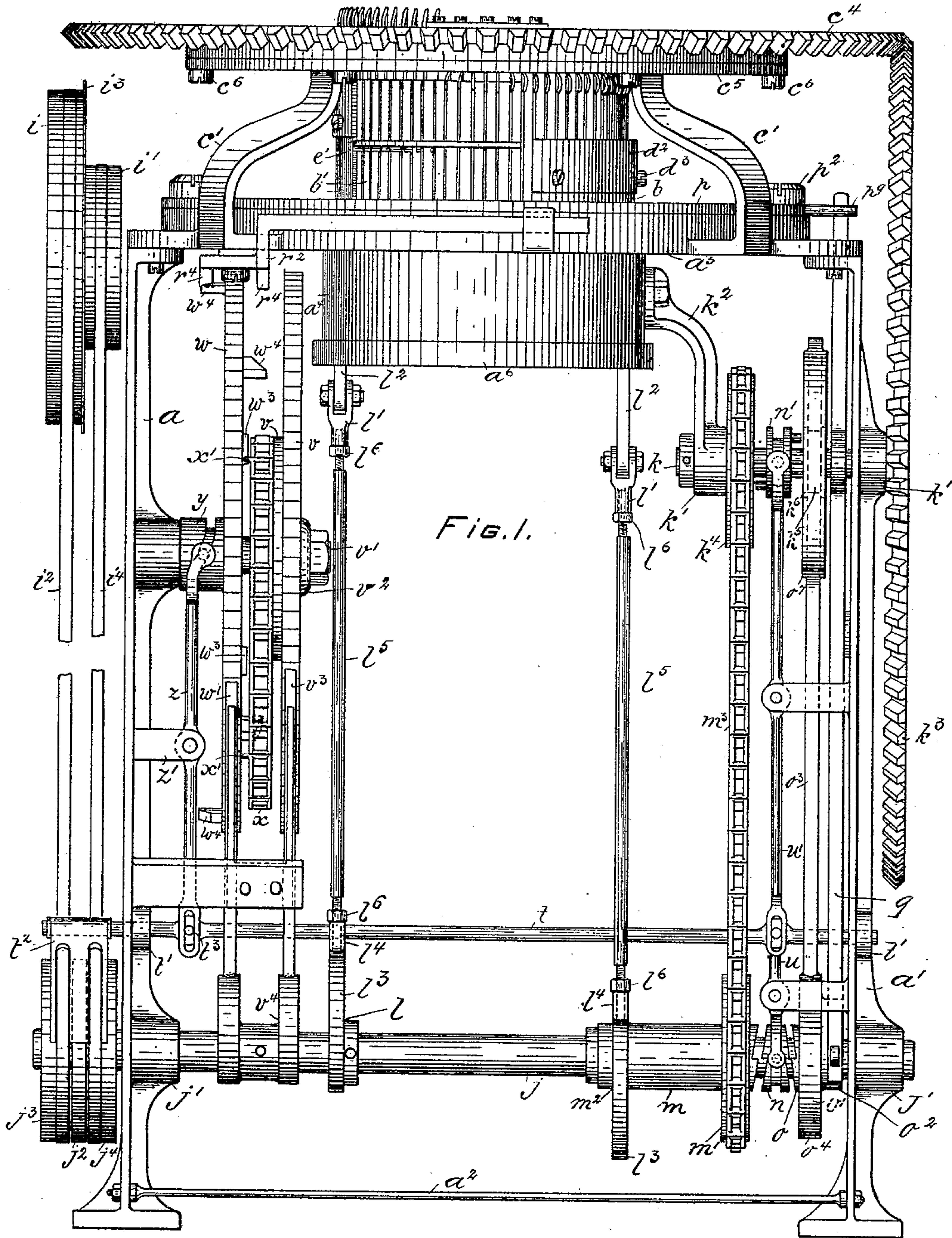


E. J. FRANCK.
KNITTING MACHINE.

No. 500,121.

Patented June 27, 1893.



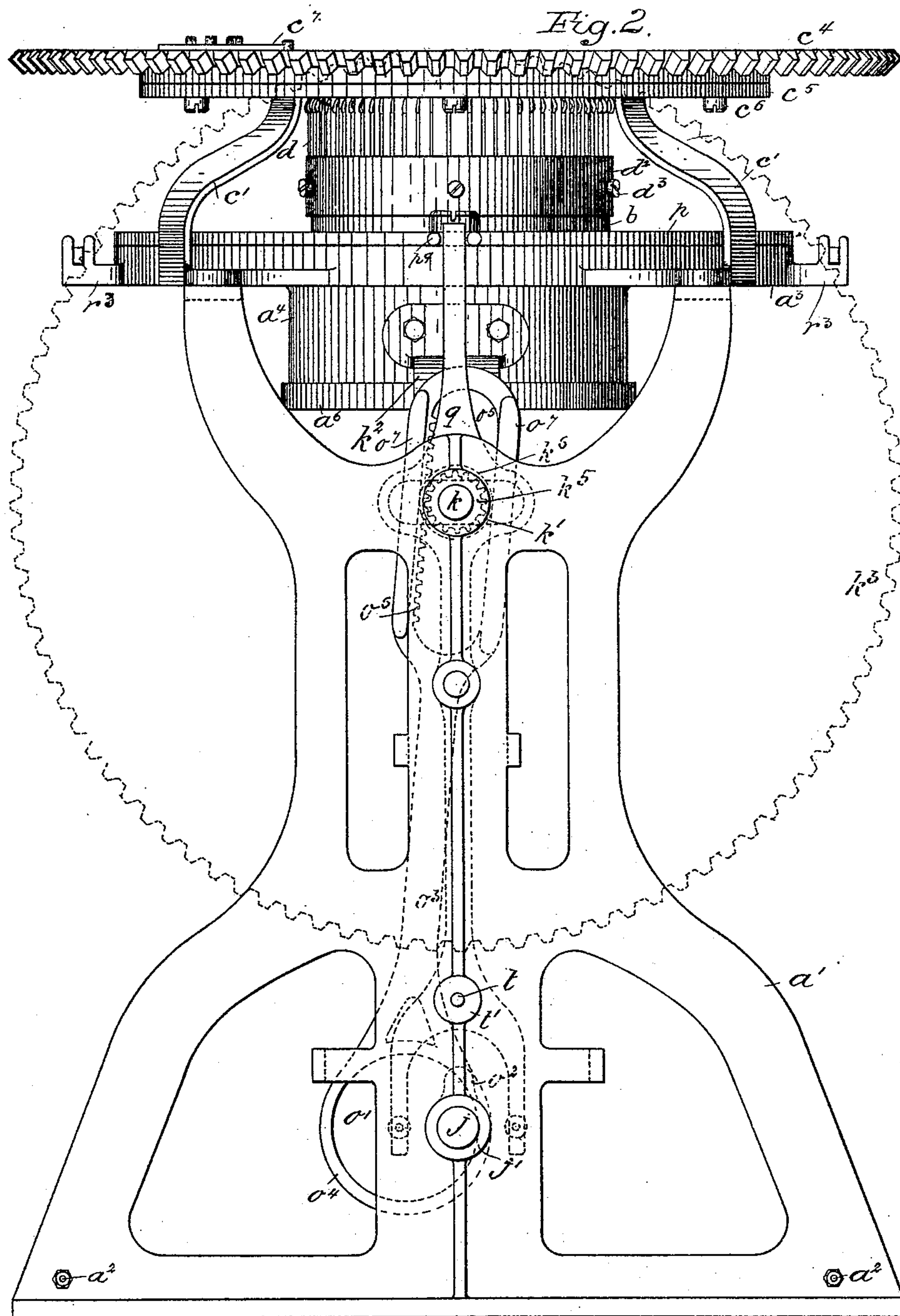
WITNESSES:
Thomas M. Smith.
John W. Achard.

INVENTOR.
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ATT'Y.

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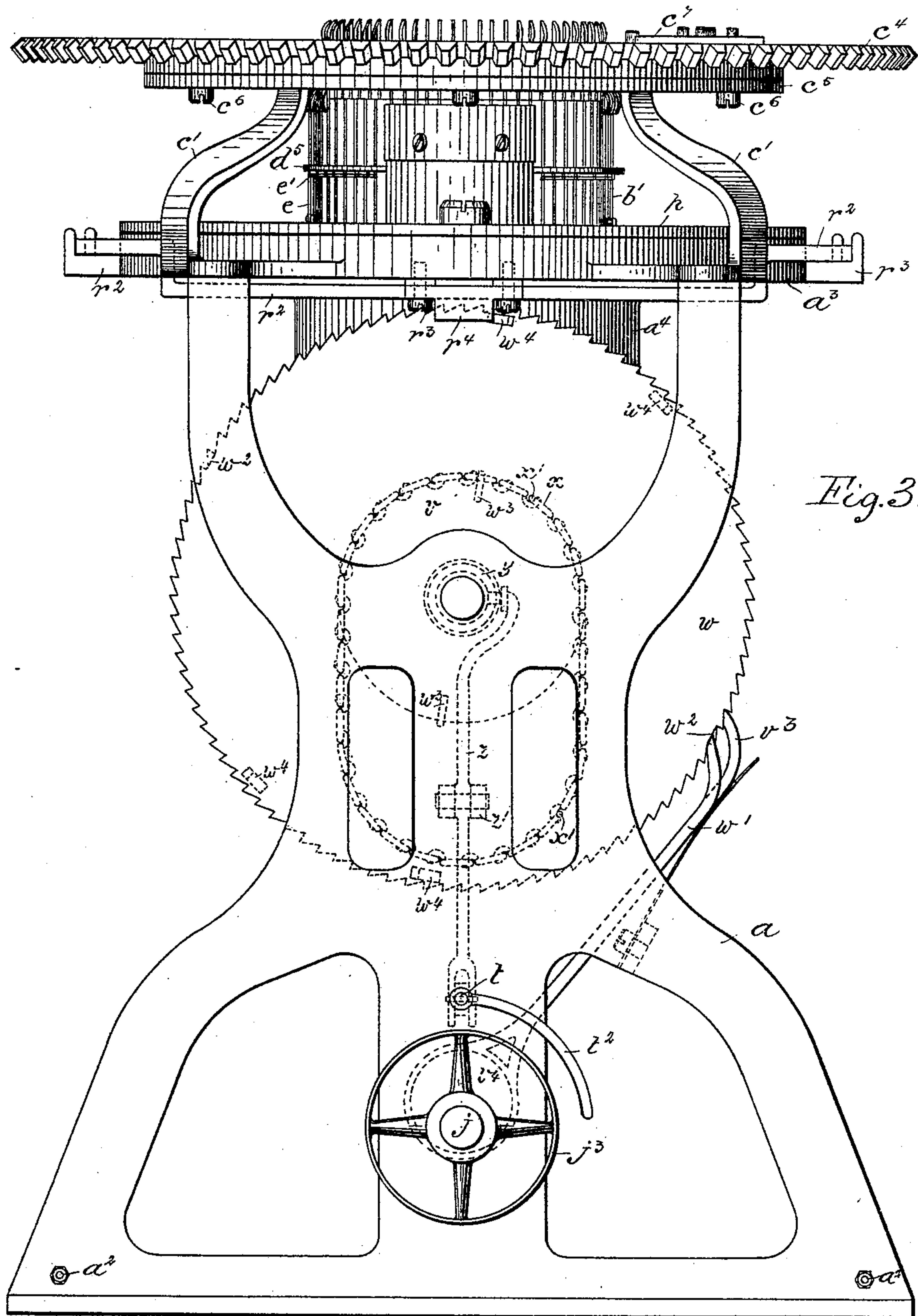
(No Model.)

8 Sheets—Sheet 3.

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Patented June 27, 1893.



WITNESSES:
Thomas M. Smith.
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(No Model.)

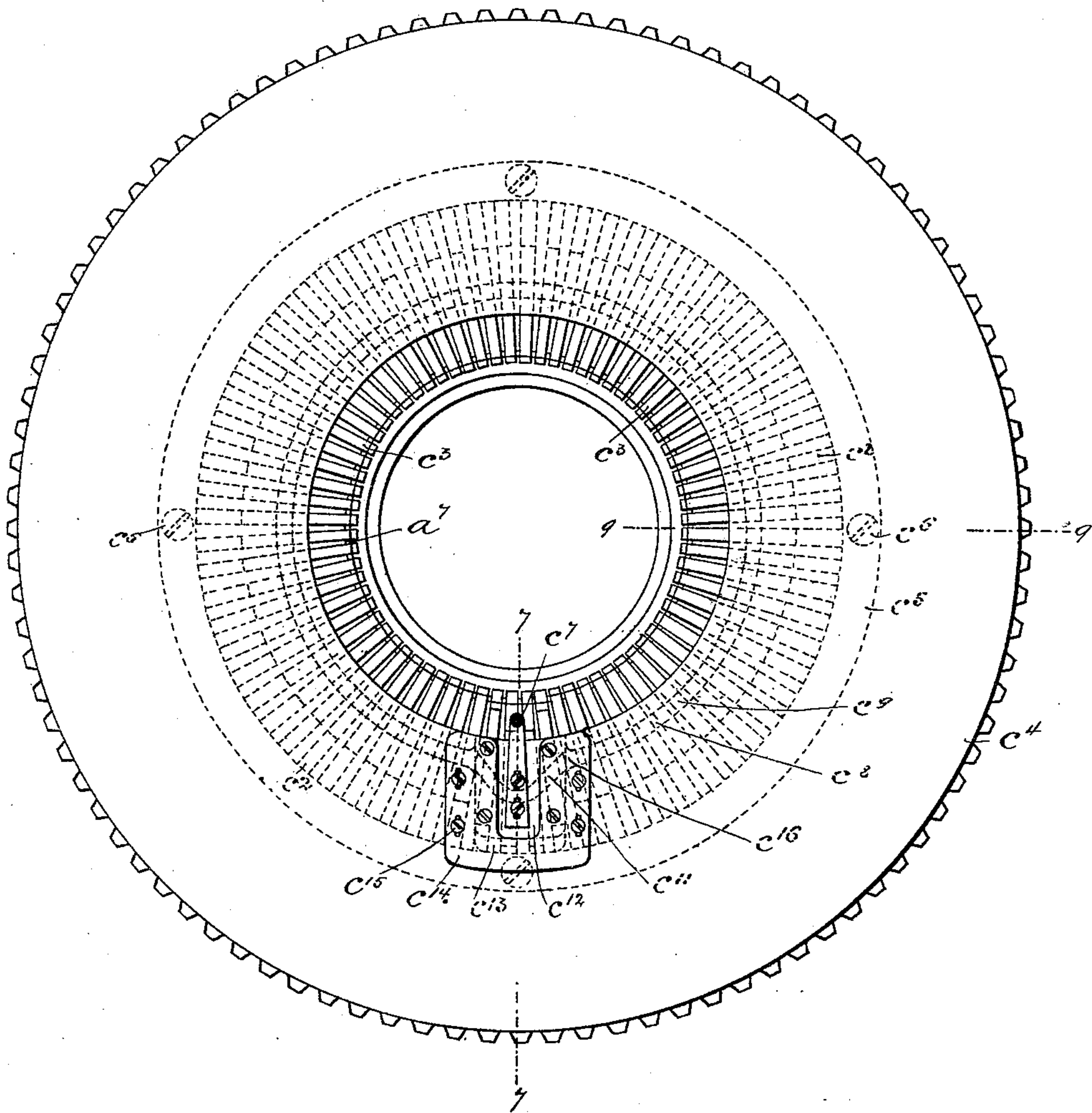
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Fig. 4.



WITNESSES:
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FIG. 5.

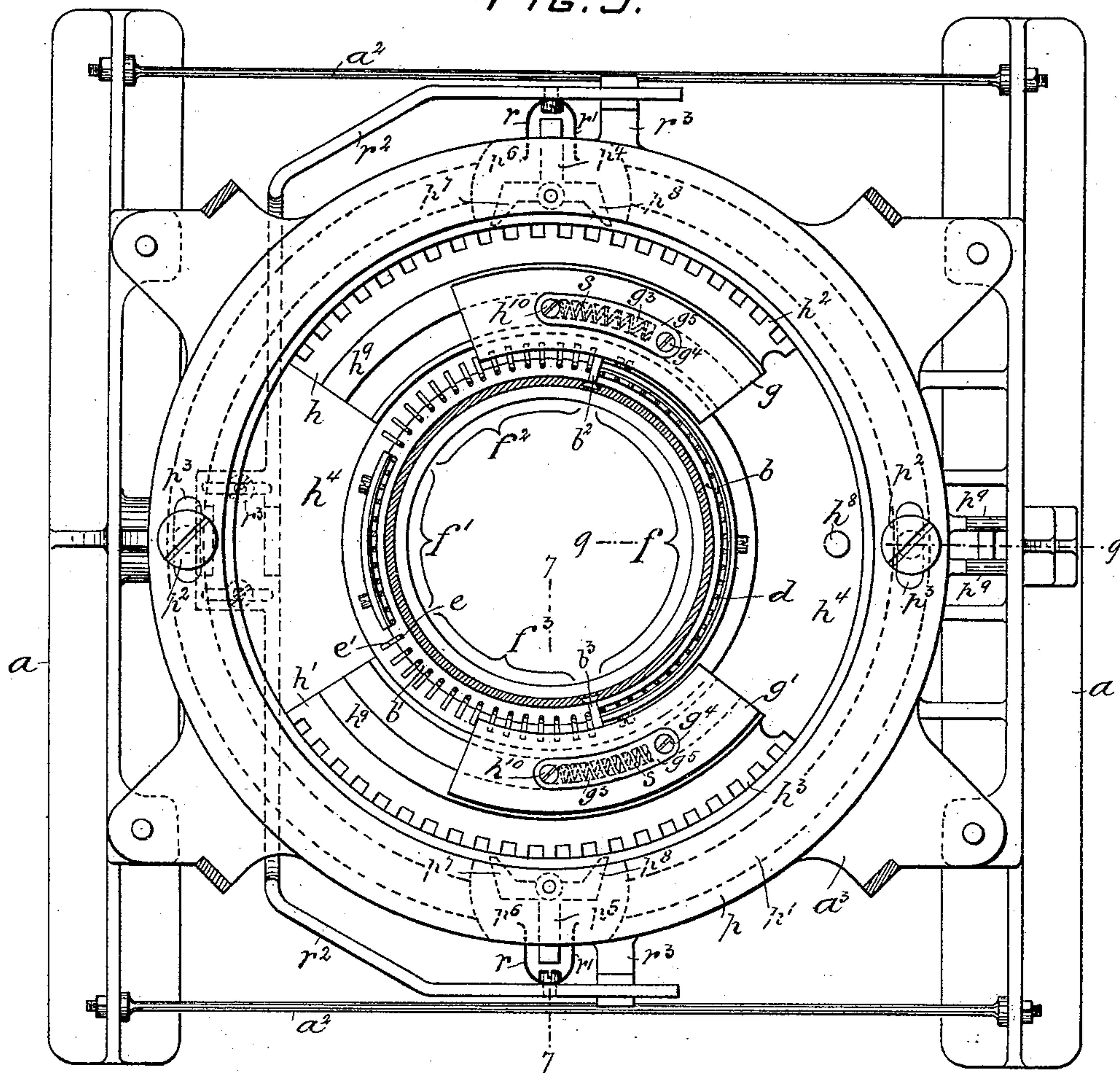
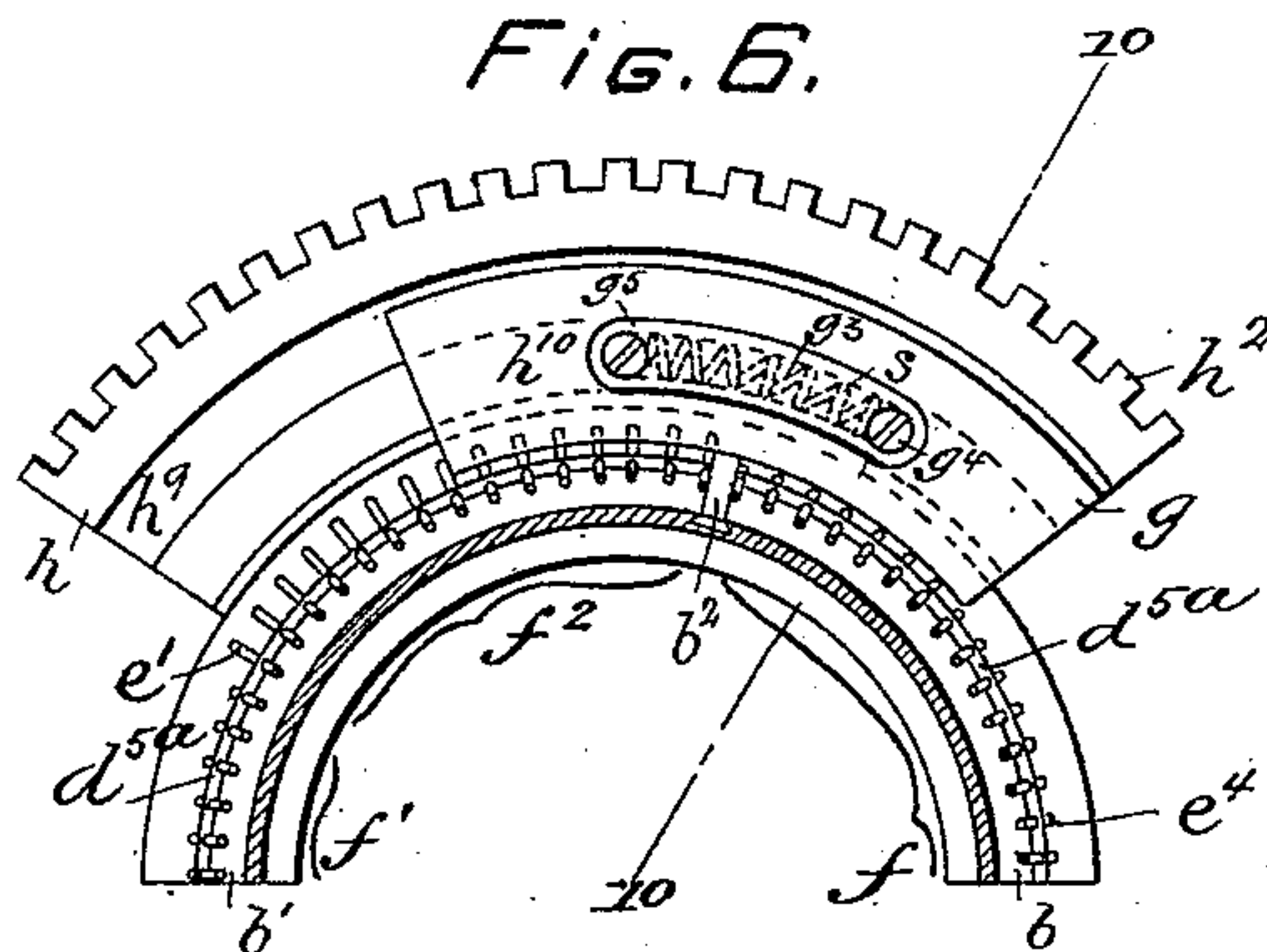


FIG. 6.



WITNESSES:
Thomas M. Smith.
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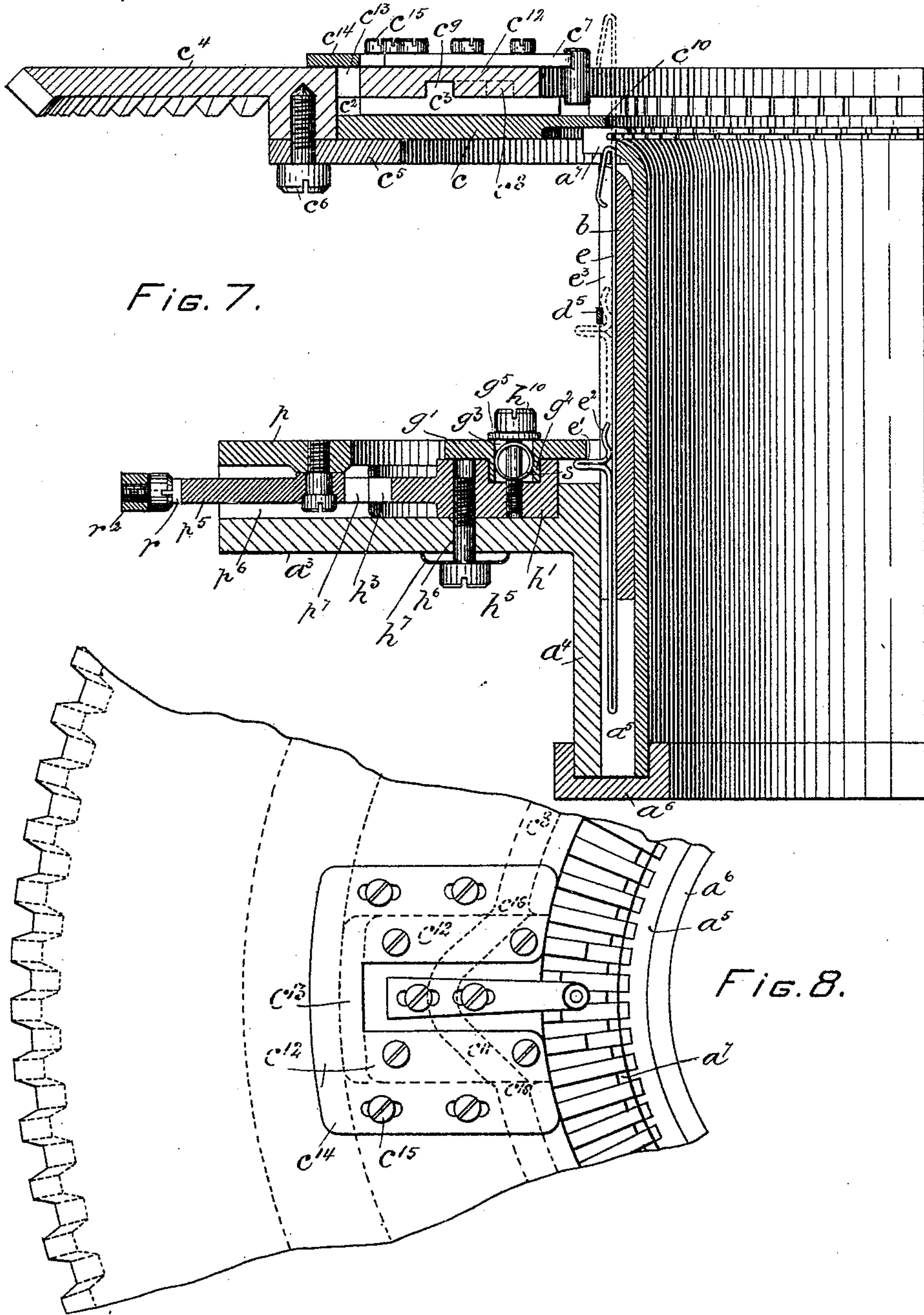
(No Model.)

8 Sheets—Sheet 6.

E. J. FRANCK.
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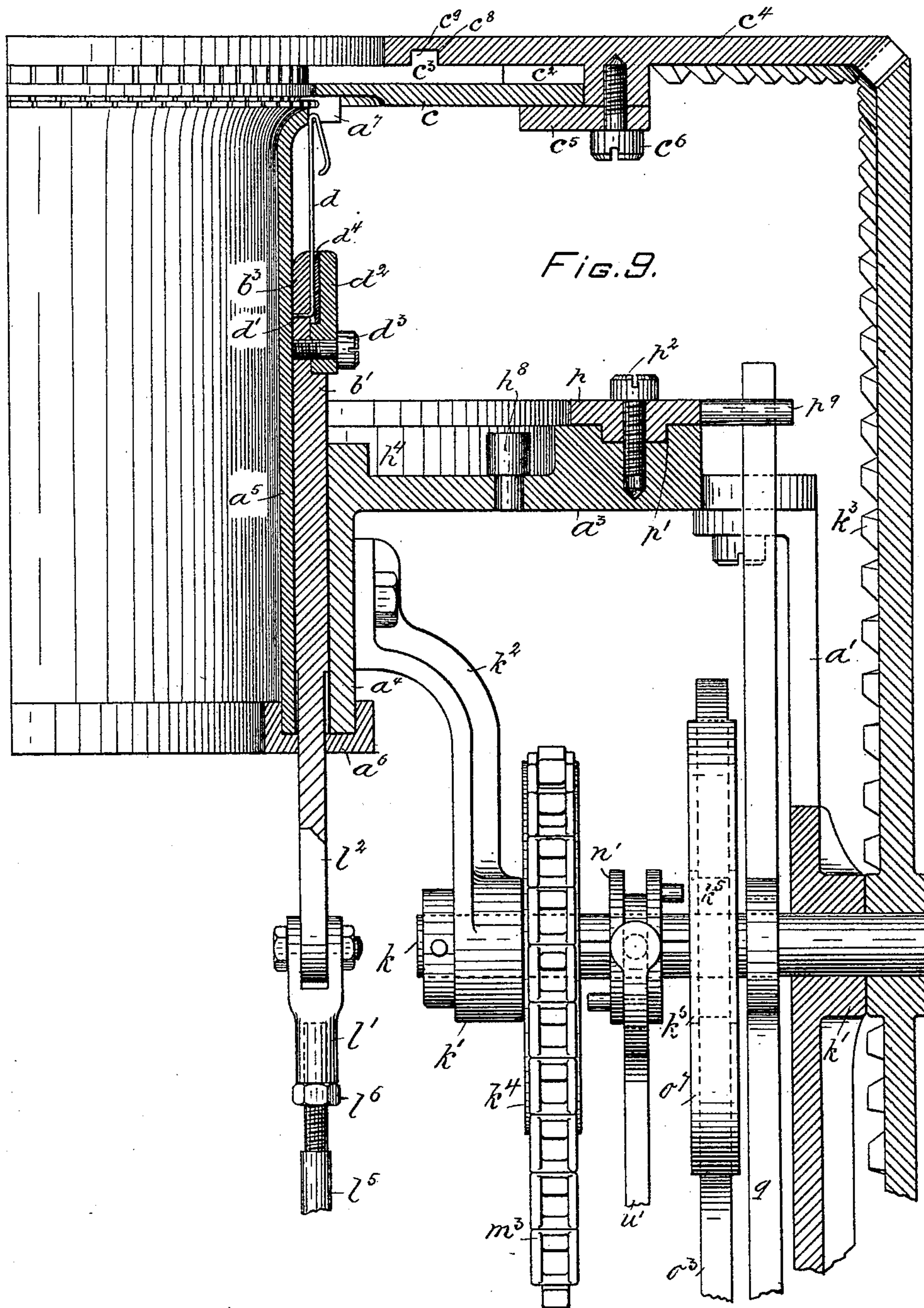
WITNESSES:
Thomas M. Smith.
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E. J. FRANCK.
KNITTING MACHINE.

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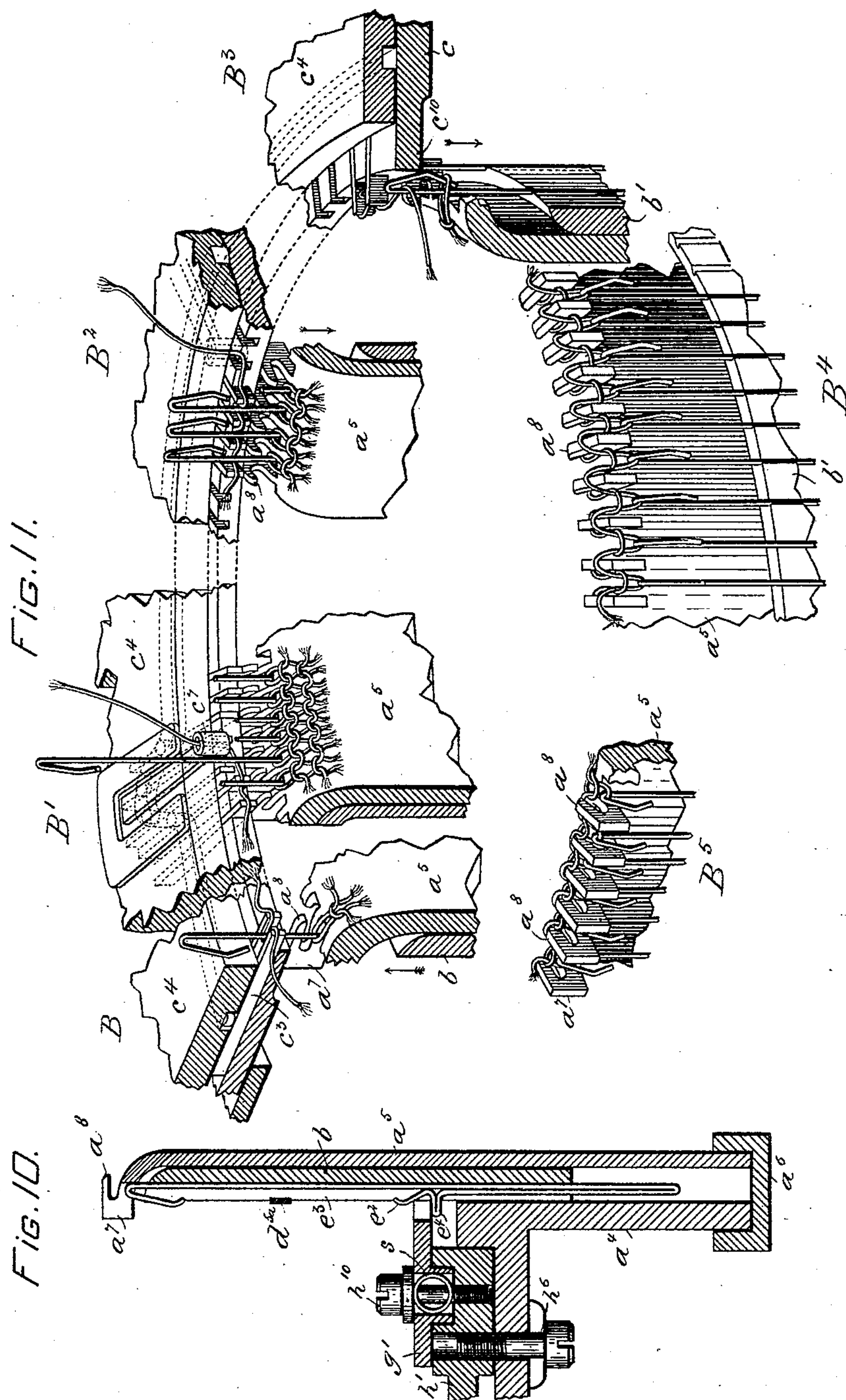
(No Model.)

8 Sheets—Sheet 8.

E. J. FRANCK.
KNITTING MACHINE.

No. 500,121.

Patented June 27, 1893.



WITNESSES.
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UNITED STATES PATENT OFFICE.

EMIL J. FRANCK, OF PHILADELPHIA, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 500,121, dated June 27, 1893.

Application filed July 23, 1892. Serial No. 441,059. (No model.)

To all whom it may concern:

Be it known that I, EMIL JOHN FRANCK, 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 Knitting-Machines, of which the following is a specification.

My invention relates to knitting machines and more particularly to so called circular knitting machines of the type commonly employed in the manufacture of hosiery, underwear and other similar articles.

It is well known that the respective meshes or stitches of a knitted web are formed or fabricated upon a knitting machine by the reciprocation of a series of needles in the direction of their lengths. Hitherto a successive movement of the needles has been attained by the employment of needle, swing, stitch and other cams. These cams formed a curved channel through which the bits or hubs of the needles were caused to travel either by the movement of the support that carried the needles or by the movement of the support that carried the cams. In either case the friction between the needle bits or hubs and the channel of the cams tended to cause the needles to be shifted sidewise. Such sidewise movement of the needles was prevented and the needles were constrained to move in the direction of their length by the presence of rods or bars that constituted the side walls of the needle grooves. However in practice this sidewise thrust of the needles due to the friction that existed between the cams and the needle bits, produced considerable strain and pressure both upon the shanks of the needles and upon the bars or rods forming the grooves in which the needles worked. This strain and pressure caused the shanks of the needles and the bars or rods to be rapidly worn, abraded and otherwise injured. Such injuries rendered the needle cylinder useless in a very short time by causing the needles to work out of alignment, thus producing or fabricating a more or less defective fabric or web. In practice comparatively large or wide bars or rods were employed in order to withstand the sidewise thrust or strain of the needles due to the action of the cams upon the

needle bits or hubs. However, the employment of such bars or rods necessitated the spacing of the needles at considerable distances apart, so that the meshes or stitches of the finished fabric were coarse or large.

The principal objects of my invention are first, to obviate the above mentioned defects and disadvantages and to provide a knitting machine in which the needles are not subjected to a sidewise thrust or strain and consequently may be spaced nearer together than was heretofore possible; second, to provide simple, efficient and durable means for automatically throwing certain of the needles out of and into operation at predetermined intervals in order to effect the narrowing, widening or other shaping of the tube, web or fabric; and third, to construct and arrange the parts of the machine for operation in such manner that the heels of hosiery fabricated thereon are comparatively wide and full.

In a circular knitting machine embodying features of my invention the required rise and fall of the needles is attained by the axial reciprocation of the respective sections that comprise a sectional needle cylinder. In connection with the sectional needle cylinder use may be made of automatic mechanism for throwing one of the sections of the needle cylinder out of and into action, and of devices for attaching and detaching the fashioning needles to or from the continuously operated section or sections of the needle cylinder in order to effect the requisite widening, narrowing or other shaping of the web or fabric.

My invention comprises a knitting machine provided with needles and a sectional needle cylinder for operating said needles.

My invention further comprises a knitting machine provided with needles, a sectional needle cylinder for operating said needles, and devices for throwing one of the sections of the needle cylinder out of action.

My invention further comprises a knitting machine provided with needles, a sectional needle-cylinder for operating said needles, devices for detachably connecting the needles and cylinder and mechanism for automatically actuating, reversing and releasing said members to effect the widening and narrowing of the fabric or web; and my invention

further comprises the improvements in knitting machines hereinafter described and claimed.

The nature, scope and characteristic features of my 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 a side elevation of a knitting machine embodying features of my invention. Fig. 2, is an elevation of the right hand end of the machine illustrated in Fig. 1, showing the gear wheel in dotted lines in order to expose certain other of the working parts to view. Fig. 3, is an elevation of the left hand end of the machine illustrated in Fig. 1. Fig. 4, is a top or plan view of the sinker-head, sinker-bars, thread-carrier, needles and their accessories. Fig. 5, is a similar view partly in section showing the sinker-head removed in order to illustrate the needle cylinder, strippers and their accessories. Fig. 6 is a diagrammatic view showing the needles detachably connected with the sectional needle cylinder and divided into two sets, whereof one has long and the other short bits or hubs. Fig. 7, is a vertical sectional view of the front portion of the needle cylinder stripper mechanism and sinker-head drawn to an enlarged scale and taken on the line 7—7, of Figs. 4 and 5. Fig. 8, is a view of a sector of the sinker-head, showing means for adjusting the throw of the sinker-cam. Fig. 9, is a vertical sectional view of the right hand portion of the needle cylinder, and sinker-head taken on the line 9—9, of Figs. 4 and 5, and showing an instep needle and a section of the ring for operating a stripper. Fig. 10, is a vertical section taken on the line 10—10, of Fig. 6 and showing an elevation of one of the detachable needles having short bits; and Fig. 11, is a perspective view illustrating diagrammatically the manner in which the stitches are completed and thrown off.

In the drawings the standards a and a' , tie-rods a^2 and bed-plate a^3 , constitute the main-frame of the machine. The bed-plate a^3 , is provided with a circular depending flange or rim a^4 , that supports a second circular flange or rim a^5 , disposed concentrically in respect to the flange or rim a^4 , through the intervention of a slotted ring or annulus a^6 . The needle cylinder is divided axially into sections; in the present instance, into two sections b and b' , that are adapted to work upward and downward between the rims or flanges a^4 and a^5 . In practice the needle cylinder is divided by means of a wide saw or other cutting tool, and the spaces thus formed between the sections b and b' , are filled up with feathers b^2 and b^3 , dove-tailed or otherwise secured to the inner rim or flange a^5 . These feathers b^2 and b^3 , not only serve as guides for the sections b and b' , but also constitute the side walls of certain of the needle-grooves that would otherwise be unduly cut away during the operation of dividing the needle cylinder.

c , is a circular sinker-bed or frame carried above the bed-plate a^3 by means of curved posts c' , and provided with radial slots c^2 , in which the sinker-bars c^3 work.

c^4 , is a sinker-gear mounted upon the sinker-bed or frame c , and revolubly connected therewith by means of a ring c^5 , engaging the under side of the sinker-frame c and detachably connected with the sinker-gear c^4 , by means of screws c^6 . The sinker-gear c^4 , carries a thread carrier c^7 , and is provided upon its under side with a cam groove c^8 , that engages projections c^9 , on the sinker-bars c^3 , and thus causes the sinker-bars to be reciprocated in the direction of their length.

The needles may be provided with latches or spring beards and are carried by the respective sections of the needle-cylinder. The needles that are always in operation are preferably clamped to place, whereas the fashioning needles, *i. e.* the needles that are sometimes thrown out of action, are detachably connected with the sectional needle cylinder. Moreover, all the needles are guided by means of slots a^7 , cut or otherwise formed in the flaring or trumpet-shaped upper portion of the rim a^5 , and co-operate with the rim c^{10} , of the sinker-frame that serves as a presser-ring closing and opening the needles. In the present instance the needles d , Fig. 9, are provided with hubs d' , that are inserted into apertures drilled or otherwise formed in an off-set portion b^3 , of the needle cylinder.

d^2 is a curved segmental plate or ring secured to the needle-cylinder by means of screws d^3 , and provided with a corrugated leather covered face d^4 , adapted to engage the needles d , and clamp the same to place.

The needles d , are always in operation and when worn out or otherwise injured may be removed and replaced by new needles by the simple operation of removing the curved plate or ring d^2 .

e , Fig. 7, are the fashioning needles, that is, the needles which are sometimes thrown out of action. These fashioning needles e are provided with bits or hubs e' , and with curved extremities e^2 , which constitute a spring catch for detachably engaging a curved segmental ring or plate d^5 , secured to the needle-cylinder. The needles e , are mounted in needle grooves e^3 , cut or otherwise formed in the needle-cylinder and adapted for their reception.

Referring now to Figs. 4 and 5, the instep needles comprise a group f , of rigid needles d ; the heel needles comprise a group f' , of similar needles; and the fashioning needles comprise groups f^2 and f^3 , of the detachable needles e . This arrangement of the fast and detachable needles is especially adapted for the production of hosiery and is advantageous in that the formation of unnecessary needle grooves e^3 , in the needle-cylinder is avoided. However, if preferred, the needles of the machine may be detachably connected with the needle-cylinder as shown in Figs. 6 and 10.

In such case the bits or hubs e^4 , Figs. 6 and 10, of the heel and instep needles f' and f , are shorter than the bits or hubs of the fashioning needles f^2 and f^3 , (the latter being omitted in Fig. 6,) and the ring d^{5a} , extends around the respective sections of the needle cylinder into position for engaging all the needles.

g and g' are strippers adapted to be shifted into range of the bits or hubs e' , of the fashioning needles in order to detach the same from the needle cylinder, and out of range of the bits or hubs e' , in order to permit the fashioning needles to rise and fall with the needle-cylinder.

h and h' , are carriages provided with peripheral racks h^2 and h^3 , and afforded a range of travel in ways h^4 , cut or otherwise formed in the top surface of the bed-plate a^3 .

h^5 , are screws inserted into the under side of the carriages h and h' , and having their shanks adapted to work in curved slots h^6 , cut or otherwise formed in the bed-plate a^3 , in order to prevent accidental displacement of the carriages in an upward direction.

h^7 , are dish-shaped spring washers interposed between the heads of the screws h^5 , and the under side of the bed-plate a^3 , in order to prevent accidental movement of the carriages h and h' .

h^8 , is a buffer projecting upward from the bed-plate a^3 , into position for limiting the range of travel of the carriages. The upper faces of the carriages h and h' , are provided with curved ways h^9 , in which lips g^2 , projecting from the under side of the strippers g and g' , are adapted to work.

The strippers g and g' , are provided with slots g^3 , adapted for the reception of spiral springs s , having one of their respective extremities connected with the strippers g and g' , by means of screws g^4 , and having the other of their extremities connected with the carriages h and h' , by means of screws h^{10} . These springs s , are retained to place by cover plates g^5 , and afford means for permitting the carriages h and h' , to advance for a short distance, while the strippers g and g' , remain at rest. This is important because it sometimes happens that the strippers collide with the side portion of a fashioning needle bit or hub by reason of the improper timing of the operations of the machine. In such case the spring s , yields and the stripper remains at rest while the carriage is advanced, so that the fashioning needle bit or hub is not broken, bent or otherwise injured. Subsequently the needle bit is removed out of range of the stripper by the further operation of the machine, whereupon the spring s , causes the stripper to be again shifted in position for passing over and holding down the bits or hubs of the succeeding fashioning needles.

In fabricating a circular web or tube, the sections b and b' , of the needle-cylinder, are alternately lifted and depressed, and the thread carrier c^7 , and sinker-cam c^9 , are revolved continuously in one direction through

the intervention of suitable mechanism, a preferred form of which will be hereinafter described. These movements are timed in such manner that as the thread carrier approaches the outside needle of the section b , the same is elevated into position for permitting the yarn or thread to be laid under the spring beard of said needle, as shown at B. The sinker-bar corresponding to said needle is drawn outward from the center of the needle cylinder during the insertion of the thread or yarn beneath the spring beard thereof, as shown at B', and is subsequently thrust forward toward the center of the cylinder, as shown at B' and B², and thus engages the yarn or thread and pushes the same inward past the needle to form the stitch, it being understood that the sinker bar holds the thread or yarn in such position while the thread is being laid onto the rest of the needles that are carried by the section b . As the thread carrier approaches the center needles of the section b , as shown at B', the latter is constantly being elevated, the thread is being inserted beneath the spring beards of the needles, and the sinker bars appertaining to the needles are projected forward toward the center of the needle cylinder one after another and as soon as the thread has been laid onto the needles to which they appertain. After the thread carrier passes the center of the section b , and while it is approaching the opposite extremity thereof, the section b , is being depressed as shown at B³. During the depression of the section b , the thread is laid onto the remaining needles thereof and is pushed inward toward the center of the cylinder and held in such position, by means of the sinker bars, as shown at B², which for this purpose, are successively operated in the manner hereinabove described. The thread carrier and sinker bars then lay the thread or yarn onto the needles of the section b' , in precisely the manner above described with reference to the section b . While the thread or yarn is being laid onto the needles of the section b , the section b' , is depressed with the result that the spring beards of the needles carried thereby are closed by contacting with the periphery of the rim c^{10} , of the sinker-bed c , as shown at B³, in precisely the same manner as they would be closed by a presser ring, so that the thread is drawn by means of the closed beards over the fingers a^8 , and through the loops of the previously formed course of stitches of the web as shown at B⁴, and these loops escape over the closed spring beards as at B⁵. The repetition of the above described operations results in the production of a knitted tube, which is held down by means of fingers a^8 , and which is fed away from the machine through the interior of the needle cylinder. The size of the stitches or meshes of this web may be increased or diminished by adjusting the throw of the sinker-bars c^3 . This result is attained by making the operative portion c^{11} , of the sinker-cam c^3 , adjustable radially in

respect to the center of the sinker-gear c^4 . For this purpose the portion c^{12} , of the gear that carries the operative part c^{11} , of the sinker-cam c^8 , is made separate and is afforded a range of movement in a slot c^{13} , cut or otherwise formed in the sinker-gear.

c^{14} , is a plate rigidly connected with the portion c^{12} , of the gear c^4 , and adapted to rest upon the portions of the gear that are adjacent to the slot c^{13} .

c^{15} , are set-screws having their shanks working in slots in the plate c^{14} , in such manner that the same may be adjusted backward or forward and then clamped to place. The thread-carrier c^7 , is also connected with the portion c^{12} , of the gear, c^4 , and consequently is maintained in proper position in respect to the operative portion c^{12} , of the sinker-cam. The portions of the sinker-cam c^8 , that are contiguous to the open extremities of the operative portion c^{11} thereof, are slightly expanded as at c^{16} , in order to avoid the presentation of sharp corners and insure the free passage of the projections of the sinker-bars c^3 , through the groove of the sinker-cam.

In knitting a flat web, one section b' , of the needle-cylinder is permitted to rise and fall and the other section b , is thrown out of action. The sinker-gear c^4 , is then caused to oscillate first in one direction and then in the other, in order to cause the thread-carrier c^7 , to present the thread backward and forward to the needles of the section b' , and also to cause the sinker-bars c^3 , to properly press the thread under the spring-beards of the same. The flat web may be narrowed by shifting the strippers g and g' , toward the left in Fig. 5, into position for passing above the hubs or bits e' , of the needles e , as shown in Fig. 7, so that when the section b' , rises such needles are prevented from rising with it, and are consequently held out of action. The strippers g and g' , may be gradually shifted toward the left with an intermittent motion, in which case the web is gradually narrowed. The web may be widened out again to its full or normal width by shifting the strippers g and g' , toward the right in Fig. 5, thus releasing the bits or hubs e' , of the needles and permitting the curved portions e^2 thereof, to engage the ring d^5 , as shown by dotted lines in Fig. 7, whereby the needles are permitted to rise and fall with the section b' .

The machine illustrated in the drawings is especially arranged for the production of hosiery and is provided with seventy-two needles, whereof thirty comprise the instep needles f , twelve the heel needles f' , and fifteen each of the sets f^2 and f^3 , of fashioning needles, so that forty-two needles are available for fabricating the heel portions of the hosiery, whereby the formation of full and wide heel portions is insured.

The sections b and b' , of the needle cylinder, the sinker-gear c^4 , and carriages h and h' , may be automatically operated and controlled in substantially the manner above

pointed out by means of various types of mechanism. However, a description will now be given of one type of mechanism that has been found practically efficient for such purposes.

i and i' , are positively driven pulleys, whereof one i , is of larger diameter than the other i' , in order to impart two different rates of speed to the machine. The pulley i , serves to drive the machine at a comparatively high rate of speed during the formation of a tubular web, and the pulley i' , serves to drive the machine at a comparatively slow rate of speed during the operations of widening and narrowing a flat web.

j , is the main driving shaft of the machine and is revolubly supported in bearings j' , carried by the standards a . and a' . This shaft j , is provided with one tight pulley j^2 , and with two loose pulleys j^3 and j^4 .

i^2 , is a belt appertaining to the pulley i , and adapted to normally ride on the loose pulley j^3 . This belt i^2 , may be shifted onto the tight pulley j^2 , and in such case serves to drive the main shaft j , at a comparatively high rate of speed. It may be remarked that the pulley i , is provided with a flange i^3 , that serves to prevent the belt from running off the same when it is in engagement with the tight pulley j^2 .

i^4 , is a belt appertaining to the pulley i' , and adapted to normally ride on the loose pulley j^4 . This belt i^4 , may be shifted onto the tight pulley j^2 , and in such case serves to drive the main shaft j , at a comparatively low rate of speed.

k , is a counter-shaft revolubly supported in bearings k' , carried by the standard a' , and by a bracket k^2 , depending from the rim or flange a^4 , of the bed-plate a^3 . This counter-shaft k , carries a gear-wheel k^3 , that meshes with and drives the sinker-gear c^4 . It has been stated that when both the sections b and b' , of the needle-cylinder are in operation, the sinker-gear c^4 , makes complete revolutions and that when only the section b' , is in operation the sinker-gear c^4 , is reciprocated backward and forward. These results are accomplished by means of the following parts:

l , is an eccentric keyed or otherwise secured to the main shaft j .

l' , is a socket pivotally attached to a lug l^2 , that is connected with the section b' , and adapted to work in a suitable slot cut or otherwise formed in the ring a^6 .

l^3 , is an eccentric strap provided with a socket l^4 .

l^5 , is a link having its respective extremities provided with threads of opposite pitch adapted to engage corresponding threads in the sockets l' and l^4 , so that the section b' , of the cylinder may be adjusted upward or downward by the simple operation of turning the link l^5 , in one direction or the other as may be required.

l^6 , is a jam-nut for locking the link l^5 , to place in its socket.

The eccentric l , serves to continuously lift and depress the section b' , of the needle-cylinder, which is advantageous because some of the needles of the section b' , are in operation during the formation of a tube and also of a shaped flat web.

m , is a sleeve revolubly mounted upon the main shaft j , and provided with a sprocket-wheel m' , and an eccentric m^2 . The eccentric m^2 , actuates the section b , of the needle-cylinder through the instrumentality of an adjustable link and its accessories which are exactly similar to the link and accessories of the eccentric l , and which are consequently designated by the same reference letters.

k^4 , is a sprocket wheel revolubly mounted on the counter-shaft k .

m^3 , is a sprocket-chain engaging the sprocket-wheels k^4 and m' .

n and n' , are friction-clutches respectively splined to the shafts j and k and adapted to engage the sleeve m , and sprocket-wheel k^4 , in order to cause the rotary motion of the shaft j , to impart a reciprocating movement to the section b , of the needle-cylinder and a rotary motion to the counter-shaft k . The rotation of the counter-shaft k , causes the gear k^3 , to drive the sinker-gear c^4 , and with it the thread-carrier c^7 , around the needles of the machine, with the result that a knitted tube is produced in the manner hereinabove indicated.

o , is a sleeve revolubly mounted upon the shaft j , and provided with an eccentric o' and a tappet-arm o^2 .

k^5 , is a pinion revolubly mounted upon the shaft k , and provided with circular side plates or flanges k^6 .

o^3 , is an arm connected at one extremity thereof by means of a strap o^4 , with the eccentric o' , and provided at the other extremity with a slot o^5 , for the reception of the pinion k^5 .

o^6 , is a rack cut or otherwise formed upon one of the interior walls of the slot o^5 , and adapted to mesh with the pinion k^5 .

o^7 , are lips adapted to ride on the circular side plates or flanges k^6 , in order to guide the upper end of the arm o^3 , and to insure the proper clearance between the teeth of the rack o^6 , and of the pinion k^5 .

p , is a ring afforded a range of reciprocating motion in suitable ways p' , cut or otherwise formed upon the upper surface of the bed-plate a^3 .

p^2 , are screws connected with the bed-plate a^3 , and working in slots p^3 , in the ring p , in order to prevent the same from being accidentally lifted upward.

p^4 and p^5 , are pawls pivotally connected with the under side of the ring p , and adapted to work in slots p^6 , cut or otherwise formed for their reception in the bed-plate a^3 . The pawls p^4 and p^5 , are provided respectively with two teeth p^7 and p^8 , adapted to mesh with the teeth of the peripheral racks of the carriages h and h' , so that when the ring p , is recipro-

cated backward and forward, the teeth p^7 may serve to shift the carriages h and h' , toward the left in Fig. 5, and the teeth p^8 , may serve to shift the carriages h and h' , toward the right in said figure.

q , is a tappet-rod centrally pivoted to the right hand standard a' , and having one extremity thereof bifurcated and provided with rollers disposed in range of the tappet-arm o^2 , and having the other extremity thereof located between pins p^9 , projecting radially from the periphery of the ring p .

When the clutches n and n' are shifted into engagement with the sleeve o , and pinion k^5 , the sleeve m , and sprocket wheel k^4 , are thrown out of action, and the rotary motion of the shaft j , causes the rock-shaft k , to be oscillated first in one direction and then in the other through the intervention of the arm o^3 , and its accessories, and also causes the ring p , to be oscillated backward and forward through the intervention of the tappet-rod q . It is to be understood that the section b , of the needle-cylinder is thrown out of action by the release of the sleeve m . Under these circumstances the section b' , of the needle-cylinder, is impelled upward and downward; the sinker-gear c^4 , and thread-carrier c^7 , are oscillated backward and forward, and the ring p , and pawls p^4 and p^5 , are also oscillated backward and forward, and these movements of the above mentioned parts are adapted to effect the production of a flat knitted web. This web may be narrowed by turning the pawls p^4 and p^5 , into position for permitting the teeth p^7 , to drive the carriages h and h' , toward the left in Fig. 5, whereby the strippers g and g' , are caused to engage the bits or hubs of the groups f^2 and f^3 , of the fashioning needles and thus throw the latter out of action. These fashioning needles may be again thrown into action in order to permit of the widening of the web by shifting the pawls p^4 and p^5 , into position for permitting the teeth p^8 , to drive the carriages h and h' , and strippers g and g' , in a reverse direction, *i. e.* toward the right in Fig. 5. The position of the pawls p^4 and p^5 , is controlled by means of arms r and r' , carried by a frame-work r^2 , afforded a range of sliding movement in suitable bearings r^3 , carried by the under surface and edges of the bed-plate a^3 . The position of the clutches n and n' , frame-work r^2 , and belts i^2 and i^4 , and consequently the speed of the machine and character of the resultant product are automatically controlled through the instrumentality of suitable mechanism, of which a preferred type will now be described.

t , is a rod afforded a range of end play in suitable bearings t' , formed in the standards a and a' .

u and u' , are levers centrally pivoted to suitable brackets carried by the right hand standard a' , Fig. 1, and having one of their extremities connected with the rod t , by means of slotted connections, and having the other

of their extremities adapted respectively to simultaneously shift the clutches n and n' in the same direction.

t^2 , is a belt shipper carried by the other end 5 of the rod t , and adapted to bring the belts i^2 and i^4 successively into engagement with the tight-pulley j^2 . When the rod t , is shifted toward the right in Fig. 1, the belt i^2 drives the shaft j , at a comparatively high rate of speed, 10 and the shaft j , operates the sections b and b' , of the needle-cylinder, and the sinker-gear c^4 , in such manner that a tube is rapidly knit. When the rod t , is shifted toward the left, the belt i^4 , drives the shaft j , at a comparatively 15 low rate of speed and the shaft j , operates the section b' , of the needle cylinder, reciprocates the sinker-gear c^4 and its accessories, and causes the strippers g and g' , to throw fashioning needles into or out of operation, with 20 the result that a flat web is fabricated and shaped.

It may be remarked that the belts i^2 and i^4 , are both brought onto the loose pulleys before either of them can be brought into engagement with the tight pulleys j^2 , whereby 25 undue shocks and jars that might arise from a sudden reversal of the direction of motion of the countershaft k , and parts connected therewith, are avoided.

v , is a pattern-chain feed-wheel revolubly mounted upon a stud v' , carried by the left-hand standard a , in Fig. 1.

v^2 , is a dish-shaped spring washer for preventing retrograde motion of the pattern-chain wheel v . 35

v^3 , is a spring controlled pawl actuated by an eccentric v^4 , keyed to the shaft j , and adapted to rotate the pattern-chain feed-wheel with a positive continuous motion.

w , is a ratchet-wheel revolubly mounted upon the stud v' . 40

w' , is a spring controlled pawl adapted to mesh with the teeth of the ratchet-wheel w , and to work in peripheral recesses w^2 therein, 45 so that the ratchet-wheel w , is driven forward by the pawl w' , until the latter falls into one of the recesses w^2 , whereupon the ratchet-wheel comes to rest.

x , is a pattern-chain carried by a suitable 50 drum connected with the feed-wheel v , and provided with sidewise projecting pins x' , adapted to contact with suitable projections w^3 , on the inner face of the ratchet-wheel w , in order to rotate the latter and thus bring 55 the pawl w' , out of the recesses into engagement with the teeth of the ratchet-wheel, so that the ratchet-wheel w , is advanced for a certain distance, then permitted to come to rest, and then advanced again.

w^4 , are wedge-shaped pieces projecting from the respective faces of the ratchet-wheel w , into range of pins r^4 , depending from the frame-work r^2 . These wedge-shaped pieces 60 w^4 , by contacting with one or the other of the pins r^4 , serve to shift the frame-work r^2 , and with it the forks r and r' , in one direction or the other, thus causing the pawls p^4

and p^5 , to drive the carriages h and h' , and strippers g and g' , toward the right or left in Fig. 5, as may be required. 70

y , is a cam carried by the ratchet-wheel w , and adapted to shift the rod t , toward the right or left in Fig. 1, through the instrumentality of a cam-lever z , pivotally connected with a bracket z' , carried by the standard a , 75 of the machine and connected with the rod t , by a slotted connection t^3 .

Inasmuch as substantially all of the working parts are located between the standards a and a' it follows that the machine presents 80 an exceedingly neat and compact appearance.

For the sake of a further explanation of my invention, a description will now be given of the mode of operation of the hereinabove described machine in the production of 85 hosiery, but it must be borne in mind that a machine embodying features of the invention may be advantageously employed in the production of other articles.

The leg or tubular portion of the stocking 90 is produced by the alternate elevation and depression of the sections b and b' , of the needle cylinder in connection with the revolution of the sinker-gear and its accessories. During this operation the machine is driven 95 at a comparatively high rate of speed by means of the belt i^2 , and its complemental pulleys. It is to be understood that the ratchet-wheel w , and ring p , are at rest and that the pattern chain feed wheel v , is in motion. 100 Upon the completion of the leg portion of the stocking, the pattern-chain x , advances the ratchet wheel w , into gear with the pawl w' , whereby the ratchet-wheel w , is continuously advanced. This motion of the ratchet-wheel 105 w , and cam y , causes the rod t , to be shifted toward the left in Fig. 1, with the following results:—The belt i^2 , is shifted onto the loose pulley j^3 , and the belt i^4 , is shifted onto the tight-pulley j^2 , the sprocket-chain m^3 , and section 110 b , of the needle-cylinder are thrown out of action, and the ring p , and sinker-gear c^4 , are oscillated backward and forward. Under these circumstances a flat web destined to constitute the heel portion of the stocking is 115 formed. During the formation of the heel portion of the stocking, one of the wedge-shaped pieces w^4 , on the outer face of the ratchet-wheel w , collides with its corresponding pin r^4 , and thus serves to shift the frame-work 120 r^2 , toward the left in Figs. 1 and 5, whereby the teeth p^7 , are brought into position for driving the carriages h and h' , and strippers g and g' , alternately toward the left in Fig. 5, whereby a fashioning needle appertaining to 125 the group f^2 , is thrown out of action, then a fashioning needle appertaining to the group f^3 , and so on, first throwing out a fashioning needle on one side and then on the other at the formation of each course of stitches, until 130 only the heel needles f' , remain in action. The continued revolution of the ratchet-wheel w , causes a wedge-shaped piece w^4 , on the inside face thereof to shift the frame-work

7², toward the right in Fig. 5, whereby the paws p^4 and p^5 , are brought into position for permitting the teeth p^8 , to drive the carriages h and h' , and strippers g and g' , toward the right in Fig. 5, thus causing the fashioning needles to be released singly and successively, first on one side and then on the other at each course or row of stitches, until the web is brought out to its full width. The rod t , is then shifted toward the left in Fig. 1, and the pawl w' , works in another one of the peripheral recesses of the wheel w , so that the tubular foot portion of the stocking is formed in substantially the same manner as the leg portion thereof. The toe portion of the stocking is then formed on the needles of the section b' , of the needle-cylinder, which for this purpose is permitted to operate by itself, the section b , of the needle-cylinder being thrown out of action by the revolution of the wheel w , and in substantially the manner hereinabove set forth in connection with the production of the heel portion. The stocking may then be removed and finished for use in any preferred manner.

It will be obvious to those skilled in the art to which my invention relates that modifications may be made in details of construction and arrangement without departing from the spirit thereof. Hence my invention is not limited to the exact construction and arrangement of parts hereinabove set forth and illustrated in the accompanying drawings; but

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a knitting machine, needles, and a sectional needle cylinder for operating said needles, substantially as and for the purposes set forth.

2. A knitting machine provided with needles, a sectional needle cylinder for operating said needles, and means for reciprocating the sections of said cylinder, substantially as and for the purposes set forth.

3. A knitting machine provided with needles, a sectional needle cylinder for operating said needles, and positively driven eccentrics and link-work interposed between said eccentrics and the sections of the cylinder, substantially as and for the purposes set forth.

4. A knitting machine provided with needles, a sectional needle cylinder for operating said needles, a positively driven shaft, and means interposed between the shaft and sections of the cylinder for reciprocating the latter, substantially as and for the purposes set forth.

5. In a knitting machine, needles, two concentric rims forming ways, a sectional needle cylinder working in said ways, and means for actuating the sections of the needle cylinder, substantially as and for the purposes set forth.

6. In a knitting machine, needles, two concentric rims forming ways, feathers projecting from one of said rims, a sectional needle cylinder working in said ways and between

said feathers, and means for actuating the sections of the needle cylinder, substantially as and for the purposes set forth.

7. In a knitting machine, an exterior rim, an interior rim provided with guide slots, a sectional needle cylinder intermediate of said rims, means for reciprocating the sections of the needle cylinder, and needles carried by said sections and working in the guide slots of the interior rim, substantially as and for the purposes set forth.

8. In a knitting machine, a sectional needle cylinder, needles, a sectional ring for engaging said needles, and means for reciprocating the complementary sections of the cylinder and ring, substantially as and for the purposes set forth.

9. In a knitting machine, a sectional needle cylinder and its complementary actuating mechanism, needles carried by the respective sections of the cylinder, sinkers, and a cam provided with an adjustable section for increasing or diminishing the throw of the sinkers, substantially as and for the purposes set forth.

10. In a knitting machine, a sectional needle cylinder and its complementary actuating mechanism, needles carried by the respective sections of the cylinder, sinkers, and means for actuating the sinkers, substantially as and for the purposes set forth.

11. In a knitting machine, a sectional needle cylinder and its complementary actuating mechanism, spring-beard needles carried by the respective sections of said cylinder, a sinker bed provided with a lip adapted to serve as a presser ring for said needles, sinkers, and means for actuating said sinkers, substantially as and for the purposes set forth.

12. In a knitting machine, a sectional needle cylinder and its complementary actuating mechanism, spring-beard needles carried by the respective sections of said cylinder and a bed provided with a lip adapted to serve as a presser ring for said needles, substantially as and for the purposes set forth.

13. In a knitting machine, a sectional needle cylinder, needles provided with spring catches for engaging the needle cylinder, and means for actuating the sections of the needle cylinder, substantially as and for the purposes set forth.

14. In a knitting machine, a sectional needle cylinder, means for alternately reciprocating the sections of said cylinder, a set of needles carried by each of the sections of the needle cylinder, and a thread carrier adapted to co-operate with each set of needles, substantially as and for the purposes set forth.

15. A knitting machine comprising a sectional needle cylinder, means for lifting and depressing the sections of said cylinder, needles, a thread-carrier, sinkers, and means for actuating said sinkers and thread-carrier, substantially as and for the purposes set forth.

16. A knitting machine comprising concentric rims, a sectional needle cylinder intermediate of said rims, means for lifting and de-

pressing the sections of said cylinder, spring-beard needles, a thread-carrier, a presser, sinkers, and means for actuating said sinkers and thread-carrier, substantially as and for the purposes set forth.

17. In a knitting machine, a sectional needle cylinder, means for actuating the sections of said cylinder, a sectional ring carried by the needle cylinder, and needles respectively provided with bits and curved extremities for engaging said ring, substantially as and for the purposes set forth.

18. In a knitting machine, a sectional needle cylinder, needles detachably applied to the sections of said cylinder, and means for lifting and depressing said sections, substantially as and for the purposes set forth.

19. In a knitting machine, needles provided with bits or hubs, a sectional needle cylinder provided with apertures for the reception of needle bits or hubs, a ring for clamping the needles to place, and means for lifting and depressing said sections, substantially as and for the purposes set forth.

20. In a knitting machine, a sectional needle cylinder provided with apertures for the reception of needle bits or hubs, a ring provided with a corrugated leather covered face for clamping said needles, and means for lifting and depressing said sections, substantially as and for the purposes set forth.

21. In a knitting machine, a sectional needle cylinder, needles carried by the respective sections of said cylinder, mechanism for actuating the sections of the cylinder, and means for throwing the actuating mechanism of one of said sections out of action, substantially as and for the purposes set forth.

22. In a knitting machine, a sectional needle cylinder, needles carried by the respective sections of said cylinder, a thread-carrier, devices for rotating and reciprocating said thread carrier, mechanism for actuating the sections of the cylinder, and means for throwing the actuating mechanism of one of the sections out of action and for reversing the direction of motion of the thread-carrier, substantially as and for the purposes set forth.

23. In a knitting machine, a sectional needle cylinder, needles carried by the respective sections of said cylinder, mechanism for actuating the sections of the cylinder, means for throwing one of said sections out of action, a revoluble sinker-head provided with sinkers and a thread-carrier, and means for rotating and oscillating said sinker-head, substantially as and for the purposes set forth.

24. In a knitting machine, a sectional needle cylinder, needles, a positively driven shaft link-motions interposed between said shaft and the respective sections of the cylinder, and means for throwing the link-motion appertaining to one of said sections out of action, substantially as and for the purposes set forth.

25. In a knitting machine, a sectional needle cylinder, needles, a positively driven shaft,

an eccentric keyed to said shaft and adapted to operate one section of said cylinder, an eccentric loose on said shaft and adapted to operate the other section of said cylinder, and a clutch for connecting and disconnecting said loose eccentric and shaft, substantially as and for the purposes set forth.

26. In a knitting machine, a sectional needle cylinder, needles, a main shaft, link motions interposed between the shaft and the respective sections of the cylinder, means for throwing one of the link-motions out of action, high and low speed power appliances, and a shipper for controlling the power appliances and actuating the means for throwing the last-mentioned link-motion out of action, substantially as and for the purposes set forth.

27. In a knitting machine, a sectional needle cylinder, needles, a main shaft, link-motions interposed between said shaft and the respective sections of the cylinder, means for throwing the link-motion appertaining to one of said sections out of action, and power appliances for driving said shaft at high and low rates of speed, substantially as and for the purposes set forth.

28. In a knitting machine, a sectional needle cylinder, needles, a main shaft, link-work interposed between the sections of the cylinder and main shaft, one tight and two loose pulleys on said shaft, high and low speed belts and their complemental driving pulleys, and a shipper for shifting said belts and throwing the link-work appertaining to one of the sections of the needle cylinder out of action, substantially as and for the purposes set forth.

29. In a knitting machine, a sectional needle cylinder, needles, a main-shaft, link-work interposed between the sections of the cylinder and main-shaft, one tight and two loose pulleys on said shaft, high and low speed belts and their complemental driving pulleys, a shipper for shifting said belts and throwing the link-work appertaining to one section of the needle cylinder out of action, and means automatically actuating said shipper, substantially as and for the purposes set forth.

30. In a knitting machine, two concentric rims and a slotted ring forming ways, a sectional needle cylinder working in said ways, lugs connected with the respective sections of said cylinder and working in the slots of said ring, a positively driven shaft and link-work operated by the shaft and connected with the lugs, substantially as and for the purposes set forth.

31. In a knitting machine, a sectional needle cylinder, needles, a positively driven shaft, eccentrics on said shaft, links interposed between the eccentrics and the sections of the needle cylinder, and a clutch for throwing one of said eccentrics out of action, substantially as and for the purposes set forth.

32. In a knitting machine, a sectional needle

dle cylinder, needles, a positively driven shaft, actuating mechanism interposed between said shaft and the respective sections of the needle cylinder, a clutch for throwing the actuating mechanism of one of the sections of the cylinder out of gear, a shipper for shifting said clutch, a cam-wheel for actuating said shipper, and mechanism interposed between said shaft and cam-wheel for intermittently rotating the latter, substantially as and for the purposes set forth.

33. In a knitting machine, a sectional needle cylinder, needles, a positively driven shaft, actuating mechanism interposed between said shaft and the respective sections of the needle cylinder, a shipper for throwing the actuating mechanism of one of the sections of the cylinder out of gear, a cam-wheel for actuating said shipper, and mechanism interposed between said shaft and cam-wheel for intermittently rotating the latter, substantially as and for the purposes set forth.

34. In a knitting machine, a sectional needle-cylinder, needles, a positively driven shaft, actuating mechanism interposed between said shaft and the respective sections of the needle-cylinder, a clutch for throwing the actuating mechanism of one of the sections of the cylinder out of gear, a shipper for shifting said clutch, a ratchet-wheel provided with a cam for operating said shipper, a pawl driven by said shaft and adapted to mesh with the teeth of said ratchet-wheel and to work in peripheral recesses therein and a pattern-chain and its complemental feed mechanism for intermittently shifting the ratchet-wheel to bring said pawl into engagement with the teeth thereof, substantially as and for the purposes set forth.

35. In a knitting machine, a sectional needle-cylinder, needles, a positively driven main shaft, actuating mechanism interposed between the sections of the cylinder and said main-shaft, a shipper for throwing the actuating mechanism appertaining to one of the sections out of gear, a ratchet-wheel provided with a cam for operating said shipper, a pawl actuated by the main shaft and adapted to mesh with the teeth of said ratchet-wheel and to work in peripheral recesses, and a pattern-chain and its complemental feed mechanism for intermittently rotating said ratchet-wheel to cause the engagement of said pawl with the teeth thereof, substantially as and for the purposes set forth.

36. In a knitting machine, a sectional needle cylinder and its complemental operating mechanism, needles tending to engage the needle cylinder, and means for preventing the engagement of certain of said needles, substantially as and for the purposes set forth.

37. In a knitting machine, a sectional needle cylinder, mechanism for operating the sections of said cylinder, devices for throwing one of said sections out of operation, needles tending to engage the needle cylinder, and means for preventing the engagement of cer-

tain of said needles, substantially as and for the purposes set forth.

38. In a knitting machine, a sectional needle cylinder, mechanism for continuously operating one of the sections of said cylinder and for intermittently operating the other section thereof, fashioning needles detachably connected with the continuously operated section, needles applied to the other section, and means for engaging and releasing the fashioning needles to throw the same into and out of action, substantially as and for the purposes set forth.

39. In a knitting machine, a sectional needle cylinder, means for continuously operating a certain section of said cylinder, fashioning needles tending to engage portions of the continuously operated section, needles intermediate of the fashioning needles, and means for restraining and releasing the fashioning needles, substantially as and for the purposes set forth.

40. In a knitting machine, a sectional needle cylinder, mechanism for operating the sections of said cylinder, needles tending to engage said sections, and a stripper for engaging the bits or hubs of certain of said needles, substantially as and for the purposes set forth.

41. In a knitting machine, a sectional needle cylinder, mechanism for operating the sections of said cylinder, two sets of needles normally carried by said sections and provided respectively with long and short bits or hubs, and a stripper for engaging the long bits or hubs, substantially as and for the purposes set forth.

42. In a knitting machine, a sectional needle cylinder, means for operating the sections of said cylinder, fashioning needles having spring-catches for engaging the needle-cylinder, and a stripper for engaging and releasing the fashioning needles, substantially as and for the purposes set forth.

43. In a knitting machine, a sectional needle cylinder, means for continuously operating one of the sections of said needle cylinder, a thread-carrier and mechanism for reciprocating the thread-carrier in respect to the needles of the continuously operated section, substantially as and for the purposes set forth.

44. In a knitting machine, needles, a sectional needle cylinder, means for continuously operating one of the sections of said cylinder, a thread-carrier, a counter-shaft, miter gearing interposed between the counter-shaft and thread-carrier, and means for reciprocating said counter-shaft, substantially as and for the purposes set forth.

45. In a knitting machine, needles, a sectional needle cylinder, means for continuously operating one of the sections of said cylinder, a thread-carrier, a counter-shaft, miter gearing interposed between the counter shaft and thread-carrier, a positively driven shaft, sprocket gearing interposed between said shafts, an arm provided with a rack and oscillated by the positively driven shaft, a pin-

ion on the counter-shaft engaging said arm, and means for throwing the sprocket-gearing and arm out of and into action, substantially as and for the purposes set forth.

5 46. In a knitting machine, needles, a sectional needle cylinder, means for continuously operating one of the sections of said cylinder, a sinker-head and its accessories, a counter-shaft, gearing interposed between the coun-
10 ter-shaft and sinker head, a positively driven shaft, an arm oscillated by the positively driven shaft and provided with a rack and cheeks, and a pinion on the counter-shaft provided with flanges and engaging said arm,
15 substantially as and for the purposes set forth.

47. In a knitting machine, needles, a sectional needle cylinder, means for continuously operating one of the sections of the cylinder, a sinker-head and its complementary sinkers,
20 a thread-carrier applied to the sinker-head, and mechanism for reciprocating the sinker-head in respect to the needles of the continuously operated section, substantially as and for the purposes set forth.

25 48. In a knitting machine, a sectional needle-cylinder, means for continuously operating one of the sections of said cylinder, needles, a thread-carrier, a counter-shaft and its complementary gearing for actuating the
30 thread-carrier, a positively driven main-shaft, two sets of connections interposed between the positively driven main-shaft and counter-shaft and respectively adapted to rotate and oscillate the counter-shaft, clutches for controlling said sets of connections, a shipper and
35 link-work for operating said clutches, a ratchet-wheel provided with a cam for actuating the shipper, and means connected with the main-shaft for intermittently rotating said
40 ratchet-wheel, substantially as and for the purposes set forth.

49. In a knitting machine, needles, means for operating said needles, a thread-carrier, a counter-shaft and its complementary gearing
45 for actuating the thread-carrier, a positively driven main-shaft, two sets of connections interposed between the positively driven and counter shafts and respectively adapted to rotate and to oscillate the counter-shaft, clutches
50 for controlling said sets of connections, a shipper and link-work for operating said clutches, a ratchet-wheel provided with a cam for actuating the link-work, and means connected with the main-shaft for intermittently rotating
55 said ratchet-wheel, substantially as and for the purposes set forth.

50. In a knitting machine, needles, means for operating said needles, a thread-carrier, a positively driven shaft, two sets of connections actuated by said shaft and adapted respectively to rotate and oscillate said thread-carrier, clutches for controlling said sets of connections, link-work for operating the
60 clutches, a ratchet-wheel provided with a cam for actuating said link-work, a pawl actuated by said shaft and adapted to engage the teeth of said ratchet-wheel and to work in recesses

between said teeth, a pattern-chain for intermittently rotating said ratchet-wheel, and continuous feed mechanism for said pattern-chain, substantially as and for the purposes set forth. 70

51. In a knitting machine, a sectional needle-cylinder, means for continuously operating one of the sections of said cylinder, needles, a thread-carrier, a counter-shaft and its complementary gears for actuating the thread-carrier, a positively driven main shaft, two sets of connections interposed between the positively driven and counter shafts and respectively adapted to rotate and oscillate the counter-shaft, clutches for controlling said sets of connections, link-work for operating said clutches, a ratchet-wheel provided with a cam for actuating said link-work, a pawl
85 actuated by said main-shaft and adapted to engage the teeth of said ratchet-wheel and to work in peripheral recesses, a pattern-chain for intermittently rotating said ratchet-wheel, and continuous feed mechanism for said pattern-chain, substantially as and for the purposes set forth. 90

52. In a knitting machine, a sectional needle cylinder, means for continuously operating one of the sections of said cylinder, needles, a thread carrier, a positively driven shaft, two sets of connections actuated by said shaft and adapted respectively to rotate and oscillate said thread-carrier, clutches for controlling said sets of connections, link-work for operating said clutches, a ratchet-wheel for actuating said link-work, a pawl actuated by said shaft and adapted to engage the teeth of said ratchet-wheel and to work in recesses between said teeth, a pattern chain for intermittently
105 rotating said ratchet-wheel, and continuous feed mechanism for said pattern-chain, substantially as and for the purposes set forth.

53. In a knitting machine, needles, a sectional needle cylinder, a sinker-head provided with a thread-carrier, a counter-shaft and complementary gearing for actuating the sinker-head, a driving shaft, eccentrics and links interposed between the driving shaft and the sections of the needle cylinder, sprocket and rack gearing interposed between the driving and counter shafts, clutches for throwing the sprocket and rack gearing and one of the eccentrics out of and into action, link-work for shifting said clutches, a ratchet-wheel for operating said link-work, and mechanism operated by the driving shaft and adapted to intermittently rotate the ratchet-wheel, substantially as and for the purposes set forth. 110

54. In a knitting machine, needles, a sectional needle cylinder, a sinker-head provided with a thread-carrier, a counter-shaft and complementary gearing for actuating the sinker-head, a driving-shaft, eccentrics and links interposed between the driving shaft and the sections of the needle cylinder, sprocket and rack gearing interposed between the driving and counter shafts, clutches for throwing the sprocket and rack gearing and one of the ec- 115 120 125 130

centrics out of and into action, link work for shifting said clutches, a ratchet-wheel for operating said link-work, a pawl actuated by the main-shaft and adapted to engage the teeth of the ratchet-wheel and to work in peripheral recesses, a pattern-chain for intermittently rotating the ratchet-wheel, and continuous feed mechanism for the pattern-chain, substantially as and for the purposes set forth.

55. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, segmental strippers adapted to engage said fashioning needles, and pawl-and-ratchet connections actuated by the main-shaft and adapted to shift said strippers, substantially as and for the purposes set forth.

56. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, strippers adapted to engage said fashioning needles, and means actuated from the main shaft and adapted to shift said strippers, substantially as and for the purposes set forth.

57. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, strippers, carriages, resilient connections between the carriages and strippers, and means for shifting the carriages, substantially as and for the purposes set forth.

58. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, carriages, strippers provided with slots, springs in said slots and connected with the strippers and carriages, and means for shifting the carriages, substantially as and for the purposes set forth.

59. A knitting machine provided with a sectional needle cylinder, means for reciprocating the sections of said cylinder, a thread carrier, a sinker head and its accessories, a rim disposed within the needle cylinder and provided at the top with notches for guiding the needles and with web holding fingers intermediate of the notches, substantially as and for the purposes set forth.

60. In a knitting machine, a bed-plate, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, carriages afforded a range of travel in ways on the bed-plate, screws working in slots in the bed-plate and provided with spring washers for preventing retrograde

movement of the carriages, strippers connected with the carriages, and means for actuating the carriages, substantially as and for the purposes set forth.

61. In a knitting machine, a bed-plate, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, carriages afforded a range of travel on the bed-plate, means for preventing retrograde movement of the carriages, strippers, resilient connections interposed between the strippers and carriages, and means for actuating the carriages, substantially as and for the purposes set forth.

62. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, strippers, racks for shifting said strippers, a frame provided with pawls having teeth for driving the racks backward and forward, means for vibrating said frame, and devices for shifting said pawls to cause the respective teeth thereof to come into action, substantially as and for the purposes set forth.

63. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, carriages, racks for shifting said carriages, strippers, yielding connections between the strippers and carriages, pawls for driving the racks backward and forward, and devices for reversing the positions of the pawls, substantially as and for the purposes set forth.

64. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, strippers, racks, pawls adapted to engage said racks and drive said strippers backward and forward, a frame for controlling said pawls, and means for intermittently actuating said frame, substantially as and for the purposes set forth.

65. In a knitting machine, a sectional needle cylinder, means for continuously elevating and depressing one of the sections of said cylinder, fashioning needles detachably connected with the continuously operated section, strippers, racks, pawls adapted to engage said racks and drive said strippers backward and forward, bars for controlling said pawls, a ratchet-wheel provided with projections for reversing the positions of said pawls, and means for intermittently rotating said ratchet-wheel, substantially as and for the purposes set forth.

66. In a knitting machine, a sectional needle cylinder, means for actuating the sections of said cylinder, needles detachably connected with said sections, strippers, having racks,

pawls adapted to engage said racks and drive said strippers backward and forward, a frame for controlling said pawls, a ratchet-wheel provided with projections for actuating said frame, a positively driven shaft, a pawl actuated by said shaft and adapted to mesh with the teeth of the ratchet-wheel and to work in peripheral recesses therein, a pattern-chain for intermittently rotating said ratchet-wheel and continuous feed mechanism for said pattern-chain, substantially as and for the purposes set forth.

67. In a knitting machine, a sectional needle cylinder, means for elevating and depressing the sections of said cylinder, fashioning needles, strippers for engaging the fashioning needles, a ring, pawl-and-ratchet connections interposed between the ring and strippers, a positively driven shaft provided with a tappet-arm and a tappet-rod in range of said arm and connected with said ring, substantially as and for the purposes set forth.

68. In a knitting machine, a sectional needle cylinder, means for elevating and depressing the sections of said cylinder, fashioning needles, strippers for engaging the fashioning needles, a ring, pawl-and-ratchet connections interposed between the ring and strippers, a positively driven shaft, connections interposed between the shaft and ring for actuating the latter, and mechanism for intermittently disconnecting the shaft and ring, substantially as and for the purposes set forth.

69. In a knitting machine, a positively driven shaft, two sets of power appliances for driving said shaft at different rates of speed, a counter-shaft, connections between the positively driven shaft and counter-shaft for rotating and for oscillating the latter, a sectional needle cylinder provided with detachable needles, strippers, mechanism interposed between the positively driven shaft and sections of the cylinder, a sinker-head operated by the counter-shaft, pawl-and-ratchet connections operated by the positively driven shaft and adapted to actuate the strippers, and an intermittently reciprocated ratchet-wheel and its complemental cams and connections for controlling said power appliances, sinker-head, strippers and needle cylinder, substantially as and for the purposes set forth.

70. In a knitting machine, a shaft, two sets of power appliances respectively adapted to drive said shaft at high and low speeds, a sectional needle cylinder provided with detachable fashioning needles, a sinker-head and its accessories, strippers for engaging said fashioning needles, a set of connections for reciprocating all the sections of the needle cylinder and revolving the sinker-head when the high speed power appliance is in gear, a set of connections for actuating one of the sections of the needle cylinder and the strippers and for oscillating the sinker-head when the low speed power appliance is in gear, a shipper for controlling the power appliances and sets of connections, and means for inter-

mittently actuating the shipper, substantially as and for the purposes set forth.

71. In a knitting machine, a sectional needle cylinder provided with detachable fashioning needles, a sinker-head and its accessories, strippers for engaging said fashioning needles, a high speed power appliance and its complemental set of connections for actuating all of the sections of the needle cylinder and revolving the sinker-head, a low speed power appliance and its complemental connections for actuating one of the sections of the needle cylinder and strippers and for oscillating the sinker-head, a shipper for controlling the power appliances, a frame for reversing the direction of travel of the strippers, and means for intermittently actuating the shipper and frame, substantially as and for the purposes set forth.

72. A knitting machine provided with needles, a sectional needle cylinder for operating said needles, a stripper for engaging certain of the needles and automatic mechanism for throwing one section of the cylinder out of action and for controlling the position of the strippers to effect the widening and narrowing of the fabric or web, substantially as and for the purposes set forth.

73. A knitting machine provided with needles, a sectional cylinder for operating said needles, a sinker-head, strippers for engaging certain of the needles and automatic mechanism for controlling said cylinder, throwing one of the sections of said cylinder into and out of action, reversing the direction of movement of the sinker-head and controlling the positions of the strippers to effect the widening and narrowing of the fabric or web, substantially as and for the purposes set forth.

74. A knitting machine provided with needles, a sectional needle cylinder for operating said needles, a sinker-head, strippers for engaging certain of the needles, high and low speed power appliances, and mechanism for automatically bringing the low speed power appliance into action to actuate one section of the cylinder and for reciprocating the sinker-head and controlling the position of the strippers, substantially as and for the purposes set forth.

75. In a knitting machine, needles, a sectional needle cylinder, a sinker-head, a counter-shaft and connections for operating the sinker-head, a main shaft provided with a fast eccentric and its complemental link for continuously operating one of the sections of the needle cylinder, strippers for engaging certain of said needles, a tappet bar for operating said strippers, a sleeve loose on the main shaft and provided with an eccentric and its complemental link for actuating the other of the sections of the needle cylinder, and with a sprocket wheel, a second sleeve loose on the main shaft and provided with a tappet arm and an eccentric, an arm provided with a rack and operated by the last mentioned eccentric,

a sprocket-chain, two sleeves on the counter-shaft provided respectively with a sprocket-wheel and with a pinion, clutches splined to the counter and main shafts, pivotal levers
5 for simultaneously shifting said clutches, and means for actuating said levers substantially as and for the purposes set forth.

76. A knitting machine provided with needles, a sectional needle cylinder for operating
10 said needles, a sinker-head, strippers for engaging certain of the needles, a ratchet-wheel provided with cams and their complemental connections for automatically throwing one
15 section of the needle cylinder out of action, controlling the sinker-head and shifting the

strippers to effect the widening and narrowing of the fabric or web, a main-shaft, a pattern-chain adapted to intermittently rotate the ratchet-wheel, a pattern chain feed-wheel, eccentrics on said shaft and spring controlled
20 pawls actuated by said eccentrics, substantially as and for the purposes set forth.

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

EMIL J. FRANCK.

Witnesses:

THOMAS M. SMITH,
J. WALTER DOUGLASS.