travelers i^4 and fingers i are entirely out of range of the needle-bits, or they permit them to assume such a position that the travelers i^4 cause the fingers to engage the needle-bits.

The operation of throwing needles into action during the process of widening is accomplished by means of the following mechanism.

f are travelers located on opposite sides of the cam e and farther from it than the fingers i . The travelers f are adapted to work in recesses e^8 in the cam e^7 , and are lozenge-shaped, as shown, so that when they are shifted in

one direction they ride over the bits d of the needles in operative position, and when they are shifted in a reverse direction they ride under the same and hence occupy positions in the recesses e^8 .

f' are hammers normally occupying positions above all the bits d of the needles, and in the space between the ring b^3 and its flange b^4 . Moreover, each of these hammers f' is adapted to strike one needle-bit at a time and knock it into range of the auxiliary cams e^3 and e^6 . The movements of these hammers f' are controlled by means of the travelers f through the instrumentality of a system of spring-actuated levers comprising the following mechanism:

f^2 are levers pivoted at or near their ends upon studs n projecting from the exterior of the cam-cylinder C, and provided at their other ends with shanks f^3 extending into the interior of the cam-cylinder C, and working in oblong slots n' in the side walls thereof. The hammers f' are connected with and carried by these shanks f^3 .

s^2 are springs connected with the exterior of the cam-cylinder C, and with hooks f^4 extending in rear of the points of pivotal support n of the levers f^2 . These springs s^2 serve to maintain the hammers normally in contact with the flange b^4 .

f^5 are levers pivoted at or near their centers by means of lugs n^2 upon the exterior of the cam-cylinder C, and having their inner ends provided with shanks f^6 , extending into the interior of the cam-cylinder through oblong slots n^3 . The travelers f are connected with and carried by these shanks f^6 .

s^3 are springs connected with the exterior of the cam-cylinder C, and with the other ends of the levers f^5 , in order to shift the travelers f normally above the needle-bits d by forcing them out of the cavities e^8 .

f^7 are links connected with the outer ends of the levers f^5 by pivotal connections f^8 , and with the central portions of the levers f^2 by means of slot connections f^9 , so that when a traveler f rides above the needle-bits d that are in contact with the cam e^7 a hammer f' is caused to strike a blow upon a needle-bit d , and when the travelers f are beneath the needle-bits d that are in contact with the cam e^7 , or in other words are in the cavities e^8 , the hammers f' remain at rest underneath the flange b^4 of the ring b^3 . The object of the slot connections f^9 is to afford the travelers f a slight range of play without affecting the position of the hammers f' .

f^{10} are keys interposed between the levers f^2 and f^5 , and pivotally connected with the exterior of the cam-cylinder C. These keys f^{10} are provided with pins that serve to force the levers f^2 and f^5 apart, whereby the travelers f and hammers f' are shifted below and above the needle-bits, and consequently into an inoperative position.

The mode of operation of the hereinabove-described knitting-machine is as follows: The

needle-cylinder B is adjusted to the proper height with reference to the needles by means of the movable ring a and crown-cams a' in the usual manner, and is then clamped to place more readily and more securely than has been heretofore possible by means of the clamping device comprising the slot b^6 , handle a^{10} , and jaw a^{11} , whereupon the cam-cylinder is rotated in the usual manner by means of a gearing, (not shown,) and the needles D are consequently operated by the cams E in such manner that, in connection with the thread-guide G, they produce a tubular web. In order to accomplish the operation of narrowing the web during its formation, the thirty-six needles shown above the line 1 1 in Fig. 2 are thrown out of range of the operating-cams E into contact with the ring b^3 by means of the handle a^7 and stems or rods a^6 , connected with the carrier a^5 . The narrowing operation is performed by knitting back and forth upon the needles below the line 1 1 in Fig. 2 and throwing out a needle first on one side of the machine, beginning with the needles nearest the line 1 1, and then on the other side of the machine, and so continuing until the two sets of needles between the lines 1 1 and 2 2 and 1 1 and 3 3 are thrown out of action. This operation of throwing needles singly and successively out of action is accomplished automatically by means of the fingers i and travelers i^4 and their accessories after the keys j have been shifted into proper position for releasing the levers c and c^4 in the following manner. When the cam-cylinder C is shifted toward the right in Fig. 3, the traveler i^4 (shown at the right-hand side in said figure) slides along beneath the bits d of the needles that have been previously thrown out of action, and thus causes the point i' of the corresponding finger i to occupy a position in the cavity i^3 , because the traveler i^4 and its corresponding finger i are constrained by the levers c and c^4 , links c^8 , and springs s and s' to move in the same direction—that is, both upward or both downward. During the progress of the cam-cylinder C the traveler i^4 runs off the bits d of the needles previously thrown out of action at the same time that the point i' of the finger i runs under the bit of the next needle to be thrown out of action, and as soon as the traveler runs off the last needle-bit d , in contact with the ring b^3 , the finger i engages the needle-bit and shifts it into range of the cam e^5 , whereby it is transferred into contact with the ring b^3 and hence out of operative position. During the remainder of the travel of the cam-cylinder toward the right the traveler i^4 runs in contact with the ring b^3 , and thus maintains the finger i above the bits d of the needles that are in contact with the cam e^7 . When the cam-cylinder C is shifted toward the left, the point i' of the finger i rides freely over the bits d of the needles that are in contact with the cam e^7 . The above-described operation is repeated whenever the

cam-cylinder C is rotated toward the right and until the required number of needles—in the present instance, twelve needles—at the right-hand side of the machine have been thrown singly and successively out of action. Of course the traveler i^4 and its corresponding finger i at the left-hand side of the machine operate in a similar manner whenever the cam-cylinder C is shifted toward the left, and cause the needles to be successively and singly thrown out of action at the left-hand side of the machine. The result of the reciprocation of the cam-cylinder is to cause needles to be thrown out of and into action singly, first on one side of the machine and then on the other side thereof. The web is widened by first throwing the fingers i and travelers i^4 out of operative position, and then throwing the travelers f and hammers f' into operative position in the manner hereinabove described, and then continuing the operation of knitting back and forth. When the cam-cylinder is shifted toward the right in Fig. 3, the traveler f at the left-hand side in Fig. 3 rides over the needle-bits d , that are in contact with the cam e^7 , and thus causes the corresponding hammer f' to strike the last needle-bit that was previously thrown into contact with the ring b^3 on the left side of the machine. The blow of the hammer f' forces the needle-bit into range of the cam e^3 , whereby it is transferred into range of the operating-cams E of the machine. During the remainder of the travel of the cam-cylinder toward the right, the traveler f rides upon the needle-bits d , that are in contact with the cam e^7 , and thus permits the hammer to remain in inoperative position. When the cam-cylinder is shifted toward the left, the said traveler f by reason of its shape is forced under the bits of the needles that are in contact with the cam e^7 , whereby the corresponding hammer f' is permitted to remain at rest. Of course the traveler f at the right-hand side of Fig. 3 and its corresponding hammer f' are operated in a similar manner when the cam-cylinder C is shifted toward the left. The result of the reciprocation of the cam-cylinder C is to cause the hammers f' to throw needles singly and successively into action, first on one side of the machine and then on the other side thereof. After all the needles have been thrown into operative position by the hammers f' , the levers f^2 and f^3 are thrown into inoperative position, the carrier a^5 is shifted downward, and the needles above the line 1 1 in Fig. 2 are pushed by the hand into action, whereupon the formation of the tubular web is continued in the usual manner.

Among the many advantages possessed by the hereinabove-described machine the following may be particularly mentioned: first, the bits or hubs of the needles are all of the same length, so that the needles may be employed interchangeably, and, second, the operations of throwing needles singly into and out of action are performed in a positive man-

ner, so that the production of perfect goods in a rapid manner is assured.

It will be obvious to those skilled in the art to which my invention relates that modifications may be made in details without departing from the spirit of the invention. Hence I do not limit myself to the exact construction and arrangement of parts as have been above described; but

What I claim as new, and desire to secure by Letters Patent, is—

1. A knitting-machine provided with a bed-plate, a needle-cylinder, needles working in recesses ranging lengthwise of said cylinder, a needle-operating cam, a bracket depending from said bed-plate, a collar mounted on said bracket, a carrier connected with said collar and provided with rods or stems working in certain of said recesses, and a hand-lever connected with said bed-plate and collar, substantially as and for the purposes set forth.

2. A knitting-machine provided with a bed-plate, a needle-cylinder, needles working in recesses ranging lengthwise of said cylinder, a needle-operating cam, a bracket depending from said bed-plate, a collar movable on said bracket, a carrier connected with said collar and provided with rods or stems working in certain of said recesses, and a hand-lever supported in an aperture in said bed-plate and having one extremity thereof connected with said collar and the other extremity thereof accessible from above the bed-plate, substantially as and for the purposes set forth.

3. A knitting-machine provided with needles, a needle-cylinder, a cam-cylinder, and a sectional ring interposed between said cylinders to limit the upward movements of the needle-bits, substantially as and for the purposes set forth.

4. A knitting-machine provided with needles, a needle-cylinder, a cam-cylinder, and a sectional ring having the parts thereof united by hinge-and-screw connections and interposed between said cylinders above the needle-bits to form a rest or stop for the needles out of action, substantially as and for the purposes set forth.

5. A knitting-machine provided with needles, an operating-cam, a traveler adapted to slide in contact with the hubs or bits of the needles out of action, a finger for engaging the hubs or bits of certain of the needles in action, and means connected with said finger and traveler and operating at the escape of the latter from the needle-bits to cause the former to throw needles successively out of action.

6. A knitting-machine provided with needles, a needle-cylinder, an operating-cam, an auxiliary cam, a traveler normally sliding in contact with the hubs or bits of the needles out of range of the operating-cam, a finger engaging the hubs or bits of the needles in range of the operating-cam, and means connected with said finger and traveler and operating at the release of the latter to cause the former

to throw the needle bits or hubs successively out of range of the operating-cam into range of the auxiliary cam, substantially as and for the purposes set forth.

5 7. A knitting-machine provided with needles, an operating-cam, a traveler adapted to slide in contact with the hubs or bits of the needles out of action, a finger for engaging the hubs or bits of certain of the needles in
10 action, and a system of spring-controlled levers and links connected with said finger and traveler and operating at the escape of the latter from the needle-bits to cause the former to throw needles successively out of action,
15 substantially as and for the purposes set forth.

8. A knitting-machine provided with a finger tending to engage a needle in action, a traveler controlled by the needles out of action, and mechanism connected with said traveler and finger for causing the former to actuate the latter, substantially as and for the purposes set forth.

9. A knitting-machine provided with needles, a needle-cylinder, a slotted cam-cylinder,
25 an operating-cam, a traveler adapted to slide in contact with the hubs or bits of the needles out of action, a finger for engaging the hubs or bits of certain of the needles in action, levers connected with the exterior of
30 the cam-cylinder, and having each an end provided with a shank extending through a slot of said cam-cylinder and connected with said finger and traveler, respectively, a link connected with the other ends of said levers,
35 and springs connected with said cam-cylinder and levers, substantially as and for the purposes set forth.

10. A knitting-machine provided with needles, a needle-cylinder, a slotted cam-cylinder,
40 an operating-cam, a traveler adapted to slide in contact with the hubs or bits of the needles out of action, a finger for engaging the hubs or bits of certain of the needles in action, levers connected with the exterior of the cylinder and having each an end provided
45 with a shank extending through a slot of said cam-cylinder and connected with said finger and traveler, respectively, springs connected with said levers and cam-cylinder, and a link
50 connected with the other end of one of said levers by a pivotal connection and with the other of said levers by a slot connection, substantially as and for the purposes set forth.

11. A knitting-machine provided with needles, an operating-cam, a traveler adapted to come in contact with the hubs or bits of needles in action, a hammer for engaging singly the hubs or bits of needles out of action, and means connected with said hammer and traveler and operating at such contact of the
60 latter to cause the former to throw needles singly into operative position.

12. A knitting-machine provided with needles, an operating-cam having a recess, a traveler sliding over the hubs or bits of the needles in action and entering said recess to slide under said hubs or bits, a hammer for engag-

ing singly the hubs or bits of needles out of action, and means connected with said hammer and traveler and operating when the
70 traveler slides upon the needles in action to cause the hammer to throw needles singly into operative position.

13. A knitting-machine provided with a traveler tending to rise above the bits of the
75 needle in action, a hammer for throwing needles into action, and means connected with said traveler and hammer and adapted to cause the upward motion of the traveler to actuate the hammer, substantially as and for
80 the purposes set forth.

14. A knitting-machine provided with needles, an operating-cam, a traveler sliding in contact with the hubs or bits of the needles in action, a hammer for engaging singly the
85 hubs or bits of needles out of action, and a system of spring-controlled links and levers connected with said hammer and traveler, substantially as and for the purposes set forth.

15. A knitting-machine provided with needles, an operating and an auxiliary cam, a traveler sliding in contact with the hubs or bits of needles in action, a hammer for engaging singly the hubs or bits of needles out
90 of action and throwing the same into range of the auxiliary cam, and means connected with said hammer and traveler for actuating the former from the latter, substantially as and for the purposes set forth.

16. A knitting-machine provided with needles, a slotted cam-cylinder, a traveler sliding in contact with the hubs or bits of the needles in action, a hammer for engaging singly the hubs or bits of the needles out of action,
105 a lever connected at one extremity thereof to the exterior of the cam-cylinder and provided at the other extremity thereof with a shank extending into the interior of the cam-cylinder and connected to said hammer, a lever
110 connected at an intermediate point thereof to the exterior of the cam-cylinder and provided at one extremity with a shank extending into the interior of the cam-cylinder and connected with the traveler, a link connected
115 at one extremity with the hammer-lever by a slotted connection and at the other extremity with the free end of the traveler-lever by a pivotal connection, and springs connected with said levers and cam-cylinder, substantially as and for the purposes set forth.

17. A knitting-machine provided with a bed-plate, a needle-cylinder having a crown-cam, a movable ring having a crown-cam and interposed between said plate and cylinder,
125 said cylinder being provided with a recess, and an operating-lever connected to said bed-plate and provided with a jaw engaging said recess, substantially as and for the purposes set forth.

18. The combination, in a knitting-machine, of a needle-cylinder, an operating-cam, needles, a ring near the top of said needle-cylinder forming a stop or bed for the bits of the

needles out of action, a carrier at the bottom of said needle-cylinder provided with stems or rods for engaging certain of the needles, and means for actuating said carrier, substantially as and for the purposes set forth.

19. The combination, in a knitting-machine, of a needle-cylinder, an operating-cam, a ring near the top of said cylinder forming a stop or bed for the bits of needles out of action, a traveler adapted to slide on said ring and along said bits, a finger for throwing needles out of action, and mechanism connected with said finger and traveler to actuate the former from the latter, substantially as and for the purposes set forth.

20. The combination, in a knitting-machine, of a needle-cylinder, a ring near the top of said cylinder forming a stop for the bits of needles out of action, a traveler carried by the cam-cylinder and free to slide on said ring and along said bits, a finger carried by said cam-cylinder and adapted to engage and to slide over the bits of the needles in action, and a system of spring-controlled links and levers connecting said finger and traveler, substantially as and for the purposes set forth.

21. The combination, in a knitting-machine,

of travelers, a hammer, a finger, systems of levers and links connecting said travelers, respectively, with said hammer and finger, springs for normally retaining said systems of levers in operative position, and keys for locking said levers in inoperative position, substantially as and for the purposes set forth.

22. The combination, in a knitting-machine, of needles, a needle-cylinder, a cam-cylinder, an operating-cam provided with a cavity, a traveler adapted to enter said cavity and connected with the cam-cylinder and having its edges inclined to cause the traveler to ride over and under the bits of the needles in contact with said cam, a hammer for throwing needles into action, and means connected with said hammer and traveler to actuate the former from the latter, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

FRANK MALSCH.

Witnesses:

THOMAS M. SMITH,
RICHARD C. MAXWELL.