

No. 686,803.

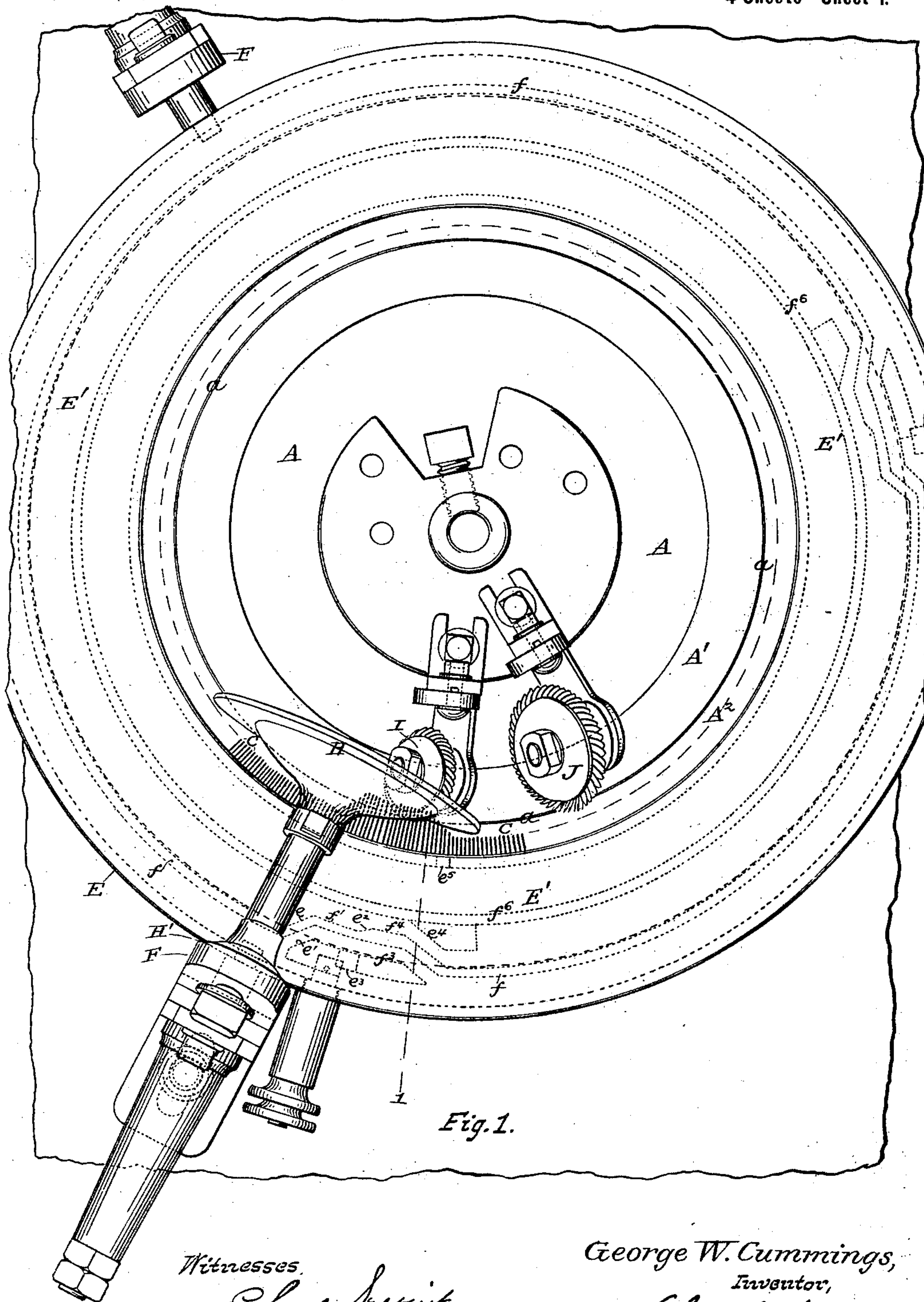
Patented Nov. 19, 1901.

G. W. CUMMINGS.
KNITTING MACHINE.

(Application filed Mar. 3, 1900.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses.

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A. L. Kirk

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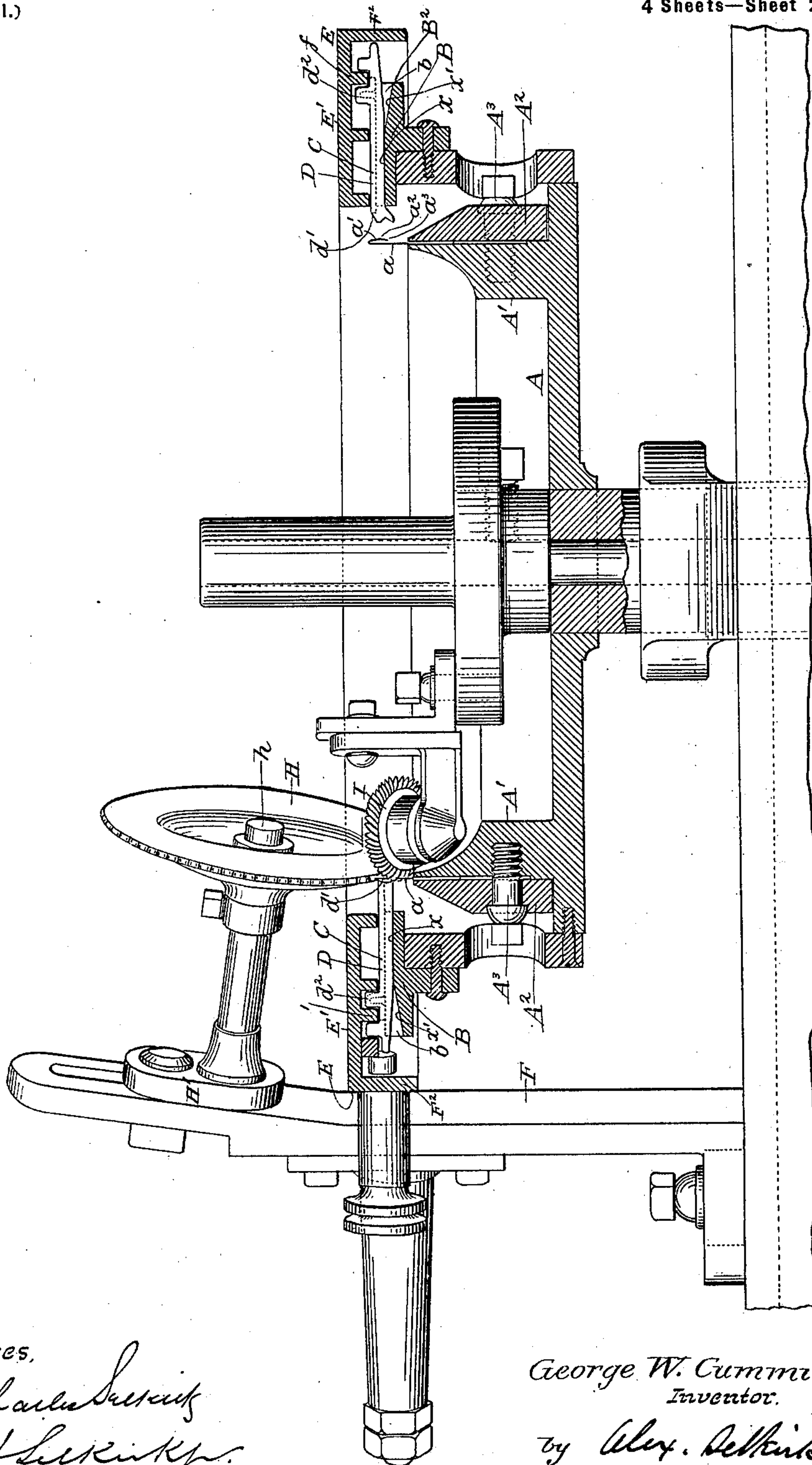


Fig. 2.

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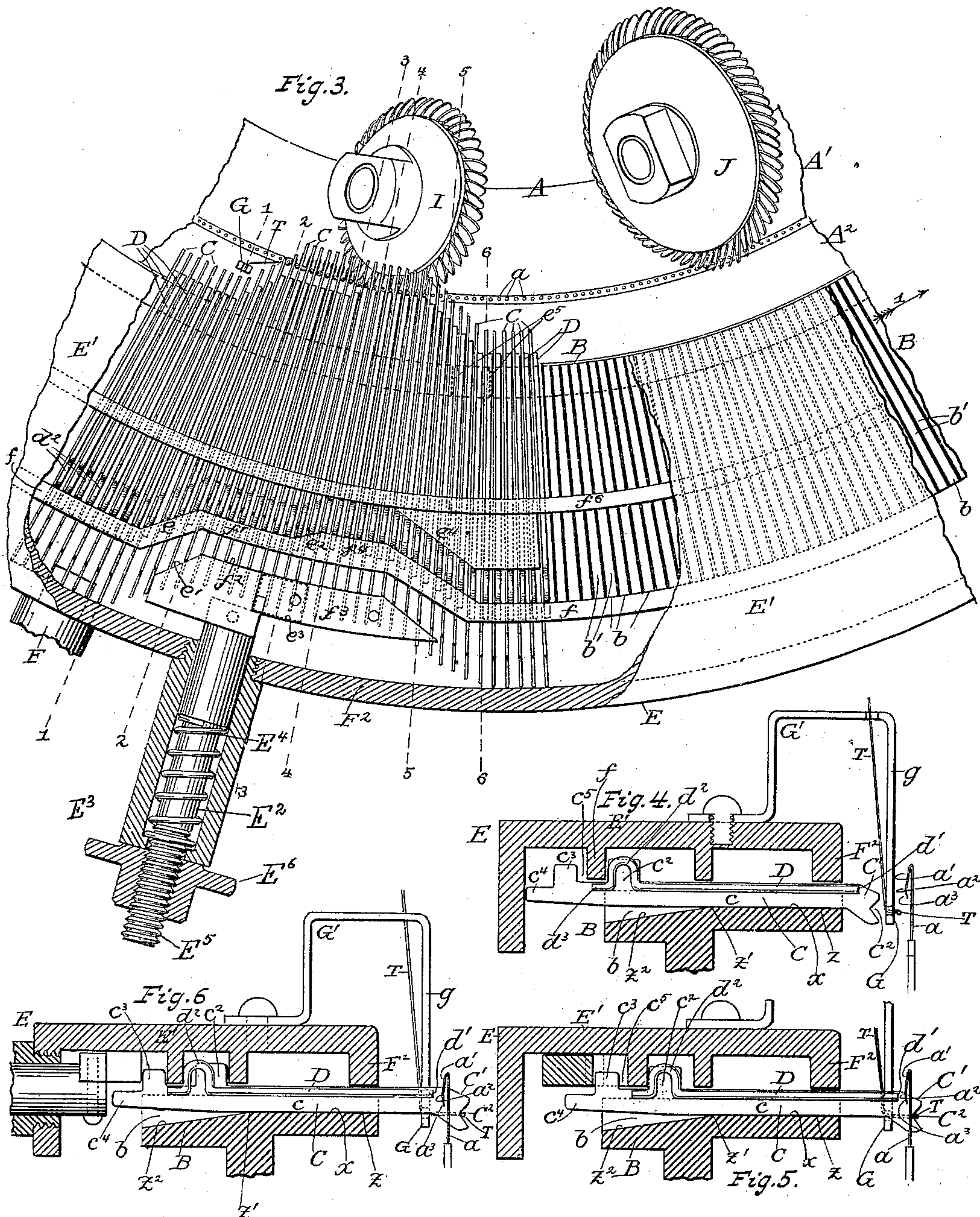
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4 Sheets—Sheet 3.



Witnesses,

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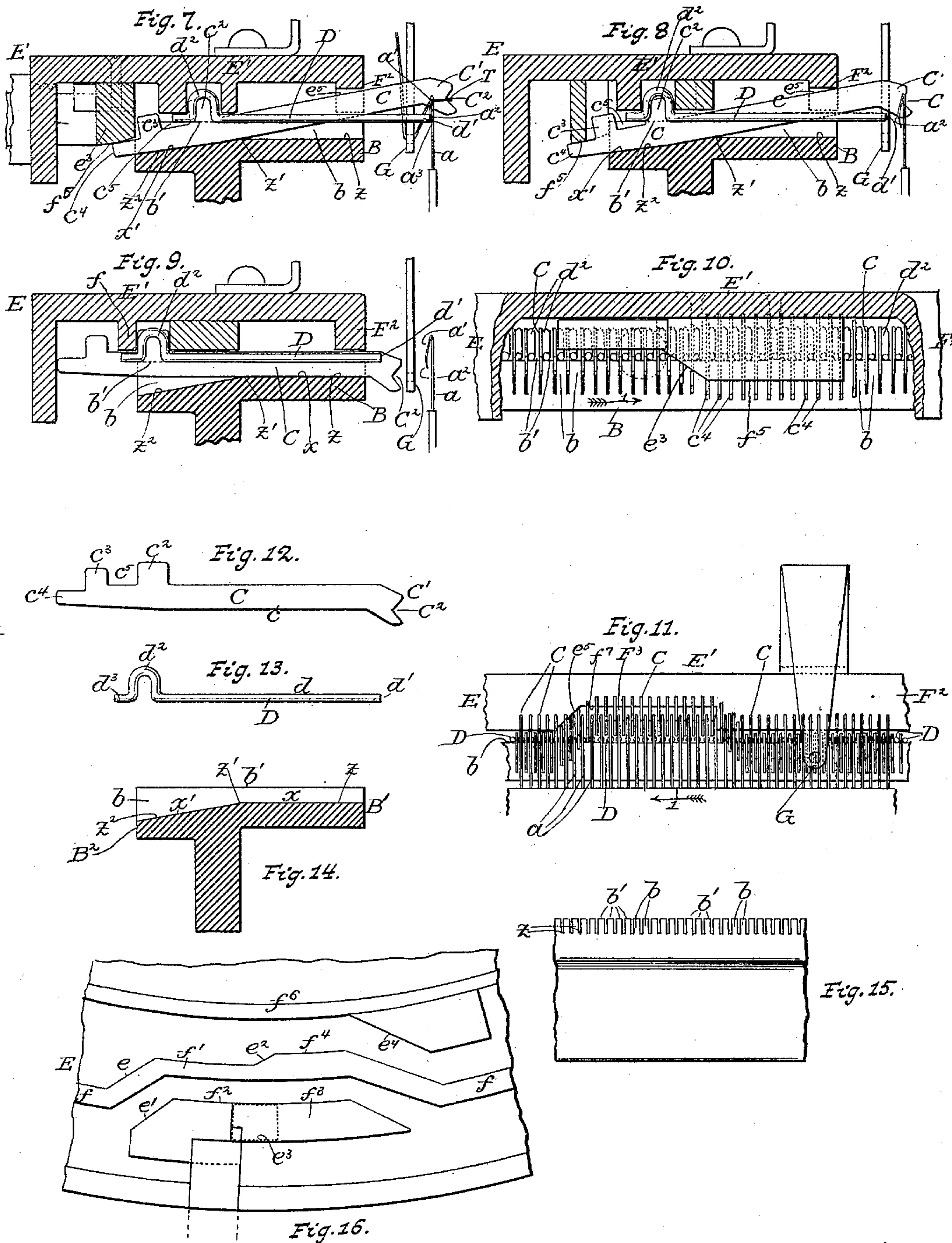
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4 Sheets—Sheet 4.



Witnesses,
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UNITED STATES PATENT OFFICE.

GEORGE W. CUMMINGS, OF COHOES, NEW YORK.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 686,803, dated November 19, 1901.

Application filed March 3, 1900. Serial No. 7,199. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. CUMMINGS, a citizen of the United States, residing at Cohoes, in the county of Albany and State of New York, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to improvements in knitting-machines; and it consists in the novel devices and novel combinations of parts and devices herein shown and described, and pointed out in the claims.

The object of my invention is to combine with a revolving cylinder of stationary knitting-needles a series of four-movement individual sinkers for operating with a thread, a series of individual pressers for operating with the barbs of the needles, a revolving sinker-guide, a series of stationary cams, and an adjustable cam for operating the sinkers and a series of cams for operating said individual pressers.

Other objects and advantages of the invention will be fully understood from the following description and claims when taken in connection with the annexed drawings, in which—

Figure 1 is a plan of a knitting-machine embodying the improvements in my invention with hidden parts indicated by dotted lines. Fig. 2 is a section taken in direction of line 1 in Fig. 1. Fig. 3 is a plan in full size of a section of the knitting-machine with cam-plate broken away for exposing parts beneath and showing the landing-bur and cast-off bur. Fig. 4 is a section taken at line 1 in Fig. 3. Fig. 5 is a section taken at line 2 in Fig. 3. Fig. 6 is a section taken at line 3 in Fig. 3. Fig. 7 is a section taken at line 4 in Fig. 3. Fig. 8 is a section taken at line 5 in Fig. 3. Fig. 9 is a section taken at line 6 in Fig. 3. Fig. 10 is a view parallel to the outer flange of the cam-plate, with said flange broken away and exposing the sinker-guides, sinkers, pressers, and cams operating said sinkers. Fig. 11 is a view of a portion of the needle-cylinder from the inner side and showing the head ends of the sinkers and pressers and cams operating the same. Fig. 12 is a side view of a sinker in its preferred form. Fig. 13 is a side view of an individual presser as at present preferred by me. Fig. 14 is a section of the sinker-guide plate. Fig. 15 is

an elevation of a portion of the sinker-guide plate viewed from its inside edge, and Fig. 16 is a plan illustrating my preferred arrangement of the several cams to operate sinkers and pressers depending from the under side of the stationary cam-plate.

Similar letters of reference refer to similar parts throughout the several views.

In the drawings, A, Figs. 1, 2, and 3, is the revolving needle-plate of the knitting-cylinder.

A' is the circular needle-clamping flange, which is preferably integral with the plate A.

A² is the outer needle-clamping device, which is preferably made sectional for convenience for securing the same by means of screws A³, clamping the shanks of needles *a a* between it and the flange A'. The said needles *a* are each provided with a barb *a'*, integral with the body of the needle and turned down from the upper end of the latter on an outward incline to a suitable point in its length, as at *a*², Figs. 4, 5, 6, 7, 8, and 9, at which point said barb is pressed on by a suitable presser at proper times for carrying the point *a*³ of the barb against the body of the needle and holding said end point *a*³ so pressed until after the needle passes the landing-bur.

B is the sinker-guide plate, which is suitably connected or secured to the revolving needle-plate A, so as to revolve with the same. This plate B is circular in form and annular to the circle of needles *a*, Figs. 1 and 3, and consists of a horizontal web, preferably made separate from the needle-plate A and secured to the latter by any suitable means as may be found to be convenient or advantageous. This sinker-guide plate has in its horizontal surface a series of sinker ways or guides *b*, Figs. 3, 10, 14, and 15, which are extended from the inner edge of said plate to its outer edge in radial lines coinciding with lines drawn radially from the center of rotation of the needle-plate A. These sinker guides or ways *b b* are spaced apart a distance equal to the thickness of the sinkers C, so as to permit said sinkers to freely move between them in either direction without binding, and the upper sides of these guides or ways form each a seat *b'* for the support of an individual presser D, which is located between adjoining sinkers C, with its forward end opposite

the barb a' of the needle a , with which the presser is to operate. The lower line of the bottom of these guides or ways b , where they join the web of this plate B, are extended each on a similar horizontal line z from the inner edge B' of plate B to a suitable distance, as to point z' , whence said lower lines are extended to the outer edge B², Fig. 14, of said plate in an outwardly and downwardly inclined line, as z^2 , as shown in Fig. 14, so as to produce a sunken horizontal seat x for supporting the sinker C in a horizontal position, as shown in Figs. 4, 5, 6, 7, and 2, and the inclined sunken seat x' for supporting said sinker at a proper time in an inclined position, as shown in Figs. 9 and 8. This sinker-guide plate B is annular to the circle of needles a and is made with such a diameter as to its inner edge B' as to be greater than that of said circle of needles for allowing between said inner edge and the needles the forwardly-projected head C' of the sinker C and the thread-guide G, with provision for a proper length of forward movement of said sinker-head C' before it is passed between a pair of adjoining needles, as shown in Figs. 3, 4, 5, and 6.

The sinkers C are each a duplicate of the other and are in number corresponding with the number of needles in the cylinder, and therefore a description of one of these sinkers will suffice for all. This sinker C is shown in Fig. 12 and is preferably made of thin steel, which is of thickness to adapt its head end to freely pass between two adjoining needles a , and comprises the body c , head C', having in its forward end the angular thread-receiving mouth C² and provided with the upwardly-projected fingers c^2 and c^3 (the latter shown to have a less extension than the former from body c) and the heel end projection c^4 . Although the lower edge of the body c may be on a single straight line back from the head C', yet I at present prefer to finish the said body with an inclined line of edge running upward from about opposite the point of front edge of the finger c^2 to the rear end of the projection c^4 , as shown, so that the depth of the sunken inclined seat x' in the plate B may be less than might be required were the lower edge of the body in one straight line. In this sinker C the bottom of the thread-receiving mouth C² of the head C', Fig. 12, is shown to be about on a line with the lower horizontal edge of the said sinker, and between the fingers c^2 and c^3 is a suitable space c^5 , which is adapted to permit a suitable cam, connected to a stationary plate, to act against finger c^2 for pushing the sinker C inward. The purposes of the several elements embodied in this sinker will be hereinafter explained.

The individual pressers D, as the individual sinkers C, are equal in number to the needles. Therefore a description of one of these pressers will suffice for all. This presser D (shown in Fig. 13) is preferably made of steel wire of

any suitable form and is of thickness or width corresponding to the distance between the forward ends of the sinkers, so as to freely move longitudinally on its seat b' between the upwardly-projected portions of the bodies c of two adjoining sinkers C C, as shown in Figs. 3 and 10, which portions of said sinkers operate as guides or ways for holding the presser from shifting laterally to any material distance. Each presser D is made to comprise the body portion d , pressing-face d' at its forward end, and the vertical projection d^2 , having a horizontal extension of width which corresponds to that of the finger c^2 of sinker C, and rearward of this vertical projection d^2 and integral with it is the finger d^3 . The body d of this presser is made with a forward extension of a length between projection d^2 and pressing-face d' suitable for allowing the latter to touch the barb a' of the needle a at the proper point thereon and move said barb forward until its lower end may touch the body a , so as to close the barb when required, as shown in Fig. 7.

In Figs. 4, 5, 6, 7, 8, and 9 the sinker-guide plate is shown in section from its lower side up to the line of bottom of ways b as to lines x and x' , and the presser is shown in said figures with the lower side of its body d at dotted lines, indicating the seat b' , on which said presser is supported, while in Fig. 2 the presser is indicated by dotted lines behind the sinkers for allowing a more clear illustration of the operations had with both the sinker C and presser D by means provided, as will be hereinafter described.

E is a stationary cam-plate, which is circular in form and ring-like in its web E', with an inside diameter corresponding with that of the plate B and its outside diameter greater than that of the latter plate, as shown. This cam-plate is suitably supported above plate B, so as to be free of contact with the latter, by means of suitable standards F, two of which are shown properly secured to said cam-plate and having their lower or foot ends secured to the top of a suitable table. It is provided on its under side with one or more groups or sets of cams, (according to the number of single threads to be run into the fabric at each revolution, one thread at each group or set of cams,) as may be found to be advantageous or as the size of the knitting-machine might allow to be employed. In Fig. 1 two such groups or sets of cams are indicated in a plate of a machine (adapted to employ three sets of said cams) located each at an equal distance from the adjoining ones, yet a greater number may be employed as the size of the machine may allow. The several cams in each group or set in the machine are shown by full lines in plan in Figs. 3 and 16 and indicated by dotted lines in Fig. 1 and are shown in part in elevation in Figs. 10 and 11 and variously in their throws in vertical section in Figs. 4, 5, 6, 7, 8, and 9 as they occur in relation to the parts they op-

erate with of the sinkers C and pressers D. These sets of cams occur at about equal distances apart in the course of the guard f , which serves to hold the sinkers C and pressers D in their inoperative positions until they begin to be operated by said cams and subsequently immediately after being returned to said guard after passing said set of cams. This guard f (shown in Figs. 1, 2, 3, 4, 9, and 16) is made with a flange-like form and preferably integral with the web E' of the cam-plate E and on a line of a circle having its center at the center of the knitting-cylinder.

My preferred construction and arrangement of each group of cams are as follows: The first cam e , Figs. 1, 3, 5, and 16, is made with a face which extends with a suitable incline horizontally from guard f to the guard f' . This cam e operates with the finger c^2 of the sinker C and projection d^2 of the presser D and simultaneously moves both the sinker and presser progressively forward until they are carried to the guard f' , and the head of the sinker is carried from position shown in Fig. 4 to that in Fig. 5, and the pressing end of the presser D is carried from that shown in Fig. 4 to near the barb a' of the needle a , as shown in Fig. 5, and also as both are shown in Fig. 3. The sinkers and pressers carried forward to position shown in Fig. 5 by cam e are landed progressively against guard f' , which is of length sufficient for guarding from back movement several of the pressers—say from six to ten or more or less—to position them with their pressing-faces d' a little back from barbs a' , as shown in Figs. 3 and 5. The second cam e' (shown in plan in Figs. 1, 3, and 16 and in elevation by full and dotted lines in Figs. 6 and 7) is rearward of cam e and has its inclined face about parallel with that of the latter and operates only with the rearward fingers c^3 of the sinkers C and after said sinkers have been moved from horizontal position (shown in Fig. 6) to inclined position in Fig. 7 and are holding the thread T up into the upper ends of the openings between the barbs and the needles, as shown in the latter figure. When the sinkers are in said inclined position, the said cam moves them successively and progressively forward, without affecting the pressers, to the finish of the outward thrust of each sinker, as shown in Figs. 3, 6, and 7, when said fingers c^3 will arrive at guard f^2 and be progressively moved to and on guard f^3 to the end of the latter, as shown in Fig. 3, and there be held, with their sinkers, in a group of any selected number, as from ten to fifteen or more or less, until progressively further operated by other cams. This cam e' may be a fixed cam when employed in a machine intended to be used with a thread of one given thickness, yet I prefer to make this cam adjustable, so that it may be set inwardly toward the needles or farther from the same, so that it may be set at pleasure for operating the sinkers to give them a

forward thrust to such a distance as the thickness of the thread to be used may require. When this cam e' is to be adjustable, I at present prefer to rigidly secure it to the inner end of a longitudinally-movable stem, as E^2 , Fig. 3, working freely in a suitable sleeve, as E^3 , secured to a suitable flange integral with the stationary cam-plate E and pressed forward by means of coiled spring E^4 , arranged between a suitable shoulder on said stem and the rear end of the chamber of said sleeve, as shown. The outer end of the reduced portion of said stem is provided with a screw-thread E^5 , on which is adjusting-nut E^6 , which nut when turned in proper direction allows spring E^4 to move the cam e' inward, and when reversely turned said cam will be moved in opposite direction. This adjustment in either direction will be very small, being only that distance either way as to correspond with the differences between the thinner and thicker threads as may be found to be advantageous. The third cam e^2 (shown in plan in Figs. 1, 3, and 16 and in section in Fig. 7) extends with an inclined face from the guard f' to guard f^4 and operates to move the presser D progressively forward from position shown in Figs. 5 and 6 to that shown in Fig. 7, when the presser, with its pressing-face d^2 against the barb a' of the needle a , holds the said barb closed against the needle, as shown in said Fig. 7, until moved off from guard f^4 . The fourth cam e^3 (shown in section in Figs. 7 and 8, plan, indicated by dotted lines, in Figs. 3 and 16, and in elevation in Fig. 10) extends with a downwardly and forwardly incline from the horizontal lower side of the piece forming cam e' , Figs. 3 and 16, to the horizontal guard f^5 and presses on the heel end projection c^4 of the sinker, and thereby depresses the heel end of the latter, as shown in Figs. 7, 8, and 10, and elevates the head end thereof and the thread T in the mouth of the same, as shown in Fig. 7. The fifth cam e^4 (shown in plan in Figs. 1, 3, and 16 and in section in Figs. 8 and 9) extends from the circular flange f^6 toward guard-flange f and to a point therefrom about equal to the width of finger c^2 of the sinker and operates progressively against the front edge of the same and the front edge of the projection d^2 of presser D for moving both the sinker and presser back to the guard-flange f , from which both were previously moved forward, as described. The sixth cam e^5 (indicated by dotted lines in plan in Figs. 1 and 3 as being located in the circular flange F^2 and shown in elevation in Fig. 11 and in section in Figs. 7 and 8) extends on an incline from the horizontal line of surface f^7 of recess F^3 , Fig. 11, made in said circular flange F^2 from its lower side, as shown, down to the lower side of said flange, as in said Fig. 11. This cam e^5 operates with the forward portion of the body of the sinkers and progressively depresses the same soon after said sinker is carried back from position

shown in Fig. 8 to that shown in Figs. 4 and 9 by the action of cam e^4 , when the said sinker will be in its original horizontal inoperative position and so remain until it is again operated by the same cams for being moved forward, elevated, rearward, and depressed in order above mentioned.

G is a thread-guide, preferably in the form of an eye, in the pendent part g of the bracket G' , which latter is supported from a stationary piece, and preferably from the cam-plate E, as shown in Figs. 6, 7, and 11. This thread-guide is below the lower end of the barb of the needle and on a line with the thread-receiving mouths of the sinkers, as shown, and is located between the circle of the needles and the head ends of the circle of sinkers at a point at which the sinkers successively begin to advance, as shown in Fig. 3.

The manner in which the several parts of this invention operate is as follows: The thread T employed is run from any suitable bobbin (not shown) to thread-guide G, Figs. 3 and 11, and the needle-cylinder will be revolved simultaneously with the sinker-plate B in direction of arrow 1 in Fig. 3. At the starting of the feed of the thread to the needles the operator will hold by any suitable means the former by its loose end from slipping. In the revolving of the needle-cylinder and sinker-plate in direction of arrow 1, Fig. 3, the thread T will pass through the feed-guide G at a point below the point of the barbs a^2 of the needles a and directly opposite to the mouths C^2 in the heads C' of the sinkers C when the latter are in place at full distance outward from the needles, as shown by left-hand sinker C in Fig. 3 and as shown by sinker C in Figs. 4 and 9, when the finger c^2 of the sinkers will abut against the guard f , Figs. 3, 4, 9, and 16, and the latter will be projected downward in space 5 between fingers c^2 and c^3 . The cam-plate being relatively stationary and both the needle-cylinder and sinker-plate being simultaneously revolved in direction of arrow 1 in Fig. 3, both the needles of the said cylinder and sinkers and pressers carried by the sinker-plate will be progressively and successively moved against the stationary cams employed for operating in proper order and at proper time the said sinkers and the pressers for properly delivering and placing the thread in process of knitting.

In the following description of the manner and order in which the sinkers and pressers are advanced against the respective cams and are guarded from misplacement for effecting a proper delivery of the thread T to the needles and the proper placement of the same in reference to each needle preparatory to being operated with by the wheels I and J I make reference to the several figures in Sheets 3 and 4. In Fig. 3, left-hand side, the first eight sinkers C and pressers D are shown to be in normal place, with their respective outer ends abutting against guard f ,

as illustrated in Fig. 4, in which the thread-receiving mouth C^2 is shown to be both opposite and back of the thread-guide G and the thread T also outside and back from the needle a and below the point a^3 of the barb a' , while the pressing end d of the presser is back from the mouth C^2 of the sinker. When the needle-cylinder and sinker-plate are revolved in direction of arrow 1 in Fig. 3, the sinkers and pressers will be guarded by guard f until they arrive at the incline of stationary cam e , Figs. 3 and 16, when said incline, operating through fingers c^2 of sinkers C and fingers d^2 of the pressers, progressively moves both the sinkers and pressers, which will successively arrive at guard f' and by it be held projected inward, as shown in Figs. 3 and 5. By a further movement of the needle-cylinder and sinker-plate the fingers c^3 of the sinkers will be moved forward against the incline of cam e' , and thereby the said sinkers will be moved inward and take in their respective thread-receiving mouth C^2 the thread T and successively carry the thread in the form of a horizontally-extended loop inward between two adjoining needles and against their bodies at points below the barbs of the needle, as from position shown in Fig. 5 to that shown in Fig. 6, while the presser will remain unmoved. When the needle-cylinder and sinker-plate are further moved in direction of said arrow 1, Fig. 3, the incline of the fourth cam e^3 (shown in Figs. 7, 8, and 10 and indicated in Figs. 3 and 16) operates with heel-end projection c^4 of the sinker to carry by its mouth C^2 , while holding with the loop of the thread, upward from position shown in Fig. 6 to that in Fig. 7, and thereby carry the thread T into the loop of the barb and hold it, while at the same time the incline of the cam e^2 will advance pressers D through its finger d^2 progressively forward and carry its pressing end d' against the barb of the needle and close the said barb with the thread securely held in the upper end of the loop of the same, as shown in Fig. 7. While the barb is held closed the landing-bur I will commence to raise last preceding loop of the thread on the outside of the said barb, when the presser will be gradually drawn outwardly by action of the incline of cam e^4 to position of presser D in Figs. 3 and 8, the landing-bur all the time operating with the said preceding loop of the thread, so as to lift it up and inwardly over the top of the needle for engagement with the thread of the loop held in the loop of the barb. The movement of the cylinder being continued both the sinker and the presser in advance of the latter will be returned to their normal idle position, as shown in Fig. 9, while the thread-loops formed will progressively move to the cast-off bur for being operated with in the usual manner.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a knitting-machine, the combination

with spring-bearded needle of a revolving needle-cylinder, a sinker-guide which is connected with said needle-cylinder so as to revolve with the same about its axis, a sinker
 5 provided in its forward end with an angular thread-receiving mouth, and cams adapted to successively move the sinker forward and carry the thread, first, inwardly against the body of the needle at a point below the point
 10 of its barb, then past the needle in the form of a horizontal loop which is wholly below the point of said barb and next up into the loop of the barb of the needle, and then retire from said loop and move the said sinker back
 15 to normal position, of a presser at a side of the said sinker and separate from and independent of the same, and cams adapted to operate said presser to move it forward and against the barb of said needle when the
 20 sinker, adjoining said presser, has raised said thread up into the loop of said barb as and for the purposes set forth.

2. In a knitting-machine, the combination with a revolving needle-cylinder, a stationary
 25 needle provided with a downwardly-extended barb a' which is adapted to have its point a^2 closed against the body of said needle and a sinker-guide which is connected with said needle-cylinder so as to revolve
 30 about the axis of said cylinder simultaneously with said needle, and which has its inner half portion of bottom, toward the needle, on horizontal line z and its rearward half portion on inclined line z^2 from point z' ,
 35 of a sinker C having its forward end provided with head C' having in its forward end edge an angular thread-receiving mouth C^2 and adapted to be reciprocated in said guide forward and past a side of the needle and to deliver a thread against the body of the needle
 40 at a point below the point of said barb and then elevate the thread to within upper end of the loop of said barb and then be moved back to normal position, and a presser D
 45 which is separate and independent of said sinker and in place parallel to a side of the latter and with its longitudinal axis in alignment with the barb of the needle, and adapted to be moved longitudinally against the
 50 same and close the said barb after the head C' has raised the thread up into the loop of said barb as and for the purposes set forth.

3. In a knitting-machine, the combination with a revolving needle-cylinder, a series of
 55 stationary needles carried by said cylinder and provided each on its outer side with barb a adapted to be closed by pressure, a sinker-plate connected with said needle-cylinder so as to revolve with the same, sinker-
 60 guides in said sinker-plate, in number corresponding with the number of spaces between said needles and in alignment with the same,

and presser-seats between each adjoining pair of sinker-guides and in alignment with the barbs of the needles, of a series of recip-
 65 rocating sinkers C which are provided, each, with head C' having in its forward end edge an angular thread-receiving mouth C^2 for holding a thread while the respective sinkers are being moved inward through the
 70 spaces between the needles and at a line below the barbs, and also while lifting the thread up into the loop of the barb until the latter is closed, and a series of horizontal
 75 pressers which are separate and independent of the said sinkers and are seated on the said presser-seats between adjoining sinkers and adapted to be moved inward for closing said
 80 barbs at times different from that of movement of said sinkers for carrying the thread inward and upward into the loop of the barb, and mechanisms described adapted to operate, respectively, said sinkers and said pressers, as and for the purposes set forth.

4. In a knitting-machine the combination
 85 with a series of barbed needles of a revolving cylinder, a sinker-guide plate revolving with the latter and a series of four-motion thread-sinkers suitably supported on said plate and having each a thread-receiving mouth in its
 90 head end, a stationary thread-guide between the said circle of needles and the thread-receiving mouths of said sinkers when the latter are in normal inoperative position, and a series of individual pressers which are each
 95 suitably supported opposite the barb of each needle, of a cam progressively moving one or more of said sinkers and adjoining pressers simultaneously forward to one step in their forward movement, a cam moving these ad-
 100 vanced sinkers successively with a thread in its or their mouths a second step inwardly and past the needles, a cam moving said pressers successively a second step forward and closing the barbs of the needle, a guard
 105 holding the pressers closing said barbs for a suitable time, a cam elevating the head end of the sinkers successively with the thread to the plane of the upper end of the needles, a cam moving both the sinkers and pressers
 110 back past the thread-guide, a cam operating to depress the head ends of the sinkers and bring them to their normal inoperative position, and a landing-bur within the circle of needles and revolved by the same and coöper-
 115 ating successively with each fully-advanced sinker in the series for landing the thread over the upper ends of the needles opposite the pressers when advanced and closing the barbs of the needles, as set forth.

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Witnesses:

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