

No. 706,509.

Patented Aug. 12, 1902.

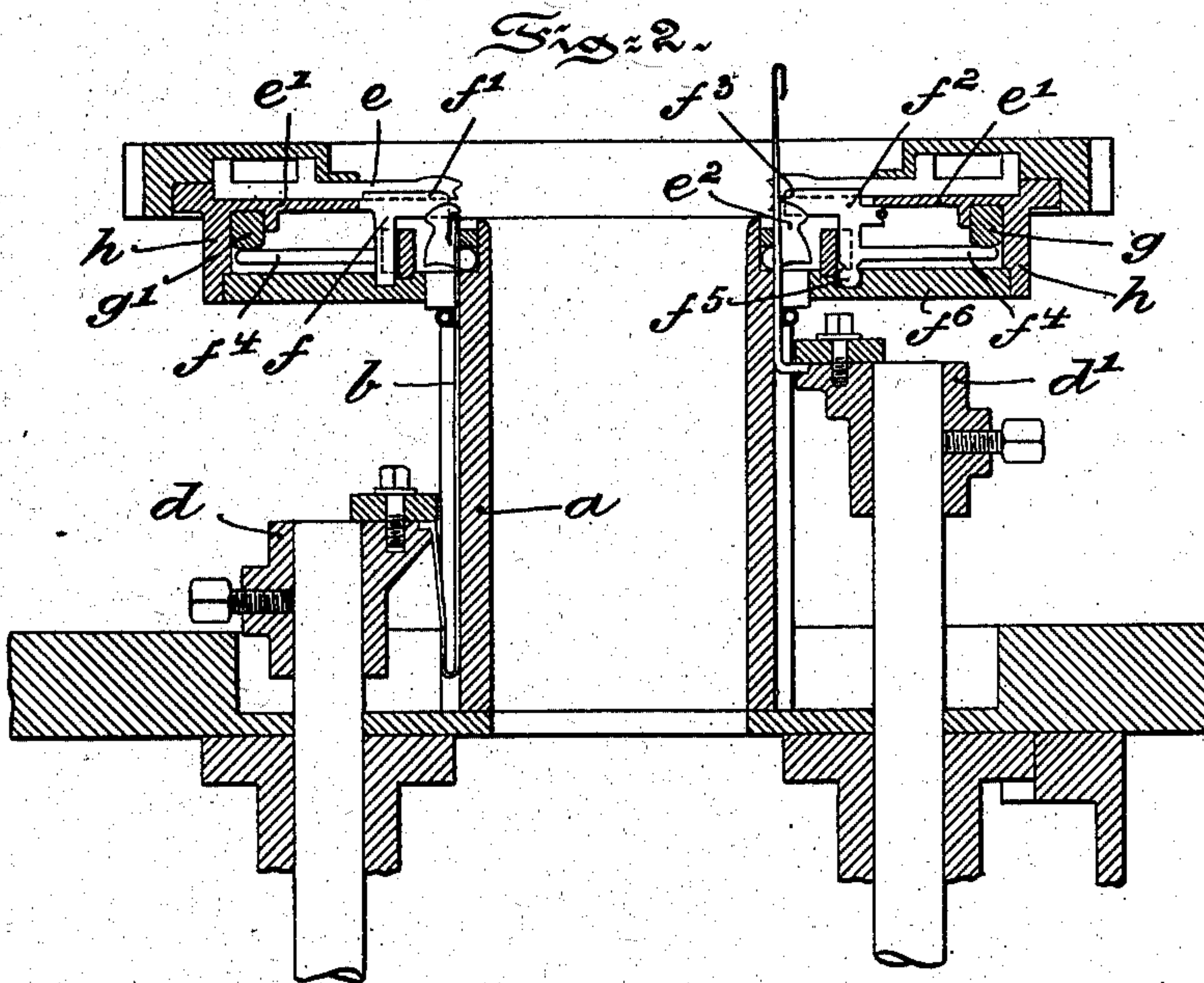
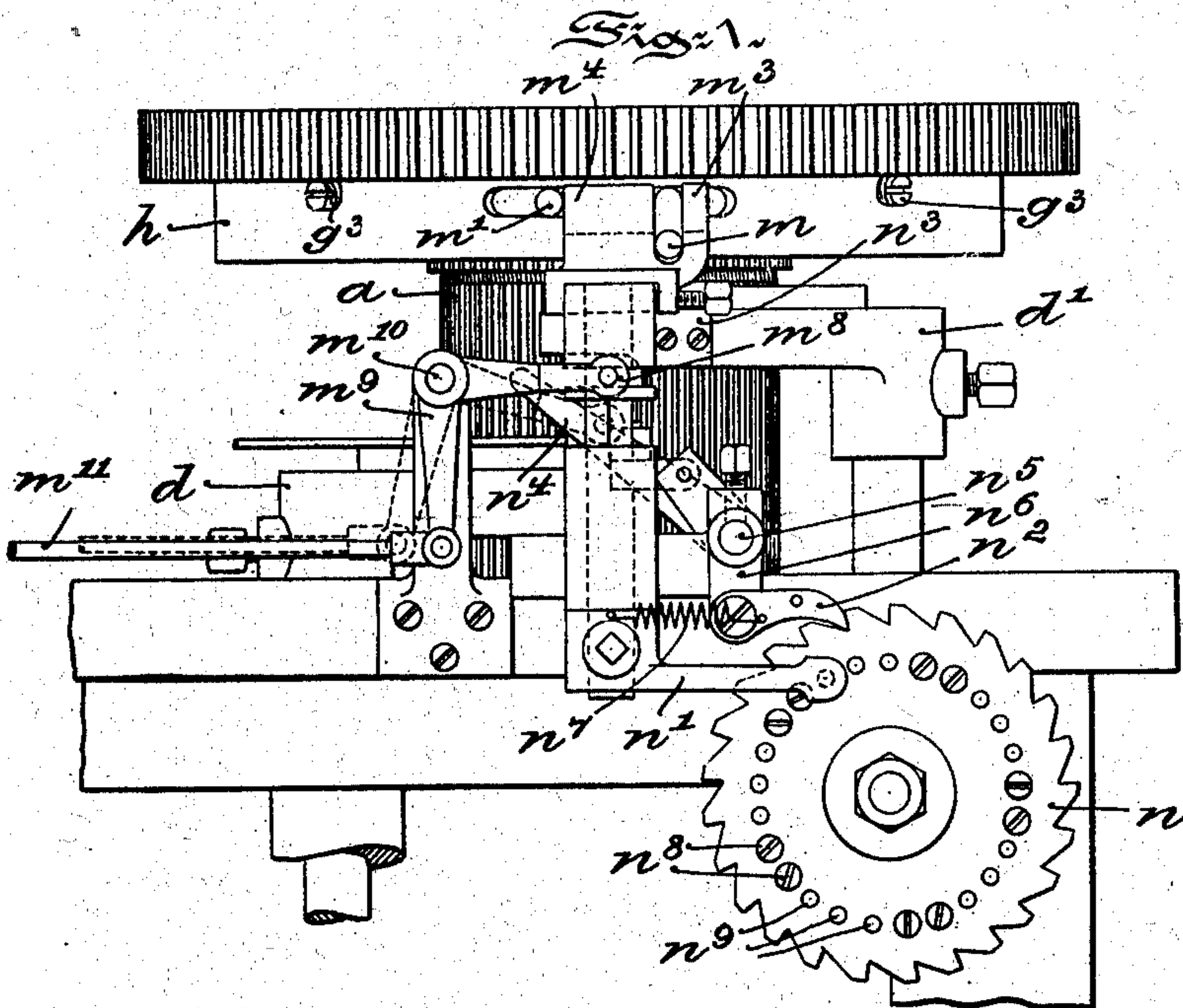
J. F. BARD.

ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Feb. 18, 1901.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
James F. Bard,
J. Walter Douglas
Attorneys.

No. 706,509.

Patented Aug. 12, 1902.

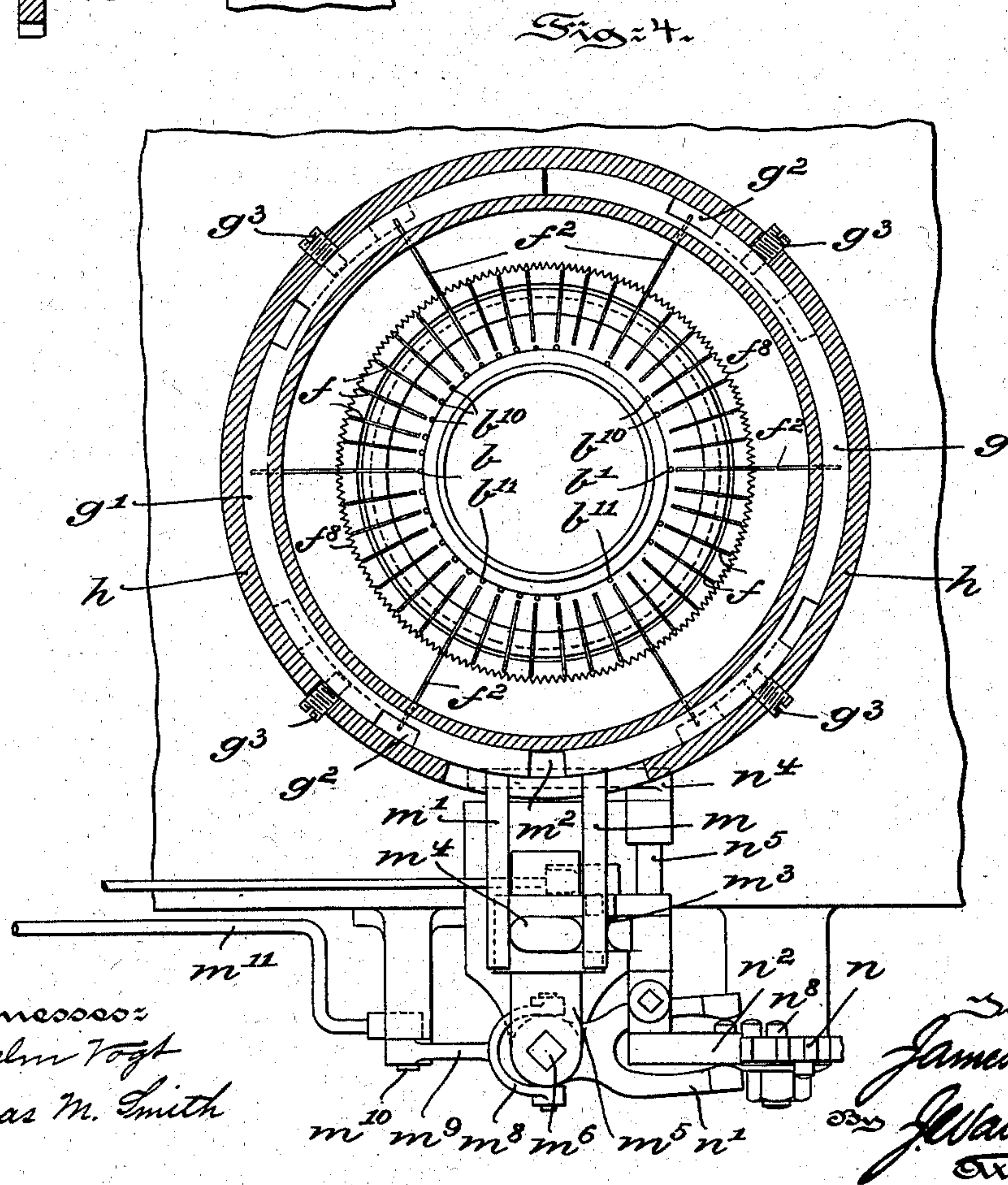
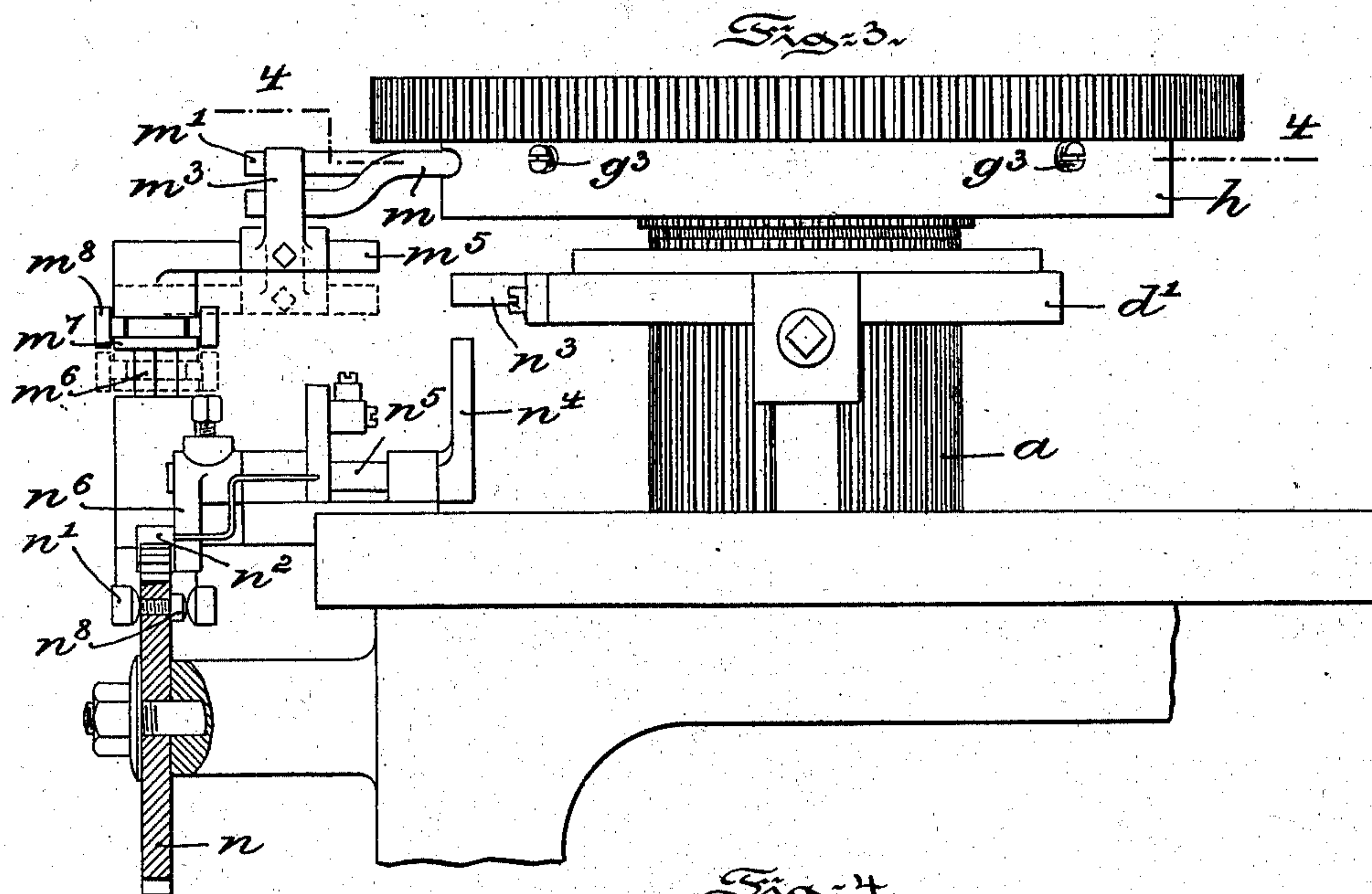
J. F. BARD.

ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Feb. 18, 1901.)

(No Model.)

5 Sheets—Sheet 2.



Witnesses:
 Wilhelm Vogt
 Thomas M. Smith

Inventor:
 James F. Bard,
 J. Waller Douglas
 Attorneys

No. 706,509.

Patented Aug. 12, 1902.

J. F. BARD.

ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Feb. 18, 1901.)

(No Model.)

5 Sheets—Sheet 3.

Fig. 5.

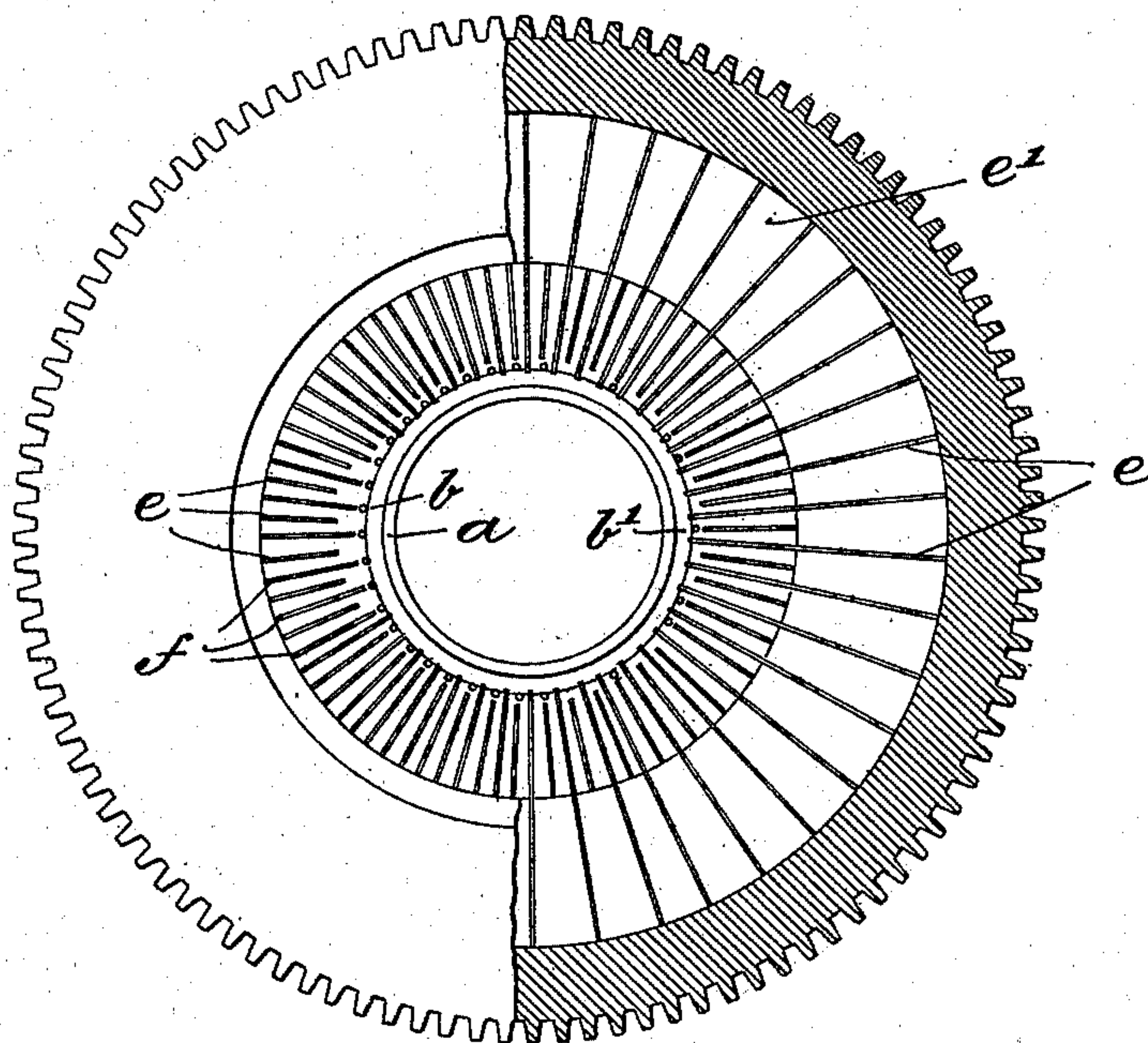
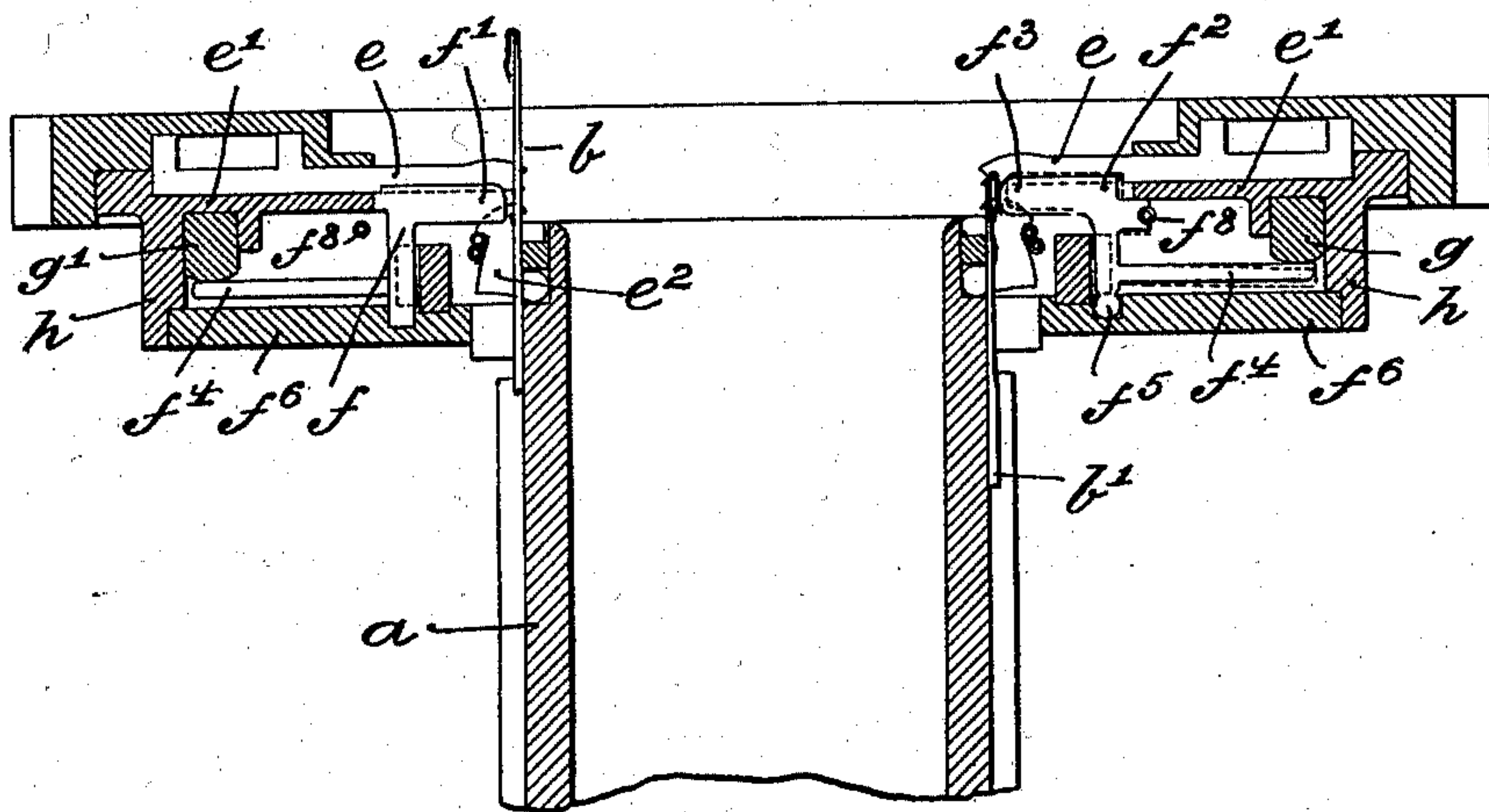


Fig. 6.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
James F. Bard,
by J. Waller Douglas
Attorney.

No. 706,509.

Patented Aug. 12, 1902.

J. F. BARD.

ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Feb. 18, 1901.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 7.

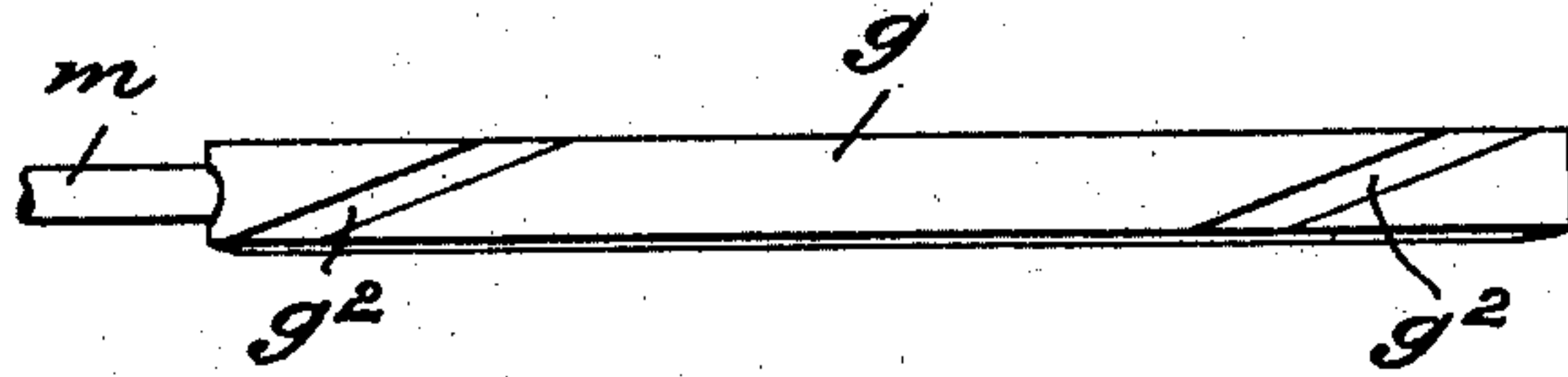


Fig. 8.

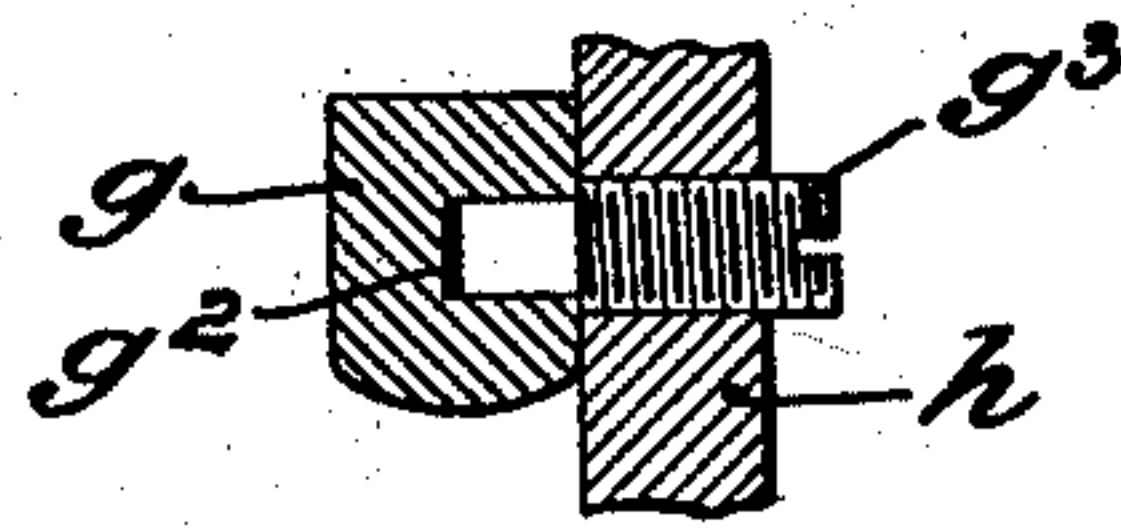


Fig. 9.

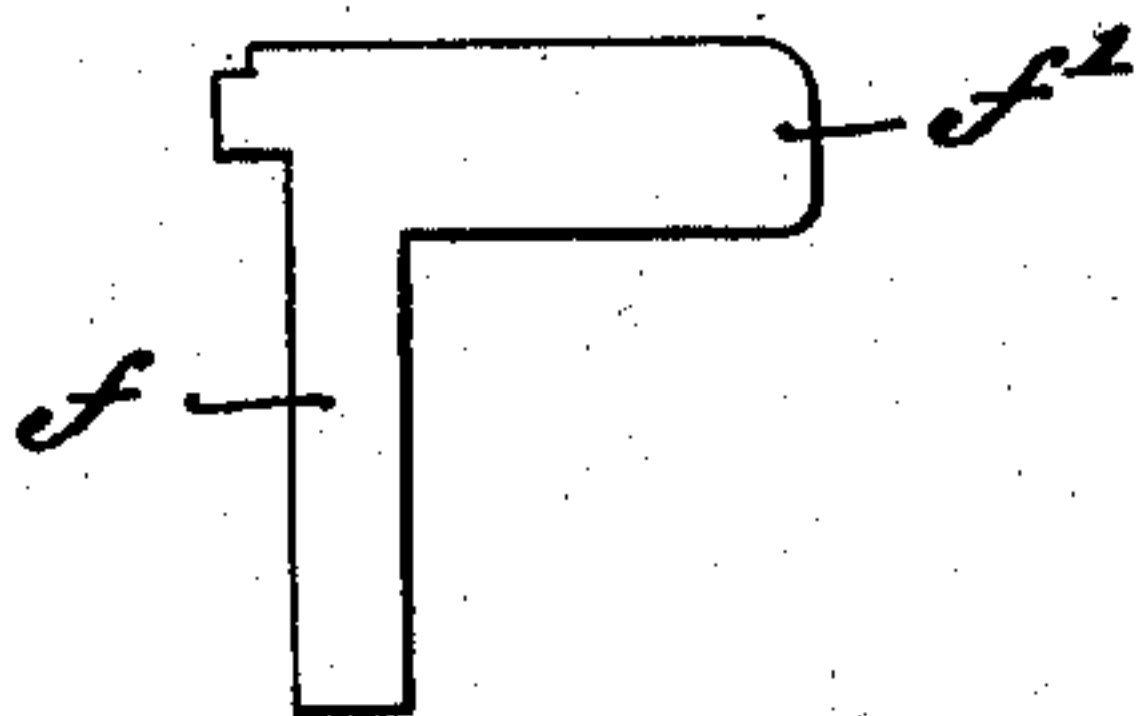
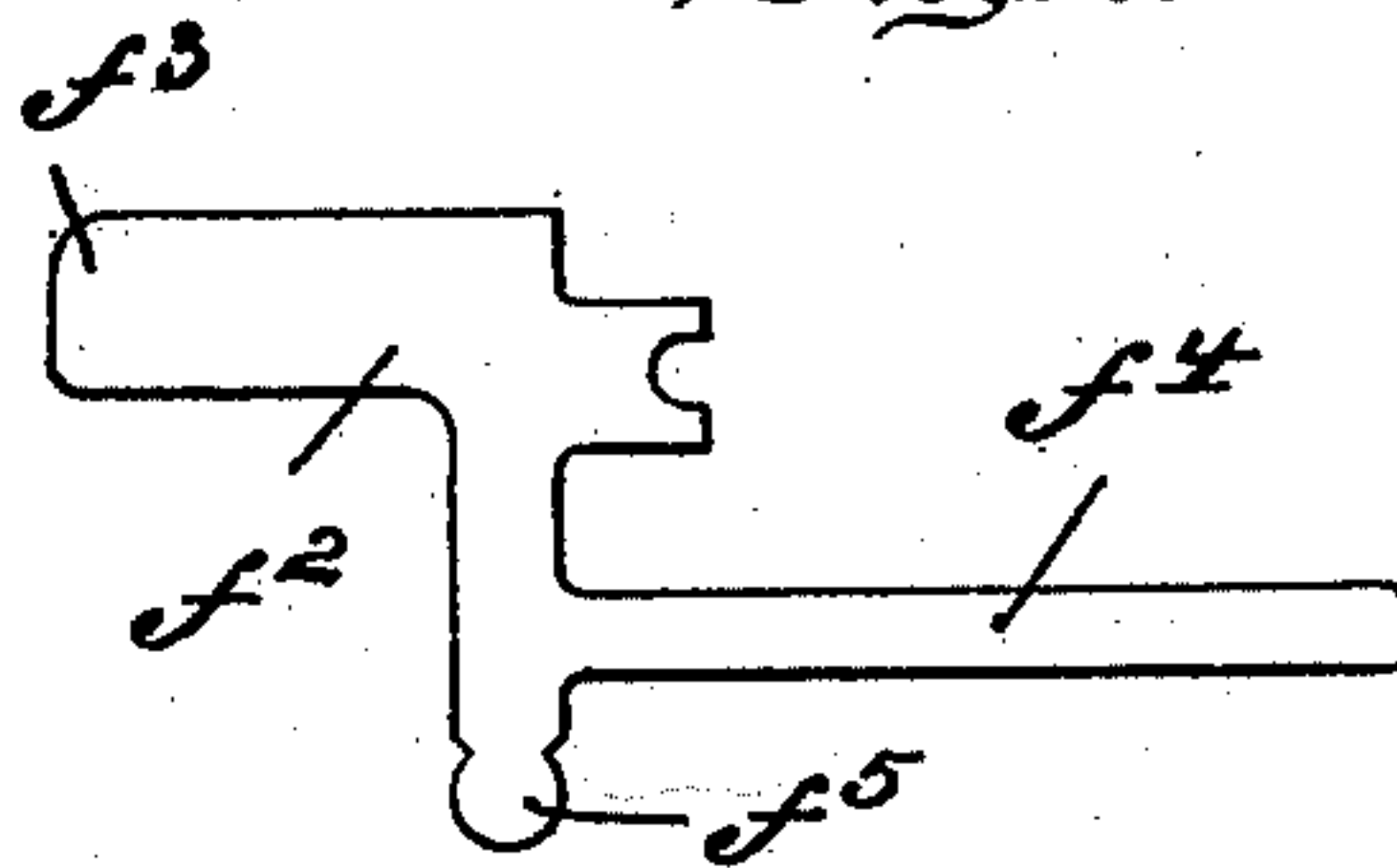


Fig. 10.



Witnesses:

Wilhelm Vogt

Thomas M. Smith

Inventor:
James F. Bard,
by J. W. Waddington
Attorney.

No. 706,509.

Patented Aug. 12, 1902.

J. F. BARD.

ATTACHMENT FOR AUTOMATIC CIRCULAR KNITTING MACHINES.

(Application filed Feb. 18, 1901.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 11.

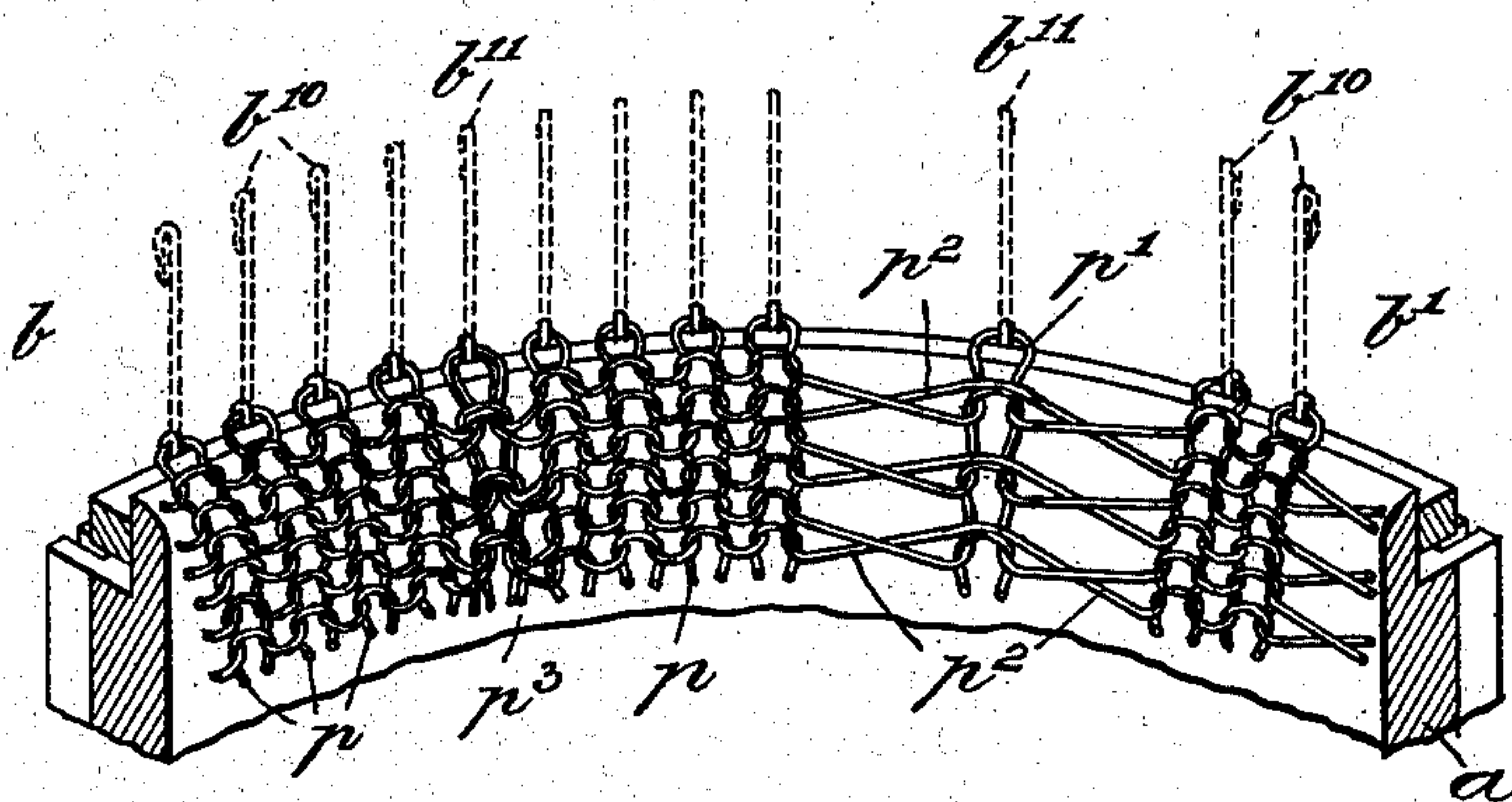
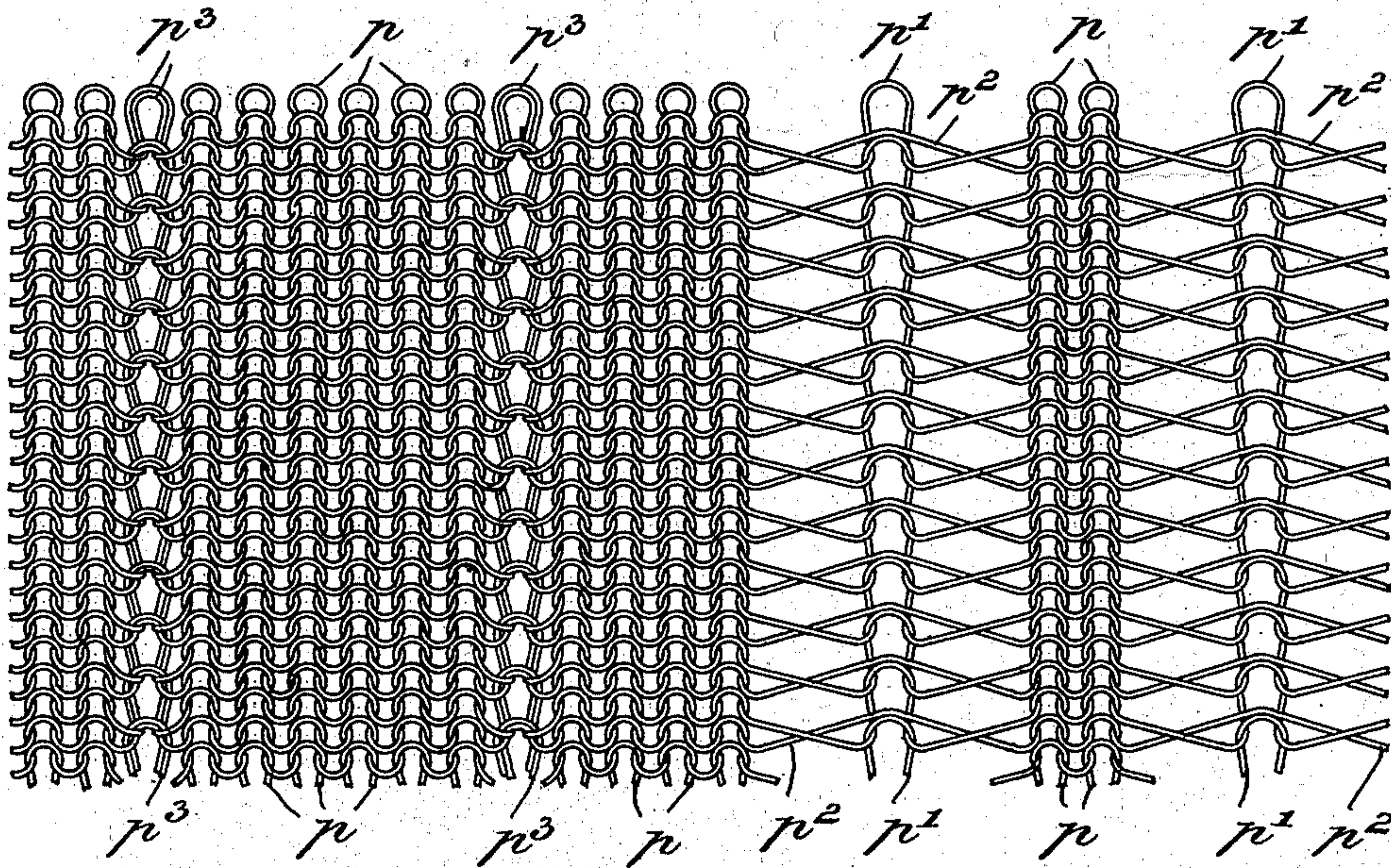


Fig. 12.



Witnesses:
Wilhelm Vogt
Thomas M. Smith.

Inventor:
James F. Bard,
by J. Walter Douglas
Attorney.

UNITED STATES PATENT OFFICE.

JAMES FRAZIER BARD, OF WAYNE, PENNSYLVANIA.

ATTACHMENT FOR AUTOMATIC CIRCULAR-KNITTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 706,509, dated August 12, 1902.

Application filed February 18, 1901. Serial No. 47,714. (No model.)

To all whom it may concern:

Be it known that I, JAMES FRAZIER BARD, a citizen of the United States, residing at Wayne, in the county of Delaware 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.

My invention has relation to a knitting-machine of the type or class known as a "circular-knitting" machine, such in particular as is illustrated in the United States Letters Patent No. 536,616, granted to Emil J. Franck under date of April 2, 1895, and in such connection it relates to the construction and arrangement of certain mechanism constituting a means whereby the machine may knit, in conjunction with the ordinary meshes, open or lace work, either in the front or rear or both in the front and rear of the tubular fabric formed by the machine.

It has heretofore been proposed to adapt the circular-knitting machine of the Franck type to the purpose of knitting the front of the fabric with open or lace work meshes by arranging the regular needles so that they may be independently movable in their carrier and providing means for locking or releasing these needles. When the needles are released, their beards are not sufficiently depressed on the down movement of the carrier to come into contact with the beard-closing ring, and hence said beards remain open and do not cast off the loops or crossing threads, which accumulate until the needles are locked to the carrier and are carried down thereby to operative engagement with the beard-closing ring. By my present improvement, however, both fashioning and regular needles are carried in the usual manner by their respective carriers and remain locked thereto. The control of the beards of certain needles in my present invention is secured by dispensing with the usual beard-closing ring and substituting two series of jacks, the jacks of one series being stationary or fixed, while the other jacks are movable automatically, so as to either close the beards on the downward movement of the needles controlled or else be swung or lifted out of the path of said beards to prevent the closure of the beard and casting off of the thread from the needle.

The nature and scope of my 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 front elevational view of the upper portion of a circular-knitting machine, the attachment therefor embodying main features of my invention being connected therewith. Fig. 2 is a vertical central sectional view thereof. Fig. 3 is a side elevational view of Fig. 1 looking toward the right-hand side of the machine. Fig. 4 is a horizontal sectional view on the line 4-4 of Fig. 3. Fig. 5 is a top or plan view of the sinker-bar bed and needle-cylinder, certain parts of the same being broken away. Fig. 6 is a view similar to Fig. 2, but illustrating the needles in opposite positions. Fig. 7 is a detail view of one section of the cam-ring for operating the movable jacks. Figs. 8, 9, and 10 are enlarged detail views of certain parts of the attachment. Fig. 11 is a perspective view illustrating diagrammatically one form of lace or open work knit by the needles; and Fig. 12 is a view of a portion of the tubular fabric knit upon the machine, the fabric being spread out upon a flat surface.

Referring to the drawings, it will be seen that main portions of the machine are arranged and operate in substantially the manner illustrated and described in the Letters Patent No. 536,616, hereinabove referred to. Thus the needle-cylinder *a* is provided on its periphery with longitudinally-arranged grooves in which the two sets of needles *b* and *b'* are adapted to reciprocate. One set, *b*, constitutes the fashioning-needles or those which knit the heel and toe and rear portions of the tubular fabric or stocking, and this set occupies the grooves grouped on one-half the periphery of the cylinder *a*. The other set, *b'*, are the regular needles and occupy the grooves of the remaining portion of the cylinder. Both sets are connected to their respective carriers *d* and *d'* and operate in substantially the manner described in the Franck patent. The sinker-bars *e*, the sinker-bar bed *e'*, and web-holders *e''* are also of the same type and operate substantially as the corresponding parts described in the said patent.

The present improvement resides in the means for controlling the beards of certain needles in one or both groups *b* and *b'*, so that those beards may be closed or left open to permit either of the formation of new loops

and the casting off of the old loops or else to prevent the casting off of the loops and threads previously fed into said beards.

In carrying out my invention the beard-closing ring of the machine described in the Franck patent is removed and in its stead two series of jacks are employed, one series being stationary and performing to the needles adjacent to which they are located the functions of the beard-closing ring, while the other series is movable at will, so that these jacks may either close the beards of the needles which they control or prevent said closure. The preferred forms of jacks, as well as the preferred means for controlling the movable jacks, are as follows: Each needle b^{10} , whose beard is to be constantly closed upon the downward movement of the needle, has adjacent to its beard and in the position usually assumed by the beard-closing ring a stationary jack f . This jack f is arranged radially with respect to the needle-cylinder and is located below the sinker-bar bed and has its nose or projecting end f' formed to engage and depress the beard of the needle. The preferred form of the jack f is illustrated in detail in Fig. 9. The other needles b^{11} , whose beards are to remain open at certain downward movements of the needles, have adjacent to each beard a jack f^2 , shaped, preferably, as illustrated in detail in Fig. 10. The movable jack f^2 has a nose or projecting end f^3 , shaped to engage and depress the beard of a needle b^{11} when the nose f^3 lies in the path of said beard. It has also a free end or tail piece f^4 , projecting away from the beard of the needle, and intermediate of its ends f^3 and f^4 it has a rounded fulcrum point f^5 , by means of which it is supported in a plate f^6 , arranged below the sinker-bed. It follows from this description that when the tailpiece f^4 is depressed the jack f^2 will oscillate and its beard-closing nose f^3 will be elevated, so as to clear the beard of the needle b^{11} when said beard descends. The jack f^2 is so weighted that normally its nose f^3 will fall under the influence of gravity and its tailpiece f^4 will be elevated, or a coiled spring f^8 may be employed to bring the jacks f^2 back to their normal position. To secure the depression of the tailpieces of the jacks f^2 and the corresponding elevation of the beard-closing noses f^3 into inoperative position, two semicircular cam-rings g and g' are preferably used. Each segment g or g' is adapted to turn within the depending ring h , which projects below the sinker-bed e' and incloses all the jacks. For this purpose each cam-segment g or g' has a pin or stud m or m' at one end. The segments g and g' do not together form a complete ring, but there is a space m^2 separating the ends, which permits under certain circumstances a turning of one segment g without disturbing or turning the other segment g' . Each segment g or g' has on its exterior periphery a diagonal slot or slots g^2 , into each of which fits a pin or stud g^3 , traversing the

ring h , within which these segments are adapted to turn. It follows, therefore, that if the segments g and g' are turned in one direction they will be elevated by reason of the slotted portions of the segments riding up on the pins, whereas if the segments are turned in an opposite direction the segments will be lowered in the ring h . When so lowered, the base of the segments g and g' will impinge on and depress the tailpieces f^4 of the oscillating jacks f^2 , whereas when the segments are elevated their bases do not engage these tailpieces and the jacks f^2 assume their normal or beard-closing position.

In the fashioning of a tubular fabric, such as a stocking, it may be advisable that the fashioning-needles b have their beards uniformly closed, and hence movement to the segment g' , controlling the beard-closing jacks f^2 of that set of needles b , must be prevented without, however, interfering with the movement of the jacks f^2 of the other set b' of needles. To accomplish this, the stud or pin m , by means of which the segment g may be turned, is downwardly bent and engages permanently a fork or clutch m^3 . This clutch m^3 has a broad tongue m^4 , extending normally between the downwardly-projecting stud m and the straight stud m' when both segments are to be turned. The clutch m^3 and its tongue m^4 are adapted not only to be rocked by preferred mechanism, hereinafter to be described, but it is also adapted to be moved up and down in a vertical direction, so that, if necessary, its tongue m^4 may be lowered out of engagement with the stud m' , and yet the clutch m^3 still remains in engagement with the stud m . To thus raise and lower the tongue m^4 , the tongue is provided with a horizontal arm m^5 , arranged to slide up and down on a square rock-shaft m^6 . The arm m^5 has a grooved collar m^7 , engaged by a forked clutch m^8 , formed at one end of an angle-lever m^9 , pivoted, as at m^{10} , to a fixed part of the machine. The other end of the angle-lever m^9 is connected to a link or rod m^{11} . Suitable means controlled by the machine and not illustrated may be employed whereby the link at certain times may be shifted in one direction to actuate the lever m^9 , so that the arm and tongue m^4 are elevated on the rock-shaft m^6 or in an opposite direction to lower said tongue. The square rock-shaft m^6 may be oscillated by the preferred mechanism illustrated in the drawings, which consists, essentially, of a pattern wheel or disk n , controlling the horizontal oscillation of a forked arm n' , connected to and adapted to swing the square shaft m^6 . When the clutch m^3 and its tongue m^4 are elevated by the angle-lever m^9 to the position indicated by full lines in Figs. 1 and 3 and the rock-shaft m^6 is oscillated, both segments g and g' are oscillated and rise and fall within the ring h . When, however, the clutch m^3 and tongue m^4 are lowered to the position indicated by dotted lines in Figs. 1 and 3, the tongue clears the pin m' ,

and hence only the segment g will be oscillated a distance measured by the free space m^2 between adjacent ends of the segments. The ratchet pattern wheel or disk n is adapted to be advanced step by step, as required, by means of a pawl n^2 , the movement of which is preferably secured or controlled by the up-and-down movement of one of the needle-carriers. This is accomplished by securing to the carrier d' a bar or pin n^3 , adapted as the carrier d' descends to impinge upon and depress the free end of a lever n^4 , the other end of said lever being secured to a rock-shaft n^5 . This rock-shaft n^5 carries a rock-arm n^6 , to which the pawl n^2 is secured. The rock-arm n^6 is normally under the tension of a spring n^7 , which tends to retract the arm n^6 and pawl n^2 and to elevate the lever n^4 when the carrier d' rises.

20 In the formation of a fabric such, for instance, as is illustrated in Figs. 11 and 12 the needles of the set b' are arranged in the needle-cylinder, as illustrated in Fig. 4, to the right of the cylinder—namely, there is first a regular needle b^{10} , adjacent to which is a stationary beard-closing jack f , then there are two grooves or spaces in which no needles are placed, then there is one needle b^{11} , adjacent to which is a movable jack f^2 , then two more vacant grooves or channels, then two regular needles b^{10} , controlled by the jacks f , then two vacant spaces, and so on around the semiperiphery of the cylinder. The pattern disk or wheel n has upon alternate faces either buttons n^8 or vacant spaces n^9 , which control the in-and-out shifting of the clutch-arm n' , and therefore the up or down movement of a segment g , or both segments g and g' , so that the movable jacks f^2 may be elevated or depressed, according to the pattern desired. The needles b^{10} in their up-and-down movement knit regular loops or meshes p ; but the needles b^{11} only knit and cast off an elongated loop or mesh p' at those periods of time when the nose of the movable jack f^2 closes the beard of said needle b^{11} . In this form of fabric the beard of each of the needles b^{11} is only closed at every second revolution of the thread, and hence the needle b^{11} will carry a loop p' and one crossing thread p^2 before the loop p' and thread p^2 are cast off and a new loop p' is formed. On the other side of the cylinder a , in which the set b of fashioning-needles are grouped, there are by preference no needles removed, and hence those needles b^{11} of this set b will form and retain the loops p^3 only and not crossing-threads, the result being tuck-stitches upon the needles b^{11} on that side of the cylinder.

60 It is, however, obvious that the entire cylinder a may contain needles grouped as illustrated in the right-hand side or in the left-hand side of the cylinder or that one side, the fashioning-needle side, may not be provided with needles b^{11} , controlled by the jacks f^2 , but by the ordinary needles b^{10} , controlled by the fixed jacks f .

Having thus described the nature and object of my invention, what I claim as new, and desire to secure by Letters Patent, is— 70

1. In a circular-knitting machine of the character described, in combination with bearded needles and mechanism for operating the same, two sets of beard-closing jacks, of which one set is fixed and controls certain of the needles to form regular meshes and the other set is movable and adapted when withdrawn to clear the beards of certain other needles and prevent the formation of regular meshes thereon. 80

2. In a circular-knitting machine of the character described, a series of bearded needles and mechanism for operating the same, means for constantly closing the beards of certain of said needles at every downward movement of the same, a series of movable jacks controlling the beards of the remaining needles, and mechanism for elevating said jacks to prevent the closure of the beards during the downward movement of said remaining needles. 90

3. In a machine of the character described, a bearded needle, a needle-cylinder wherein the needle is adapted to be reciprocated, a sinker-bar bed adjacent to the needle-cylinder, a sinker-bar arranged to operate in said bed, and a beard-closing jack in fixed lateral relationship to the needle-cylinder and fulcrumed below the sinker-bar bed so as to oscillate toward and away from the beard of the needle, substantially as and for the purposes described. 100

4. In a machine of the character described, a beard-closing jack having at one end a beard-closing nose and at the other end a tailpiece, said jack having a fulcrum intermediate of its ends, and a segmental cam-piece adapted to be oscillated and to be elevated and depressed adjacent to the tailpiece and when depressed adapted to impinge on said tailpiece to depress the same and to elevate and withdraw the nose of the jack from the beard of said needle. 110

5. In a circular-knitting machine of the character described, bearded needles, mechanism for operating the same and fixed and movable jacks for respectively closing regularly and intermittently the beards of said needles. 115

6. In a circular-knitting machine of the character described, bearded needles, mechanism for operating the same, two sets of jacks, whereof one set is adapted to continuously in one direction close and the other set intermittently in the same direction close the beards of said needles. 120 125

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

JAMES FRAZIER BARD.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.