

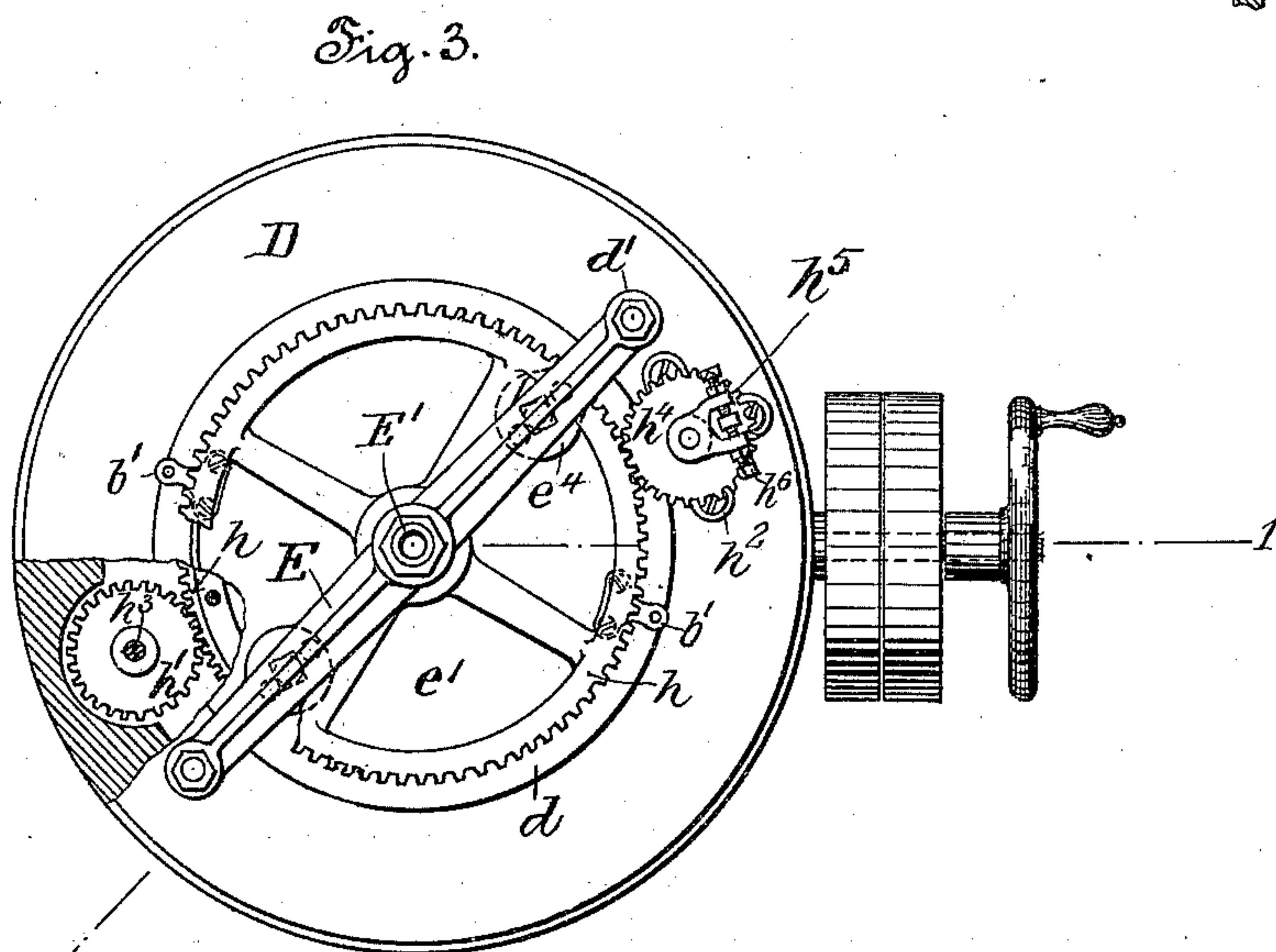
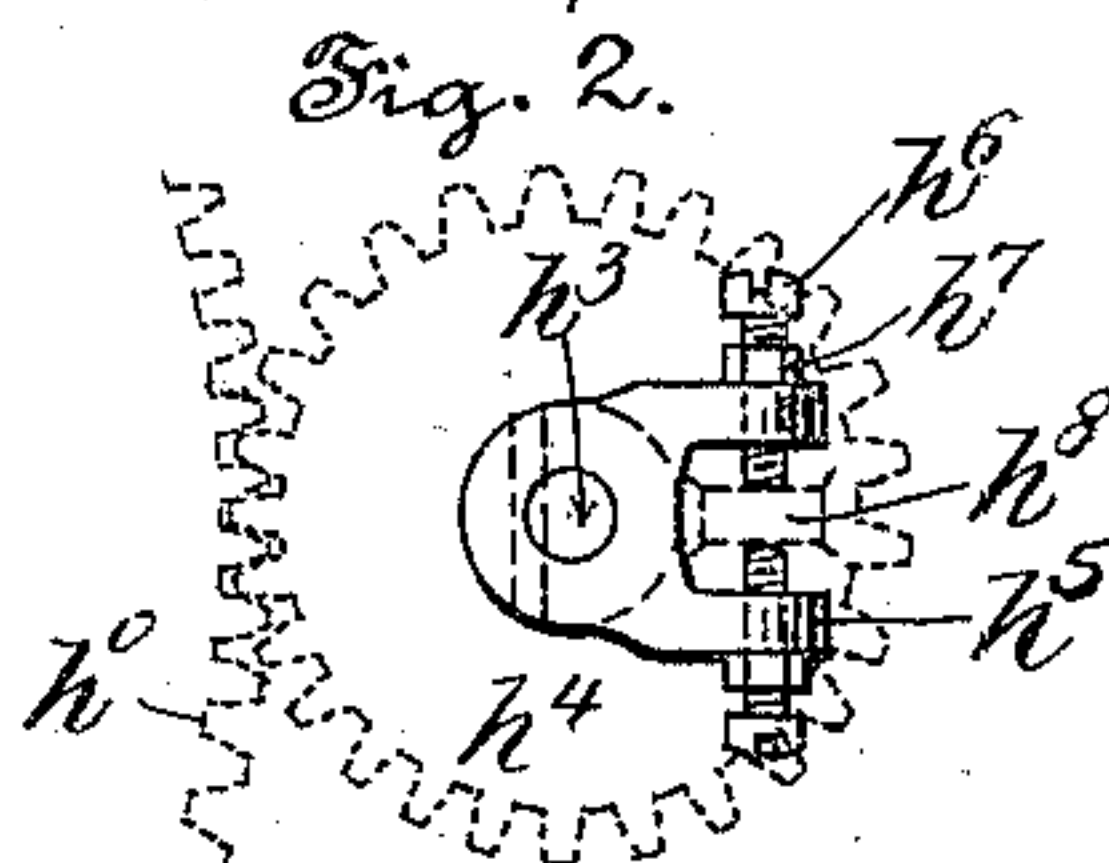
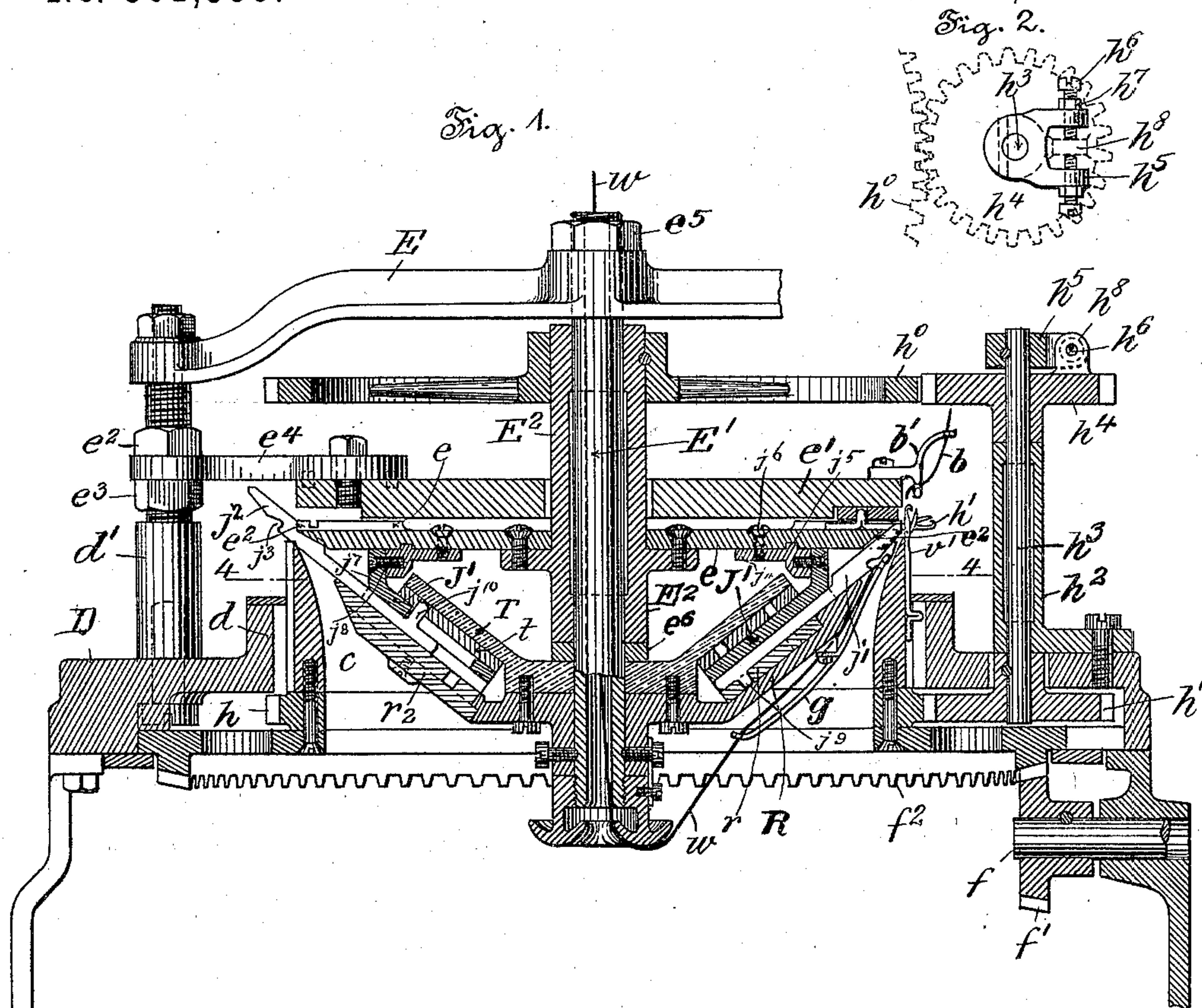
(No Model.)

2 Sheets—Sheet 1.

D. C. BELLIS.  
KNITTING MACHINE.

No. 561,559.

Patented June 9, 1896.



Witnesses:  
Hermann Müller  
J. Meyer

Inventor:  
David C. Bellis  
By Hermann Bormann  
Att'y.



(No Model.)

2 Sheets—Sheet 2.

D. C. BELLIS.  
KNITTING MACHINE.

No. 561,559.

Patented June 9, 1896.

Fig. 5.

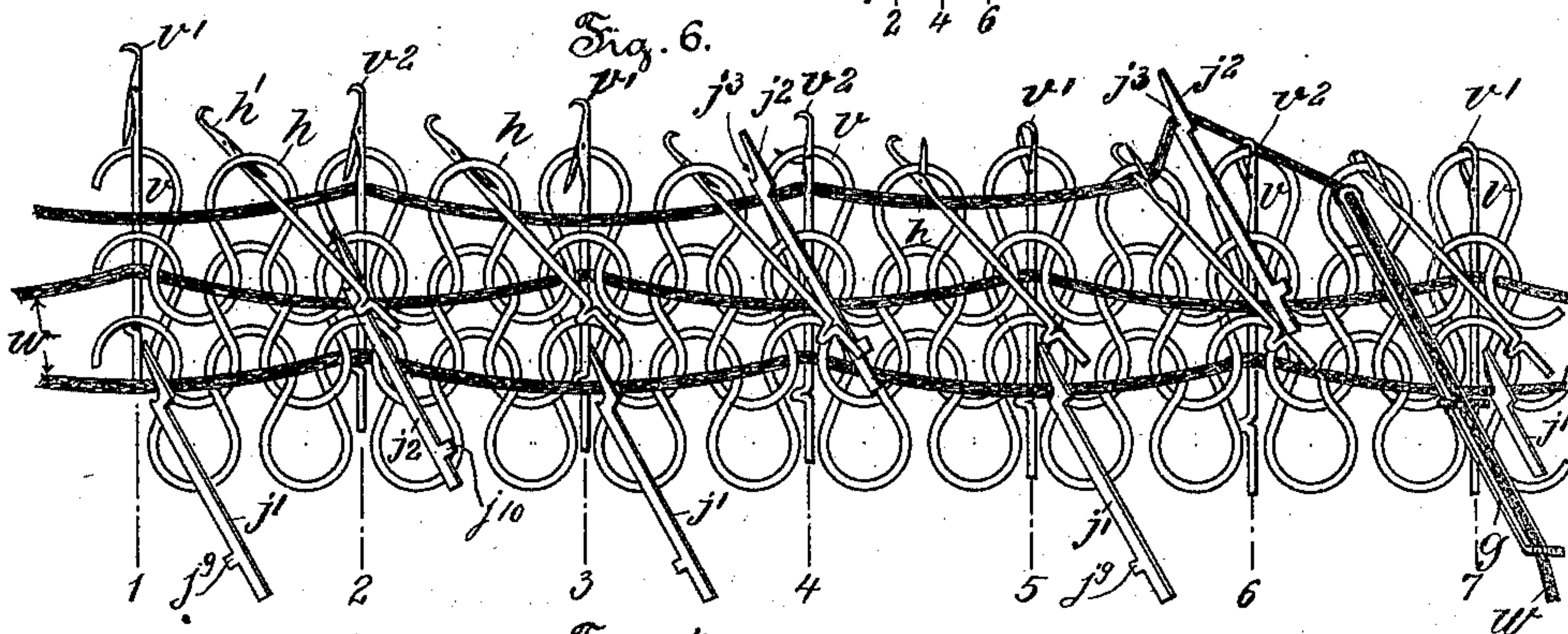
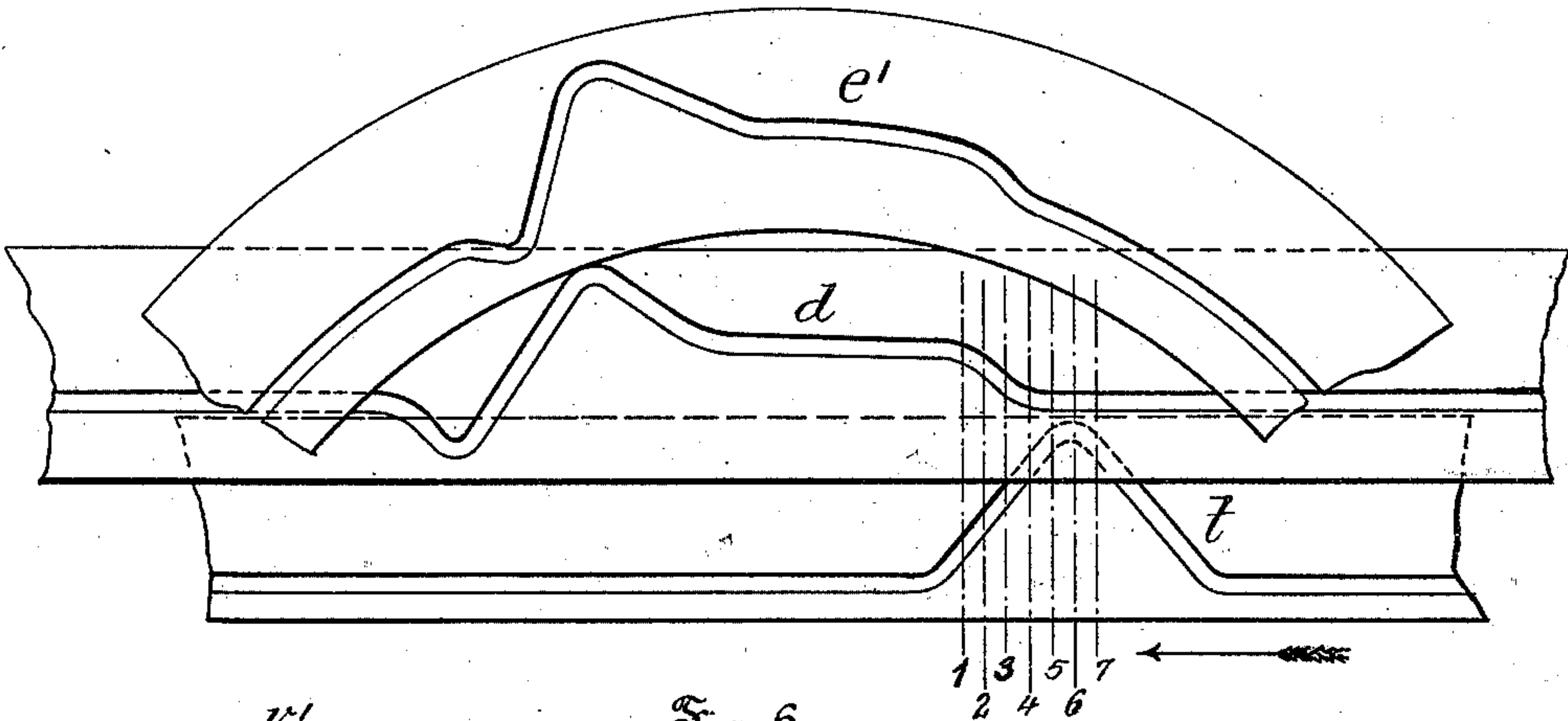
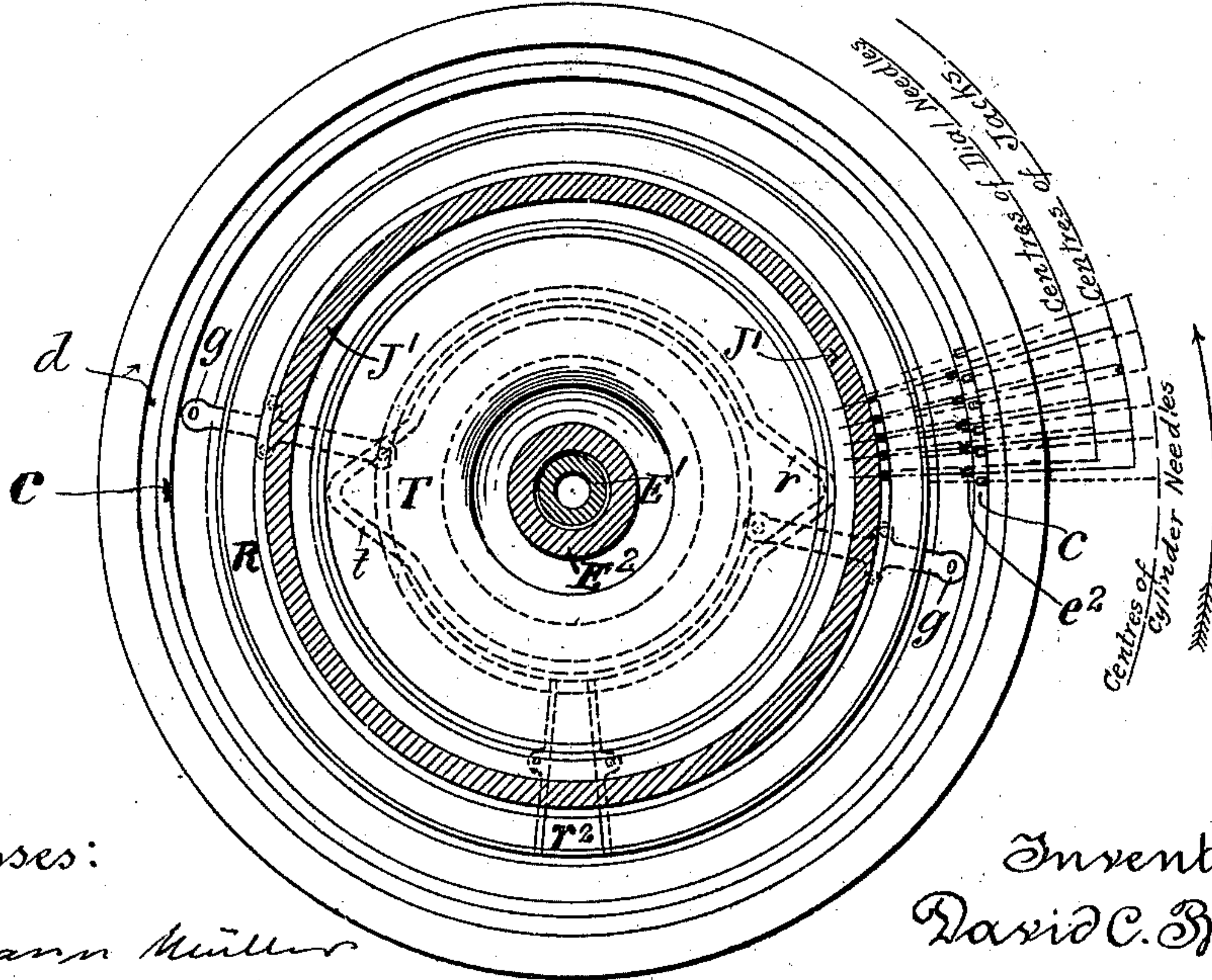


Fig. 4.



Witnesses:

Hermann Müller  
J. Heyer

Inventor:

David C. Bellis.  
By Hermann Bormann  
Att'y.



# UNITED STATES PATENT OFFICE.

DAVID C. BELLIS, OF ELIZABETH, NEW JERSEY.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,559, dated June 9, 1896.

Application filed March 2, 1895. Serial No. 540,371. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID C. BELLIS, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to those knitting-machines which produce ribbed fabrics and are commonly called "rib-frames."

The object of my invention is to construct a machine which is capable of producing a two-ply rib-knit webbing or of providing a backing on the ribbed knit fabric, which may be of a different material from that of which the body of the fabric is composed, while the latter is being produced by the machine.

The ribbed knit fabric with backing produced by a circular or flat knitting machine forms the subject-matter of an application for a patent filed of even date herewith. (Serial No. 540,370.)

The invention consists of a knitting-machine having two sets of needles disposed at an angle to each other, to produce a ribbed knit fabric, and one or more sets of jacks or loopers operated to act in conjunction with the needles to interlace a supplemental thread with the meshes composing the body of the ribbed fabric produced by the said two sets of needles.

The invention further consists of the improvements hereinafter more fully described, and pointed out in the claims.

The invention will be more fully understood when taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical section on different radii of a circular-knitting machine, the section being taken approximately on the lines 1 1 of Fig. 3, showing a common circular rib-frame having a set of horizontal needles and a set of vertical needles and interlacing devices, as jacks, and a conical jack-bed with cams, all arranged to interlace at the inside of the knit fabric a supplemental thread with the meshes formed by the needles. Fig. 2 is a top view of a device for adjusting the gearing by which the jack-bed and needle-dial are driven, so that the dial-needles and jacks may be brought into proper relative

position with the cylinder-needles. Fig. 3 is a top view of the machine, showing the driving mechanism for the needle-dial and jack-bed. Fig. 4 is a sectional view taken on lines 4 4 of Fig. 1, showing the jack-cams and jack-bed, as well as the needle-cylinder and the positions of the vertical needles, horizontal needles, and jacks. Fig. 5 is a diagrammatic view of the different cams employed for the needles and jacks, and showing the relative positions of the said cams; and Fig. 6 is a view showing the operation of the two sets of needles and cams to produce the improved ribbed web.

Referring now to the drawings for a further description of my invention, D is the machine-bed of a circular-knitting machine provided with the usual stationary cam-cylinder *d* and the rotatable needle-cylinder *c* for the vertical needles *v'* and *v''*. *e* is the rotatable needle-dial for the horizontal needles *h'*, which latter are actuated by cams on the stationary cam-dial *e'*. These parts are constructed in the well-known manner, and the needle-cylinder *c* and needle-dial *e* are operated from the main shaft *f* by the bevel-gears *f'* and *f''* and by other devices hereinafter more fully described.

To produce a plain ribbed fabric, the vertical needles *v'* *v''* and horizontal needles *h'*, above mentioned, are necessary only; but to produce a backing on such fabric while the latter is being produced devices must be provided which bring the backing or supplemental thread from the inside of the machine over the needles at certain and predetermined intervals, so that it may be interlaced with the meshes of the fabric, as will be hereinafter more fully described. Various devices may be employed to accomplish this; but preference is given to jacks *j'* *j''*, which are of such dimensions as to pass between the needles and of such strength and stiffness as to sustain wear and tear. These jacks or loopers *j'* *j''* are mounted in grooves of a conical jack-bed *J'*, fastened to the needle-dial *e* in any suitable manner. In the present instance an annular ring *j<sup>4</sup>*, having a feather *j<sup>5</sup>* fitting into a groove of the dial *e*, is secured to the dial by the screws *j<sup>6</sup>*, and the conical jack-bed *J'* is provided with a vertical flange *j<sup>7</sup>*, fitting the circumferential



edge of the ring  $j^4$ , and is held thereto by the screws  $j^8$ . The dial  $e$  is slotted at its periphery, as shown in Figs. 1 and 4 at  $e^2$ , to further guide the jacks  $j' j^2$  at their outer ends, which are provided with notches  $j^3$ , engaging the backing-thread  $w$ , led from the yarn guide or guides  $g$ , fastened to the lower stationary jack cam-bed R.

The jacks  $j' j^2$ , having hubs  $j^9 j^{10}$ , are preferably operated by cams in about the same way as the needles are operated. In lacing a backing-thread of wool or other material onto a ribbed fabric it is not always desirable to lace the said thread with each mesh formed by the needles, first, because the backing-thread is generally chosen of thicker and better quality of yarn than that of which the body is composed; secondly, to prevent bunching of the backing itself; thirdly, to give an even and smooth inner face to the fabric, and, fourthly, to prevent the appearance of the backing-thread on the outer face of the fabric. For the latter reason it is desirable to interlace the backing thread only with the meshes formed by the vertical needles  $v' v^2$ , and for the former reasons it is desirable to interlace the backing-thread with every other mesh of one horizontal row of meshes produced by the said vertical needles  $v'$  and at the next horizontal row of meshes by the needles  $v^2$ , so that the backing-thread  $w$  is interlaced with the meshes of the needles  $v^2$ , which meshes are in vertical direction between the meshes formed by the needles  $v'$  of the preceding row, with which the backing-thread  $w$  was interlaced, as is clearly shown in Fig. 6.

It is obvious that when the backing-thread  $w$  is to be interlaced with every other mesh of a horizontal row of meshes formed by the vertical needles, as mentioned before, two sets of jacks  $j'$  and  $j^2$  and two jack-cams  $r$  and  $t$  must be provided, one set of jacks,  $j'$ , operating in conjunction with the vertical needles  $v'$  and the other set of jacks,  $j^2$ , operating in conjunction with the vertical needles  $v^2$ . For this purpose there is arranged one conical cam-bed R below the conical jack-bed  $J'$  and a conical cam-bed T above the said jack-bed  $J'$ , and in each of the cam-beds R and T are provided the cams  $r$  and  $t$ , respectively. These cams  $r$  and  $t$  are so mounted on the cam-beds R and T as that their highest points or highest sections lie in a diametrical line of the machine when the latter is a "two-feed"—i. e., when the machine is provided with two sets of cams for the vertical and the horizontal needles and two guides  $b'$  for the yarn which is to compose the body of the ribbed knit web.

The mounting of the different devices, cams, cam-beds, and dial and the movements of the needle-cylinder, needle-dial, and jack-bed is accomplished in the following manner:

Onto the base D are fixed, diametrically opposite each other, two posts  $d'$ , which are offset and threaded at their upper ends to first

hold the cam-dial  $e'$  in proper position by the brackets  $e^4$  and the nuts  $e^2$  and  $e^3$ , and, secondly, to support the transverse arm E, on which the hollow central spindle E' is adjustably suspended, the adjustment being attained by the nut  $e^5$  for the purpose of producing finer or coarser knitted rib fabrics, as may be desired and as is well known by those skilled in the art. The stationary spindle E' carries at its lower end the hub of the conical cam-bed R, which is rigidly secured thereto. The upper cam-bed T is connected with the lower cam-bed R by screws, so that both beds are held stationary and rigid to the base of the machine.

On the top of the hub of the upper cam-bed T and around the hollow spindle E' is mounted a washer  $e^6$ , and on this a sleeve E<sup>2</sup>, surrounding the spindle E'. The sleeve E<sup>2</sup> is provided with a flange, to which the rotating needle-dial  $e$  is secured.

To insure synchronous movements of the needle-cylinder  $c$ , needle-dial  $e$ , and jack-bed  $J'$ , a toothed ring or gear-wheel  $h$  is interposed and fastened between the bevel-wheel  $f^2$  and needle-cylinder  $c$ , and with this wheel  $h$  mesh the two pinions  $h'$ , fastened to shafts  $h^3$ , journaled in brackets  $h^2$ , which are disposed diametrically opposite each other and fastened to the base of the machine. On the upper end of these shafts  $h^3$  are loosely mounted the pinions  $h^4$ , which mesh with a gear-wheel  $h^6$ , secured to the sleeve E<sup>2</sup>, so that the needle-dial  $e$  and jack-bed  $J'$  are driven at the same speed as that of the needle-cylinder  $c$ . To set and retain the needle-dial and jack-bed in proper relative position to the needle-cylinder, any device may be connected to the shaft  $h^3$  and the loose pinion  $h^4$ ; but preference is given to that shown in Fig. 2, which is simple, rigid, and the necessary adjustments may be made very readily thereby. This device consists of a forked arm or hub  $h^5$ , secured to the upper end of each shaft  $h^3$ , in the prongs of which screws  $h^6$ , with counter-nuts or jam-nuts  $h^7$ , are provided to hold the tongue or projection  $h^8$  of the pinions  $h^4$  rigidly between them. By unscrewing one and tightening the other screw  $h^6$  the needle-dial  $e$  and jack-bed  $J$  may be brought into proper position with the needle-cylinder  $c$ .

To insert or remove the jacks  $j'$  and  $j^2$ , a removable piece or cap  $r^2$  is provided in the lower cam-bed R, which is fitted into and held to the latter by screws accessible from the under side of the machine. The portion of the cam  $r$  which is cut away at this point of the cam-bed R is provided for by making the cap-piece  $r^2$  thicker than the bed R, so that the inner face of the cap is flush with the inner face of the cam  $r$ , and cutting a groove in the inner face of the cap  $r^2$  in line with the groove of the cam  $r$  for the hubs  $j^9$  of the jacks  $j'$ , as shown in Figs. 1 and 4.

In Fig. 5 are illustrated in their relative positions a cam of the cam-dial  $e'$ , a cam of the cam-cylinder  $d$ , and a cam  $t$  for operating



one set of jacks  $j^2$ . It may here be remarked that when ribbed knit fabric with a backing, as shown in Fig. 6, is desired—i. e., when the backing-thread  $w$  is to be interlaced with meshes of every other wale produced by every other vertical needle—one jack-cam must be provided for each cylinder-cam. For instance, a “two-feed” machine, as shown, is provided with two thread-guides  $g$  for the backing-thread  $w$  and with two jack-cams  $r$  and  $t$ , of which the cam  $r$  operates the jacks  $j'$  and the cam  $t$  the jacks  $j^2$ . Now as there are as many jacks  $j'$  and  $j^2$  as there are needles  $v'$  and  $v^2$  and each of the latter are actuated twice during each revolution of the needle-cylinder, while the jacks  $j'$  and  $j^2$  are actuated by their respective cams  $r$  and  $t$  only once during the same operation, it will be seen that a backing-thread  $w$  is interlaced with a mesh of every other wale. It will, however, be understood that should the backing-thread  $w$  be interlaced with each mesh formed by a dial-needle or a vertical needle one set of jacks, having their hubs projecting in one and the same direction, are necessary, and one jack-cam  $r$  or  $t$  must be provided for every cam in the cam-cylinder or cam-dial.

In Fig. 6 are shown seven cylinder-needles on center lines 1, 2, 3, 4, 5, 6, and 7, and these lines are also indicated in Fig. 5. Dial-needles  $h'$  and jacks  $j'$  and  $j^2$  are also shown in Fig. 6, and the operation of the jacks  $j^2$  in conjunction with their respective cylinder or vertical needles  $v^2$  may be readily seen from both Figs. 5 and 6.

In describing the operation of interlacing the backing-threads, of which two ends are used in the machine shown in the drawings, it is deemed sufficient to describe the interlacing of one thread  $w$  by one set of jacks  $j^2$  only, because the other thread or threads controlled by the set of jacks  $j'$  is or are interlaced in precisely the same manner.

To interlace the backing-thread  $w$  with the meshes to be formed by the vertical needles  $v^2$ , the thread is led from the outside of the machine through the hollow spindle  $E'$ , Figs. 1 and 4, and then through one of the guides  $g$ , Figs. 1, 4, and 6. From the diagram Fig. 5 it will be seen that assuming that the needle-cylinder  $c$ , needle-dial  $e$ , and jack-bed  $J'$ , with the needles and jacks, move in the direction indicated by the arrow, the jacks  $j^2$  first rise in a slanting direction to push the thread  $w$  over the vertical needle  $v^2$ , as shown at 6, Fig. 6, while the vertical needle  $v^2$  is held depressed. The jacks  $j^2$ , in passing farther through their cam  $t$ , recede and the vertical needles begin to rise, so that the thread  $w$  is brought fully back of the needles  $v^2$ . Needles  $v^2$ ,  $v'$ , and  $h'$  now form in the usual manner the loops  $v$  and  $h$ , and the needles  $v^2$  cast off the finished meshes  $v$ , together with the thread  $w$ , interlaced with the said mesh, as will be readily understood by those skilled in the art.

It is obvious that modifications may be made in the details of construction of the machine, the shaping of the jacks and their operating cam or cams, and also in the interlacing of the backing or other thread with either or all of the meshes produced by the vertical needles or horizontal needles or both, or of certain meshes produced by either or both of them, without departing from the spirit of the invention; and it is also obvious that any other form of machine for producing a ribbed knit fabric may be provided with jacks or similar devices to bring a thread  $w$  over a needle to be interlaced with a mesh formed by such needle.

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

1. A knitting-machine having two sets of needles and cams therefor for producing ribbed fabrics, jacks or loopers, cams and a bed therefor operated by the driving mechanism of said machine to interlace a supplemental thread with the meshes produced by the said needles, substantially as and for the purposes set forth.

2. A circular-knitting machine having two sets of needles and cams therefor, in combination with a conical jack-bed supported centrally of the machine, jacks or loopers mounted in said bed, and cams adapted to operate the jacks or loopers in conjunction with certain of the said needles, substantially as and for the purposes set forth.

3. A circular-knitting machine having two sets of needles, needle-cylinder, cam-cylinder, needle-dial and cam-dial together with jacks or loopers operatively mounted in grooves of a jack-bed fastened to the needle-dial, and cams adapted to operate the said jacks or loopers in conjunction with the said needles to interlace a supplemental thread with the meshes produced by the said needles, substantially as and for the purposes set forth.

4. A circular-knitting machine having two sets of needles a needle-cylinder, cam-cylinder, needle-dial and cam-dial, together with two sets of jacks operatively mounted in grooves of a jack-bed fastened to the needle-dial, and two sets of cams each adapted to operate in conjunction with certain of the said needles, substantially as and for the purposes set forth.

5. A knitting-machine for producing ribbed knit fabrics having two sets of needles and cams therefor, and jacks or loopers operated by cams to bring an extra thread from the inside of the machine over certain of the needles, substantially as and for the purposes set forth.

6. A circular-knitting machine having two sets of needles and means for operating the same, a system of loopers or jacks operated by cams to interlace a supplemental thread with the meshes produced by the said needles.



dles and means for supplying the said loopers with yarn, substantially as and for the purposes set forth.

7. In a circular-rib-knitting machine the combination of two sets of needles a cylinder and a dial therefor, a system of loopers or jacks, guided in slots of the said dial, a bed for said loopers or jacks and means for operating the said needles and loopers, substantially as and for the purposes set forth.

8. In a circular-knitting machine the combination of two sets of needles, a system of loopers or jacks and means for operating said needles and loopers, a hollow spindle supporting a sleeve, a needle-dial and a bed for the system of loopers or jacks the spindle adapted to lead a supplemental thread from the outside of the machine to the said needles, substantially as and for the purposes set forth.

9. A knitting-machine for producing ribbed knit fabric comprising a rotating needle-cylinder and needle-dial, a stationary cam-cylinder and cam-dial, said needle-cylinder driven from a main shaft by bevel-gears, a gear-wheel fastened to said needle-cylinder and meshing with pinions each fastened to one end of a shaft, pinions adjustably held on the other ends of said shafts and meshing with a gear-wheel attached to a sleeve supporting the said needle-dial, a jack-bed attached to said dial and rotating therewith, and a hollow spindle carried by a cross-arm of the machine, for guiding the said sleeve and supporting the cam-beds for the said jacks, substantially as and for the purposes set forth.

10. A knitting-machine for producing ribbed knit fabrics, comprising a rotating needle-cylinder and needle-dial, a stationary cam-cylinder and cam-dial, two posts, a cross-arm supported thereby, said dial adjustably held on said posts, a hollow stationary spindle suspended centrally from the said arm, jack-actuating cams secured to said hollow spindle, a sleeve surrounding said spindle and supported thereby, a jack-bed and said needle-dial fastened to said sleeve and receiving rotary motion from the rotating needle-cylinder by gearing, jacks slidingly mounted in the rotating jack-bed and actuated by the said jack-cams to operate in conjunction with

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

11. A knitting-machine for producing ribbed knit fabrics comprising two sets of needles, a needle and a cam cylinder, and needle and cam dial, two posts, a cross-arm supported thereby, said cam-dial adjustably held to said posts, a hollow spindle suspended from said arm and surrounded by a sleeve carrying the needle-dial and a jack-bed, jacks slidingly mounted in the said jack-bed, a jack cam-bed fastened to the lower end of the hollow spindle, which is provided with one or more thread-guides, and a removable section by which the jacks may be removed from the said bed, substantially as and for the purposes set forth.

12. A knitting-machine for producing ribbed knit fabrics, comprising a rotating needle-cylinder and needle-dial, a stationary cam-cylinder and cam-dial, said needle-cylinder driven from a main shaft by bevel-gears, a gear-wheel fastened to said needle-cylinder and meshing with a pinion fastened to one end of a shaft journaled in a bracket attached to the machine-bed, a pinion having a projection mounted loosely on the other end of said shaft, a forked arm attached to said shaft and having at its forked ends set-screws, which impinge against the projection of the loose pinion, two posts attached to the base of the machine, a cross-arm supported thereby, said cam-dial held adjustably to said posts, a hollow central spindle suspended from the cross-arm, one or more jack cam-beds fastened to the lower end thereof, a rotatable sleeve surrounding said spindle and supported by said jack cam-beds, a jack-bed and said needle-dial attached to said sleeve, a gear-wheel also secured to said sleeve and meshing with the loose pinion before mentioned, and jacks slidingly mounted in said jack-bed, substantially as and for the purposes set forth.

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

DAVID C. BELLIS.

Witnesses:

ANTOINETTE H. BRUSH,  
LOUIS H. NOE.