

**No. 670,489.**

**Patented Mar. 26, 1901.**

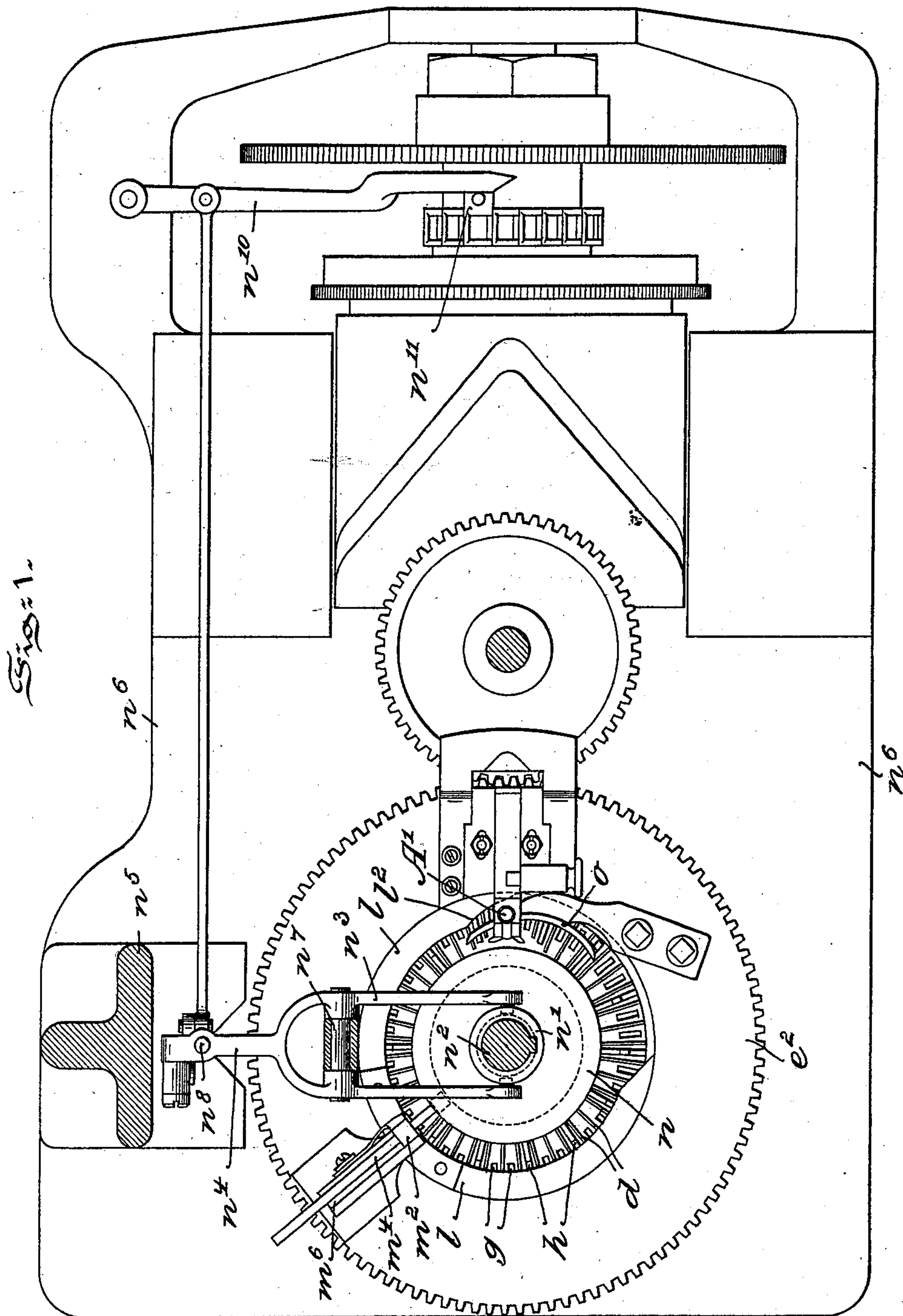
**G. BLACK & T. L. DODD.**

## ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(No Model.)

(Application filed Aug. 16, 1900.)

**4 Sheets—Sheet 1.**



28Xmssosoz  
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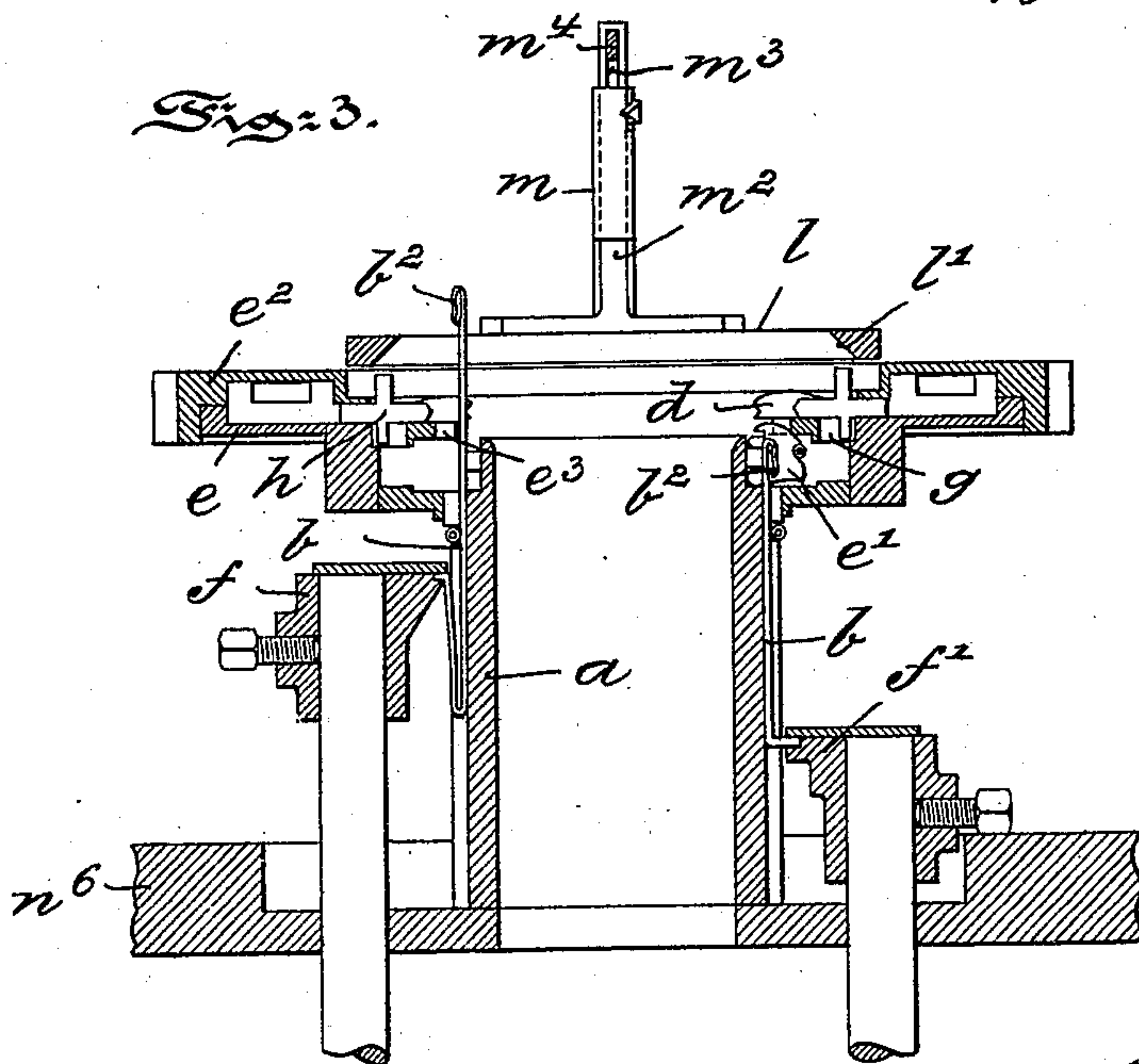
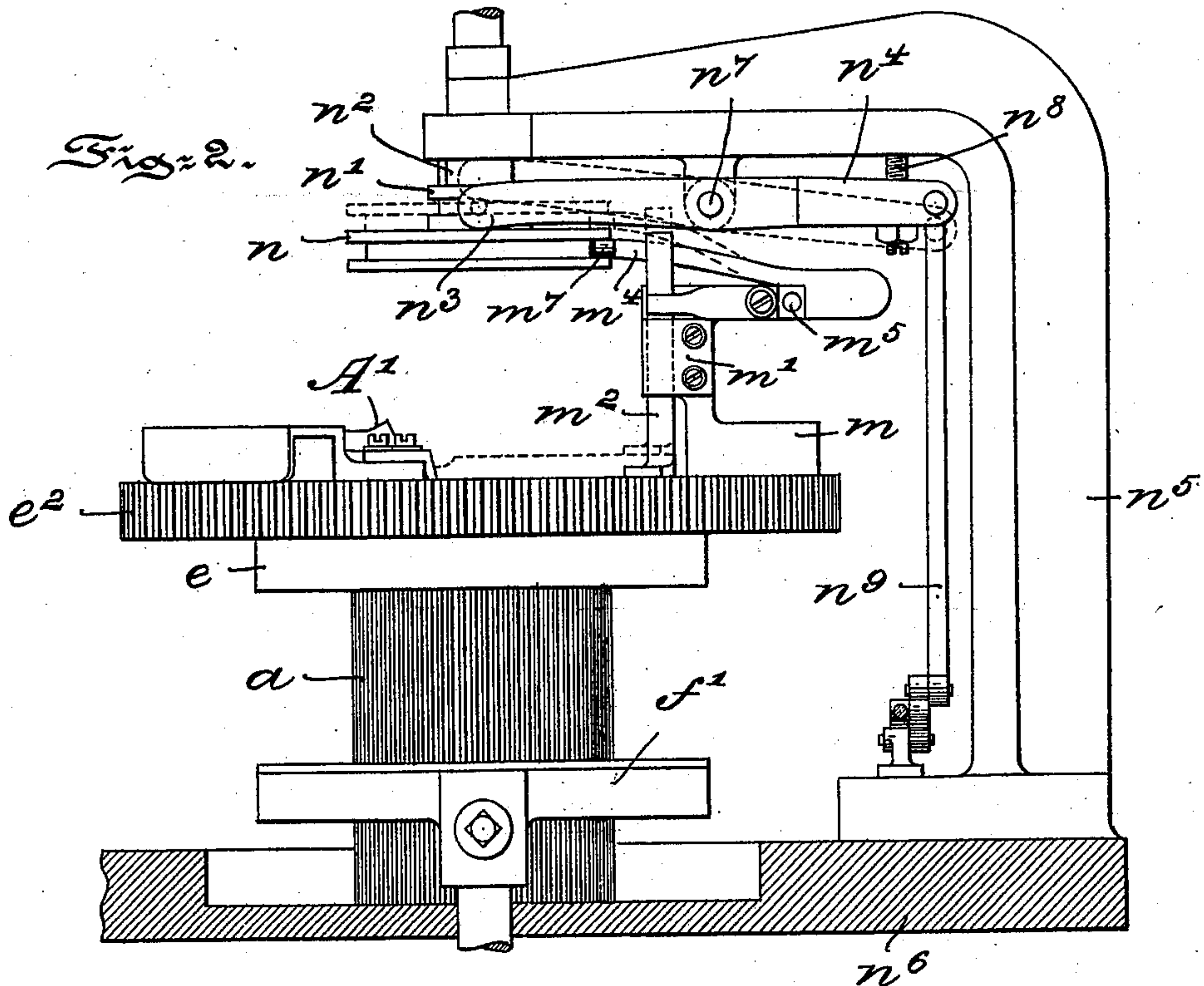
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ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Aug. 18, 1900.)

(No Model.)

4 Sheets—Sheet 2.



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4 Sheets—Sheet 3.

Fig. 4.

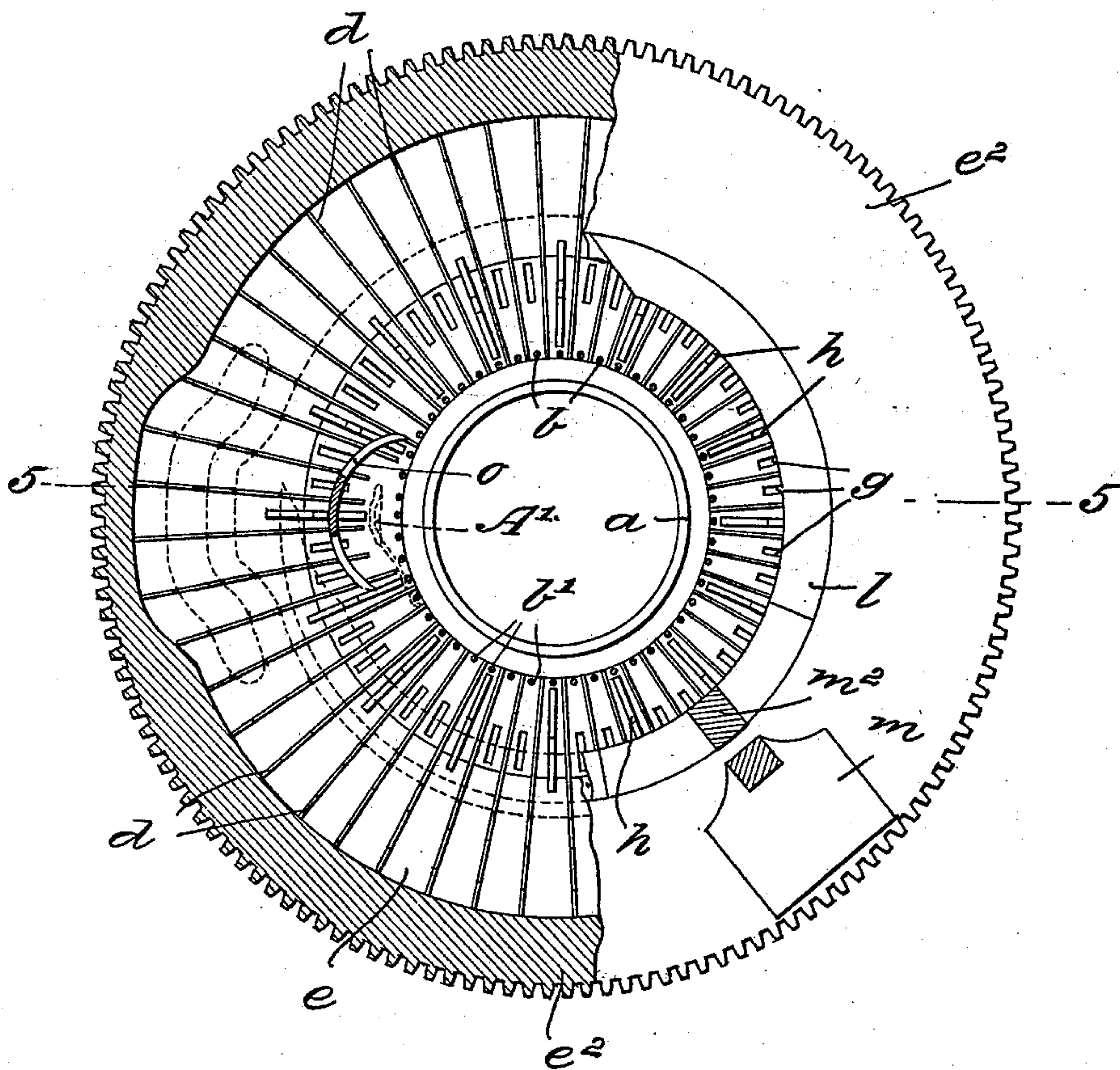
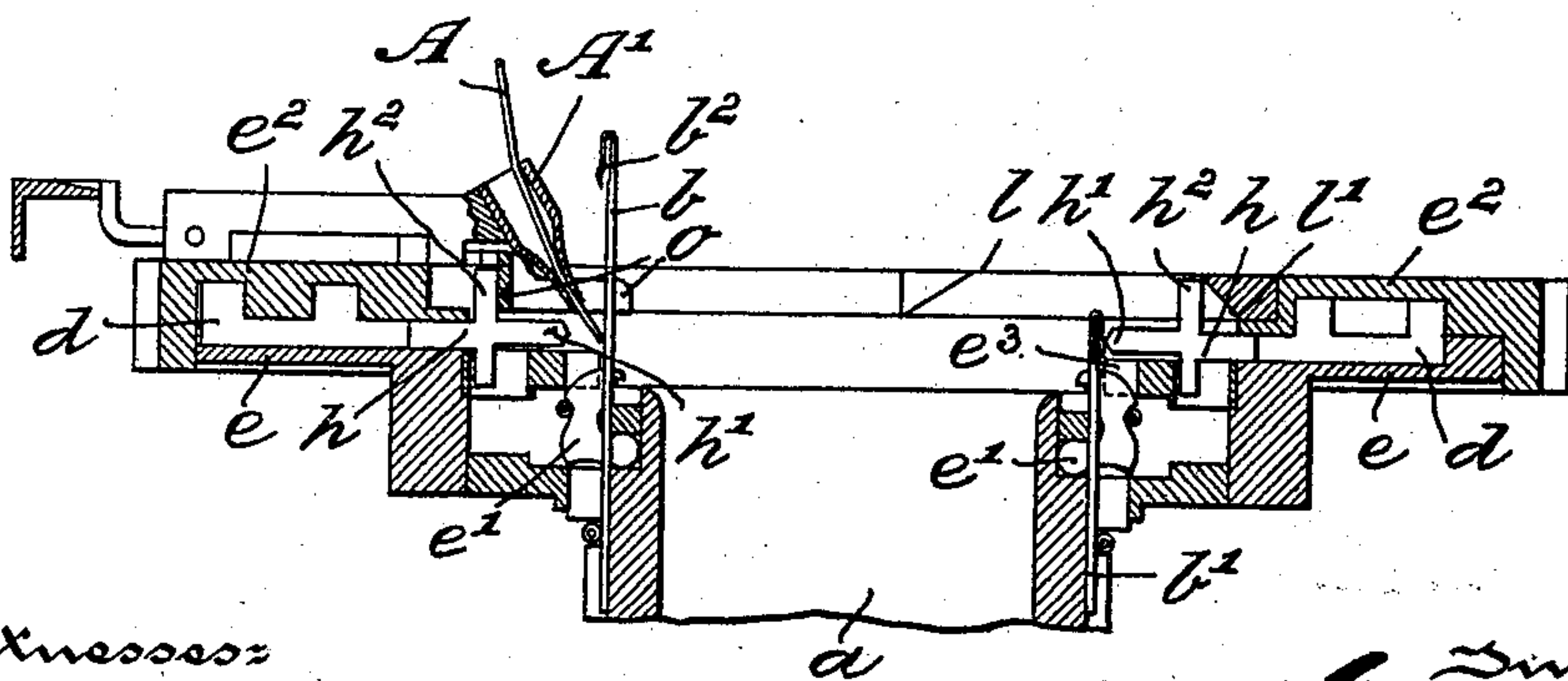


Fig. 5.



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ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(No Model.)

(Application filed Aug. 16, 1900.)

4 Sheets—Sheet 4.

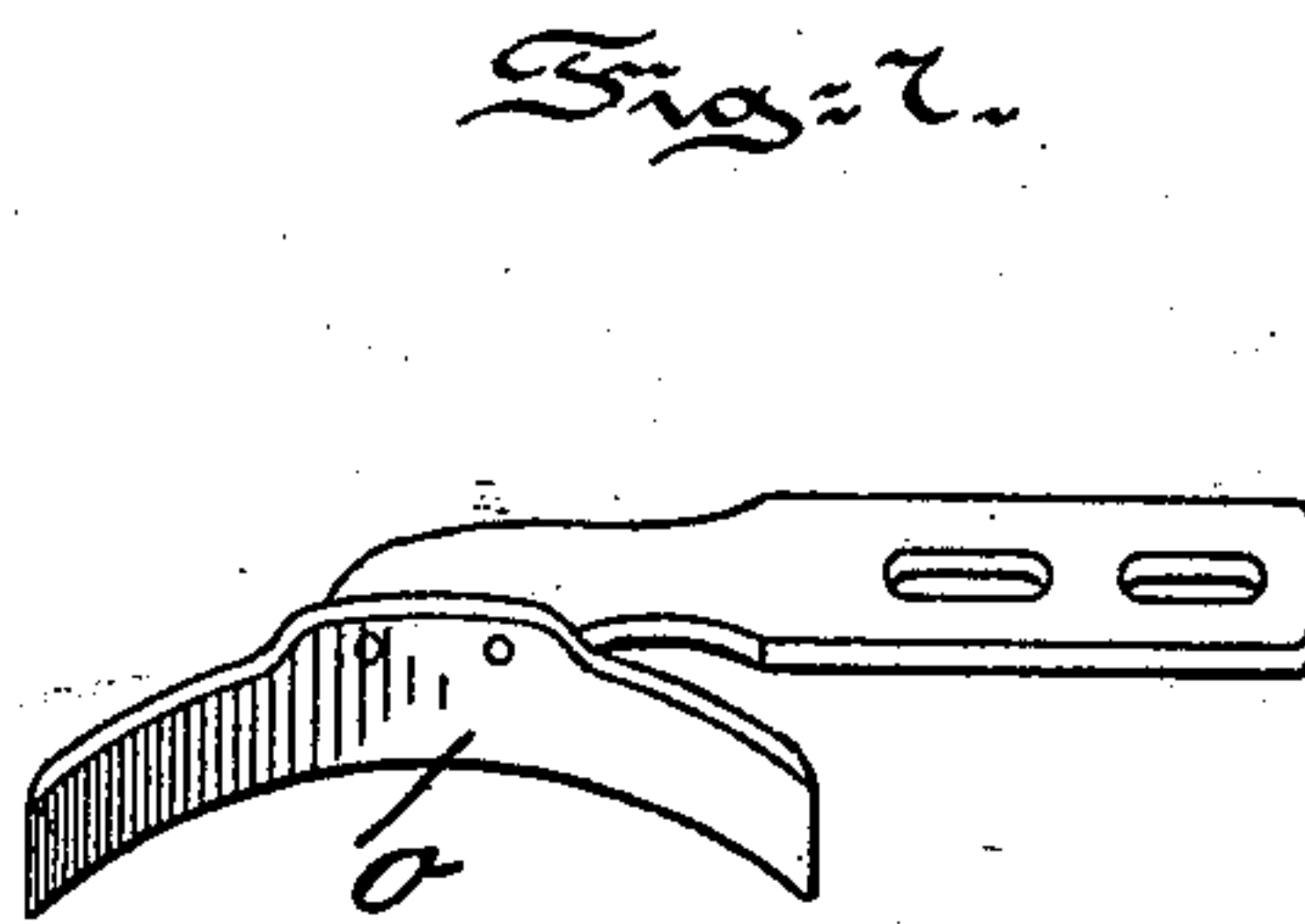
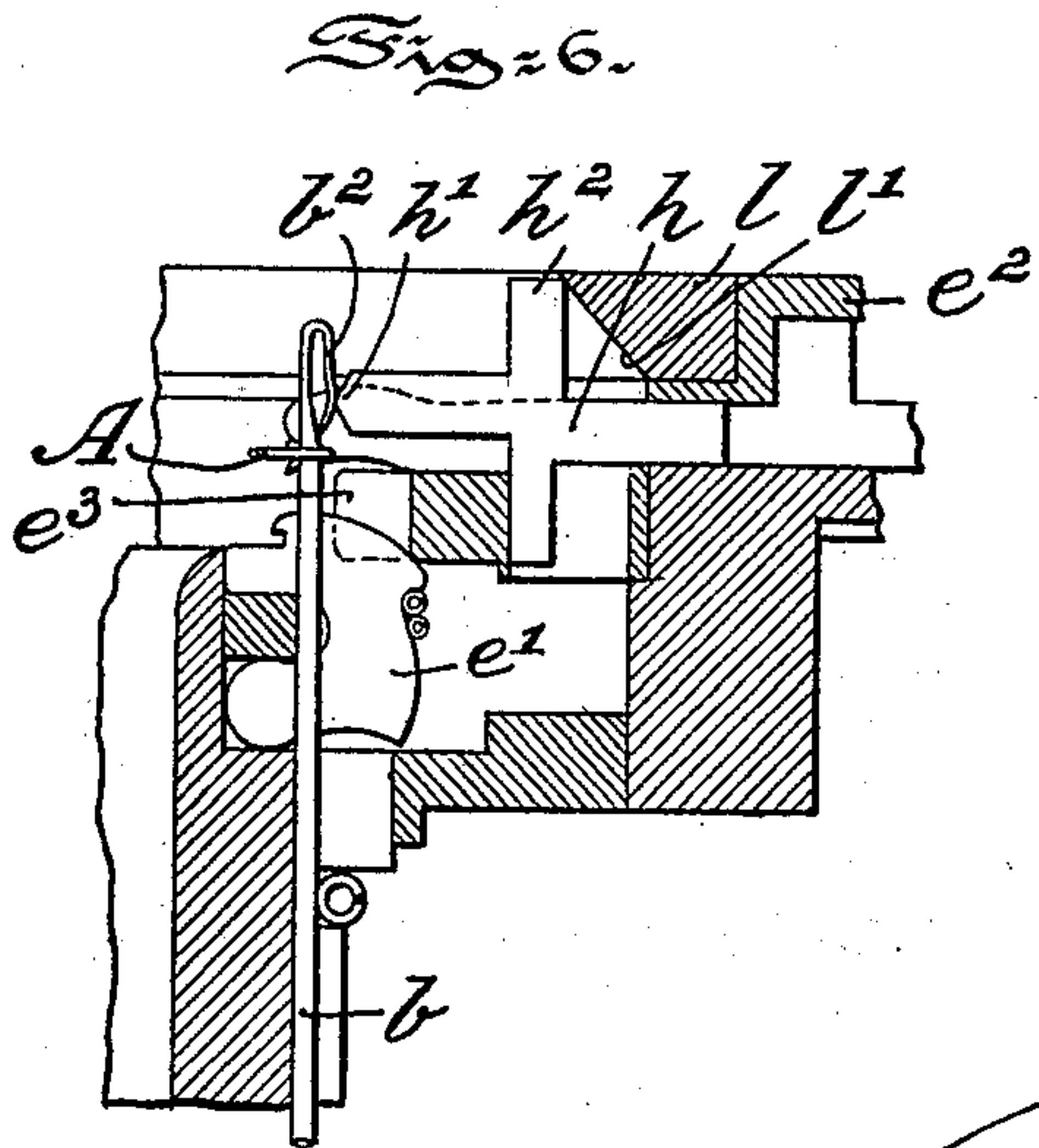
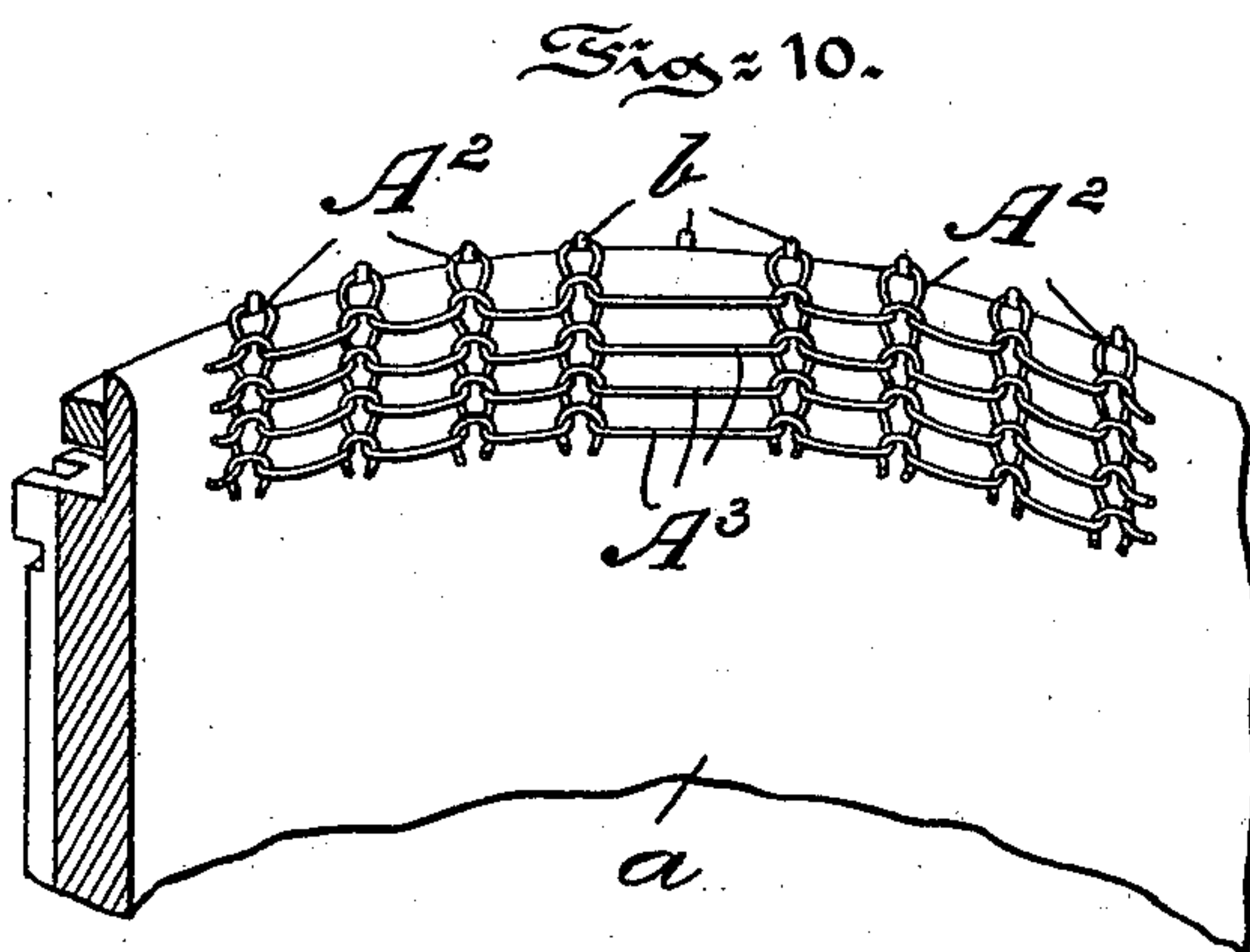
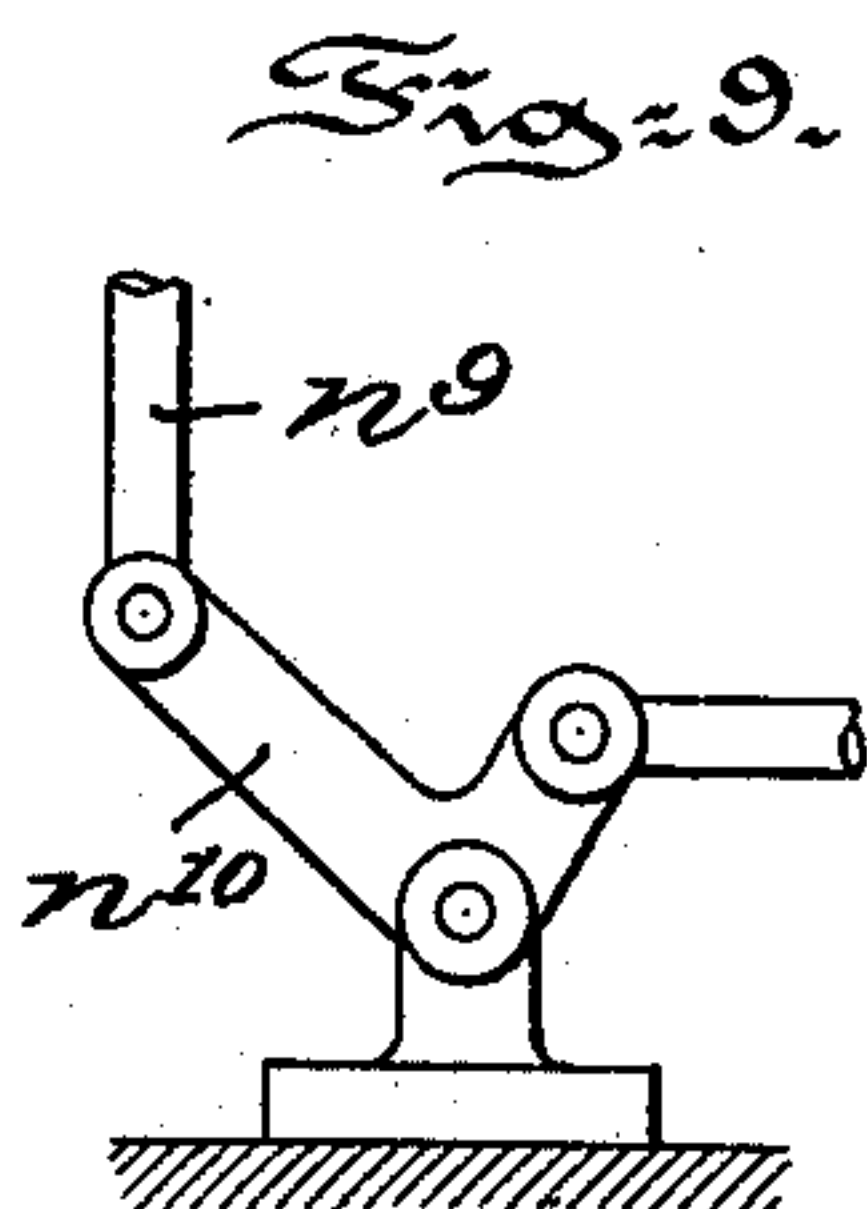
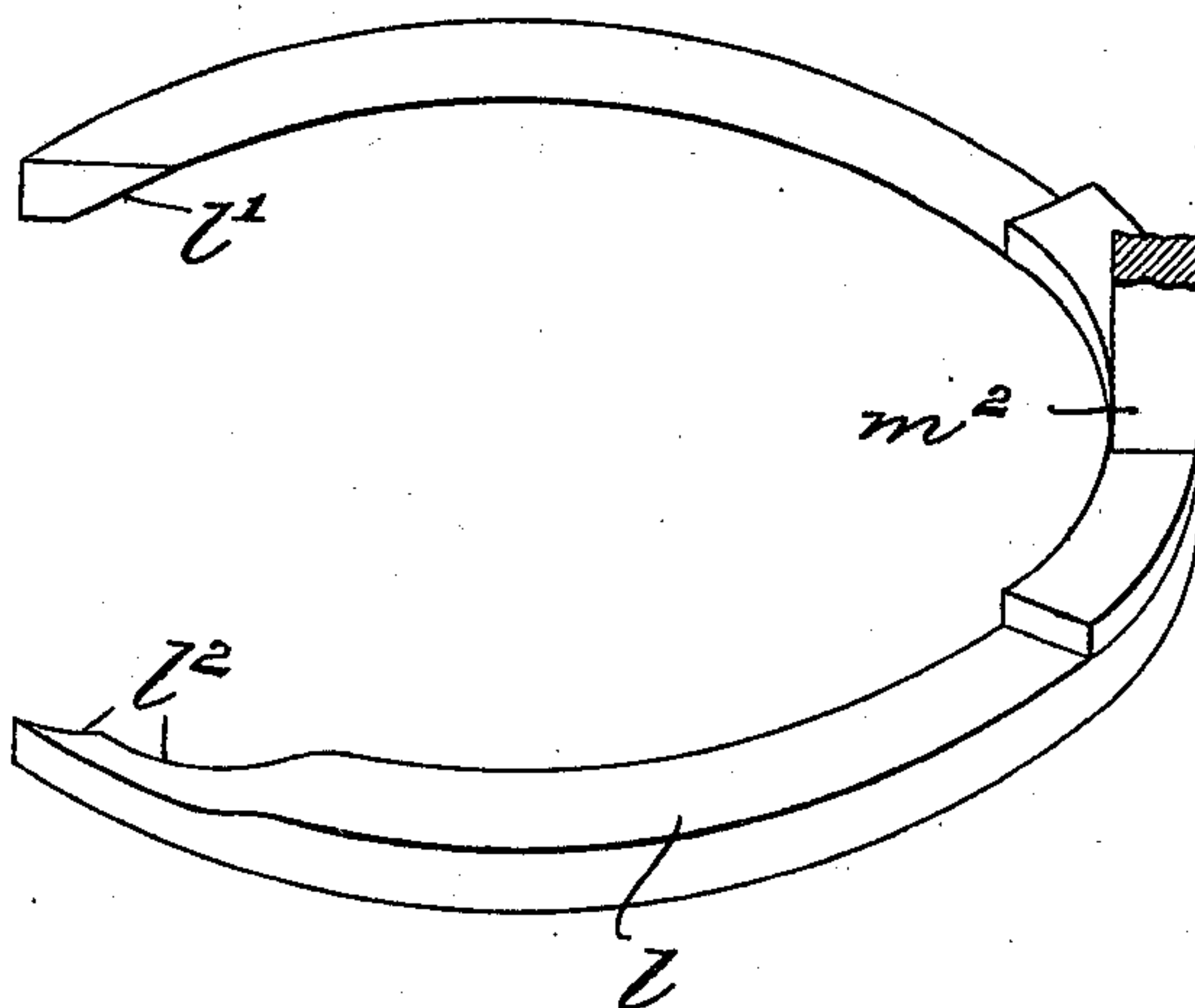


Fig. 8.



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# UNITED STATES PATENT OFFICE.

GEORGE BLACK AND THOMAS L. DODD, OF PHILADELPHIA, PENNSYLVANIA,  
ASSIGNORS, BY MESNE ASSIGNMENTS, TO JANE E. HENRY, OF SAME PLACE.

## ATTACHMENT FOR AUTOMATIC CIRCULAR-KNITTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 670,489, dated March 26, 1901.

Application filed August 16, 1900. Serial No. 26,997. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE BLACK, a subject of the Queen of Great Britain, and THOMAS L. DODD, a citizen of the United States, both residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Attachments for Automatic Circular-Knitting Machines, of which the following is a specification.

Our invention has relation to that type or class of automatic circular-knitting machines in which the needles are provided with spring-beards—such, for example, as the machine illustrated in Letters Patent of the United States No. 536,616, granted to E. J. Franck under date of April 2, 1895; and in such connection it relates to the construction and arrangement of the parts constituting an attachment whereby open or lace work may be knit upon the machine in conjunction with the regularly-formed meshes knit thereon.

The principal object of our invention is to provide in a circular-knitting machine having two sets of bearded needles, of which one set is the fashioning-needles and the other the ordinary needles, an attachment whereby the beards of certain needles of either or both sets may be automatically closed to prevent the formation by said needles of the regular loops or meshes and to secure the formation of crossing-threads forming the lace or open work of the fabric.

Our invention, stated in general terms, consists of an attachment for automatic circular-knitting machines constructed and arranged in substantially the manner hereinafter described and claimed.

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

Figure 1 is a top or plan view of an automatic circular-knitting machine with the attachment embodying main features of our invention connected therewith in operative position, certain portions being sectioned or broken away in order to more clearly illustrate the attachment. Fig. 2 is a side eleva-

tional view of the attachment and of such portions of the machine as are necessary to make the attachment operative. Fig. 3 is a vertical sectional view of the needle-cylinder and auxiliary parts and of the cam-ring which operates the beard-closing mechanism of the attachment, the cam-ring being illustrated in elevated or inoperative position. Fig. 4 is an enlarged top or plan view of the needle-cylinder, partly broken away and sectioned to illustrate the sinker-bed, sinkers, and the mechanism constituting the main portion of the attachment. Fig. 5 is a longitudinal sectional view on the line 5 5 of Fig. 4. Fig. 6 is an enlarged detail view of the jack closing the beard of the needle and of auxiliary parts operating the jack. Fig. 7 is an enlarged perspective view of the cam-piece surrounding the yarn-feed and adapted to retract the jacks immediately in front of the yarn-feed. Fig. 8 is a similar view of the cam-ring adapted to press the jacks inward against the beards of the needles. Fig. 9 is a detail view of the levers for transmitting the motion of a pattern-chain to the attachment, and Fig. 10 is a diagrammatic view illustrating the formation of the fabric.

Referring to the drawings, it will be seen that the main portions of the knitting-machine are arranged and operate in substantially the manner illustrated and described in the Letters Patent No. 536,616, hereinbefore referred to—that is, the needle-cylinder *a* is provided on its periphery with longitudinally-arranged grooves in which are adapted to reciprocate two distinct sets of needles, one set, *b*, occupying one-half the grooves in the cylinder *a* and constituting the fashioning-needles, while the other set, *b'*, are arranged in the other grooves and constitute the regular needles. Each needle *b* or *b'* has a beard *b<sup>2</sup>*, and in conjunction with this beard *b<sup>2</sup>*, which catches the thread *A* and forms the vertical loop of the fabric, are the sinkers or sinker-bars *d*, which hold the thread horizontally and gage the transverse measurement of the formed loop. The sinker-bar bed *e* and web-holders *e'* are of the same general type as illustrated and described in said patent and operate in the same general manner. Detailed



description of these parts and of the needle-carriers  $f$  and  $f'$  is therefore not deemed necessary.

Our present improvement resides in the means whereby the beard  $b^2$  of certain of the needles in either or both sets may be controlled during the operation of the machine, so that the beards may at certain periods of time be closed against the stems of the needles to prevent the entrance of the thread into the beards and to thereby prevent the formation of a loop by those needles. In order to accomplish this, which results in the formation of open or lace work in the fabric, the following preferred form of mechanism is employed: In the sinker-bar bed  $e$  are provided auxiliary grooves or vertically-arranged slots  $g$ , which radiate from the points at which the beards  $b^2$  of the needles  $b$  or  $b'$  approach the sinker-bar bed  $e$ . In each or certain of these grooves or slots  $g$  is adapted to slide a jack  $h$ . The preferred form of these jacks is illustrated in detail in Fig. 6 and consists of four prongs or projections, of which two are arranged horizontally and two vertically. The inner of the horizontal prongs has a beveled edge  $h'$ , adapted when the jack  $h$  is slid inward to bear against and to close the beards  $b^2$  of the needle, as clearly illustrated in Figs. 5 and 6 of the drawings. The jack  $h$  is located above the beard-closing ring  $e^3$  and acts upon the beard  $b^2$  before the ring  $e^3$  can act upon the same. The movement of the jacks  $h$  inward toward the beards  $b^2$  is secured by the following preferred mechanism: Above the sinker-bar bed  $e$ , on the sinker-head  $e^2$  thereof, is arranged a cam-ring  $l$ , in the shape of a segmental ring. The under face of this cam-ring  $l$  is beveled, as at  $l'$ , and is adapted when the ring is first depressed and then revolved to slide all the jacks  $h$  inward, so that the beveled ends  $h'$  press upon the beards  $b^2$ . One or both extremities of the cam-ring  $l$  is pointed, as at  $l^2$ , to enable the ring in revolving to engage the upper vertical prongs  $h^2$  of the jacks  $h$  and to guide them inward toward the beveled under face  $l'$  of the ring  $l$ . Up-and-down motion, as well as rotary motion, is given to the cam-ring  $l$  by the following preferred mechanism: Upon the sinker-head  $e^2$  is secured the standard  $m$ , carrying a vertically-slotted bracket-piece  $m'$ , in the slot of which a vertical arm or projection  $m^2$  of the ring  $l$  is adapted to be guided. The upper end of the arm  $m^2$  is transversely slotted, as at  $m^3$ , and through this slot extends a lever  $m^4$ , pivoted, as at  $m^5$ , to an extension  $m^6$  of the bracket-piece  $m'$ . The free end of the lever  $m^4$  is provided with a friction-roll  $m^7$ , engaging the slotted or grooved periphery of a horizontally-arranged disk or wheel  $n$ . The wheel  $n$  has a grooved collar  $n'$ , splined to a short shaft  $n^2$ , and engaging the groove of the collar  $n'$  is a forked clutch  $n^3$ , formed at one end of a lever-arm  $n^4$ . The shaft  $n^2$ , collar  $n'$ , and wheel  $n$  are supported in the horizontal or free end of a right-angled standard  $n^5$ ,

which is secured to and supported by the bed-plate  $n^6$  of the machine. The lever-arm  $n^4$  is pivoted, as at  $n^7$ , to the under face of the horizontal arm of the standard  $n^5$  and carries at its outer end an adjusting-screw  $n^8$ , serving as a stop to limit the downward movement of its inner forked end  $n^3$ . The outer end of the lever-arm  $n^4$  is connected by a link  $n^9$  with a series of levers  $n^{10}$ , operating in any suitable manner and preferably controlled by the pattern-chain  $n^{11}$ . It will be understood from the foregoing description that when the inner or forked end  $n^3$  is depressed the wheel or disk  $n$  is lowered and through the lever  $m^4$  serves to depress the arm  $m^2$  and ring  $l$ , so that the beveled face of the said ring will engage the prongs  $h^2$  of the jacks  $h$  and throw said jacks inward against the beards  $b^2$  of the needles  $b$  or  $b'$ . When, however, the wheel  $n$  is elevated, the ring  $l$  is withdrawn from contact with the prongs  $h^2$  of the jacks  $h$ .

Unless the jacks  $h$  are provided with springs or other retracting mechanism they would always remain in their inward position against the beards  $b^2$ . In this inward position the prongs  $h^2$  would always lie in the path of the rotating yarn-feed  $A'$  and would consequently be broken off when the feed  $A'$  in rotating struck them. Inasmuch as springs would serve to complicate the arrangement of the parts and at best are liable to break or otherwise fail to perform their function, a positive means for retracting the jacks is deemed preferable, not only to permit of the rotation of the yarn-feed  $A'$ , but also to retract the jacks when the cam-ring  $l$  has been elevated. To accomplish this, beneath the yarn-feed  $A'$  is arranged a curved cam-plate  $o$ , which travels with the feed  $A'$  and is designed, as shown in Figs. 4 and 5, to engage the prongs  $h^2$  and throw the jacks  $h$  outward. When the cam-ring  $l$  is elevated, the cam-plate  $o$  as the yarn-feed revolves throws all the jacks  $h$  successively outward to release the beveled ends  $h'$  from the needle-beards  $b^2$  and to remove the prongs  $h^2$  from the path of the yarn-feed  $A'$  and the jacks  $h$  remain in this retracted position. When, however, the cam-ring  $l$  is in depressed or operative position, the movement of the cam-plate  $o$  is followed by the entrance of one of the pointed ends  $l^2$  of the cam-ring  $l$ , which guide the prongs  $h^2$  and the jacks  $h$  into the inward position immediately after the yarn-feed has passed. In this instance the plate  $o$  is used simply to clear the path immediately in front of the yarn-feed when the needles are raised to permit the laying of the thread  $A$  against their shanks, and the ring  $l$  follows to bring the jacks  $h$  up against the needle-beards  $b^2$  to prevent the entrance of the said thread into the beards of the needles.

It is obvious that a full-fashioned seamless stocking may be knit upon a machine of this character and provided with our attachment. The rows of open or lace work may extend



from end to end or upon only a portion of the stocking at the will of the operator and without removing any needles and without removing the fabric from one machine after a portion has been knit and continuing the operation on another machine. The arrangement or location of the rows of open-work may be changed at will by taking out or adding jacks *h*. In Figs. 1 and 4 the jacks *h* are arranged so as to render every third needle inoperative. In Fig. 10 a fabric is shown which may be knit by making one needle in five inoperative. The jacks *h* may be used with either one of the sets *b* and *b'* of the needles or with both sets, whichever is preferred.

In the formation of the fabric the beard-closing ring *e*<sup>3</sup> serves to close the beards *b*<sup>2</sup> after the thread *A* has entered and to permit the previously-formed loop *A*<sup>2</sup>, which is on the shank of the needle, to slip over the bearded end of the needle as the needle descends. The jacks *h*, however, are thrown against the beards *b*<sup>2</sup> before the beards are operated upon by the beard-closing ring and before the thread *A* can enter the beard. Hence in further descending the needle will not form a loop, but will simply cast off at the proper times a long or crossing thread *A*<sup>3</sup>, which has been laid against the shank of the needle and has not been manipulated by the beard.

Having thus described the nature and object of our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a circular-knitting machine provided with sets or groups of bearded needles, means for elevating and depressing the needles to form the loops of the fabric and means whereby the beards of certain of the needles may be closed during the operation of the needles whereby the formation of loops by said certain needles is prevented, substantially as and for the purposes described.

2. In a circular-knitting machine having sets or groups of bearded needles, means for elevating and depressing the needles to form the loops of the fabric and a series of jacks adapted to impinge upon the beards of certain of said needles during the operation of the needles to render said certain needles inoperative, substantially as and for the purposes described.

3. In a circular-knitting machine provided with sets or groups of bearded needles, means for elevating and depressing said needles to form the loops of the fabric, a series of jacks adapted to close the beards of certain of said needles before the thread is fed thereto, and means for controlling said jacks, substantially as and for the purposes described.

4. In a circular-knitting machine provided with bearded needles, means for elevating and depressing said needles to form the loops of the fabric, a series of jacks adapted to auto-

matically close the beards of certain of said needles prior to the feeding of thread thereto, and mechanism for automatically controlling said means to release said beards, substantially as and for the purposes described.

5. In a circular-knitting machine, a bearded needle, means for elevating and depressing said needle to form a loop of the fabric, a jack adapted to impinge upon the beard of said needle to close the same before the thread is fed thereto, and means for retracting said jack to open said beard, substantially as and for the purposes described.

6. In a circular-knitting machine having bearded needles, mechanism for elevating and depressing said needles to form the loops of the fabric, a series of jacks adapted to impinge upon the beards of certain of said needles to close the beards before the thread is fed thereto, a sinker-bar bed in which the jacks and needles are adapted to shift in directions transversely to each other, and a cam-ring adapted to advance the jacks against the beards of the needles, said cam-ring adapted to rotate above the sinker-bar bed, substantially as and for the purposes described.

7. In a circular-knitting machine having bearded needles, mechanism adapted to elevate and depress said needles to form the loops of the fabric, a sinker-bar bed, a series of jacks adapted to slide radially in said sinker-bar bed transversely to the movement of the needles and to impinge upon the beards of certain of said needles to close said beards prior to the feeding of thread thereto, an upper vertical prong formed on each jack, a cam-ring having an under beveled face adapted to strike upon the prongs of the jacks to force the jacks against the beards and means for elevating and depressing said cam-ring, substantially as and for the purposes described.

8. In a circular-knitting machine having bearded needles, mechanism for elevating and depressing the needles to form the loops of the fabric, a sinker-bar bed, a series of jacks adapted to shift radially in said bed and transversely to the movement of said needles, a cam-ring adapted to shift the jacks inward to cause said jacks to impinge upon and close the beards of certain of the needles before the thread is fed thereto, a rotary yarn-feed and a curved cam-plate traveling with said yarn-feed and adapted to shift the jacks outward away from said bearded needles, substantially as and for the purposes described.

In testimony whereof we have hereunto set our signatures in the presence of two subscribing witnesses.

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