

6 Sheets—Sheet 1.

No. 513,048.

Patented Jan. 16, 1894.

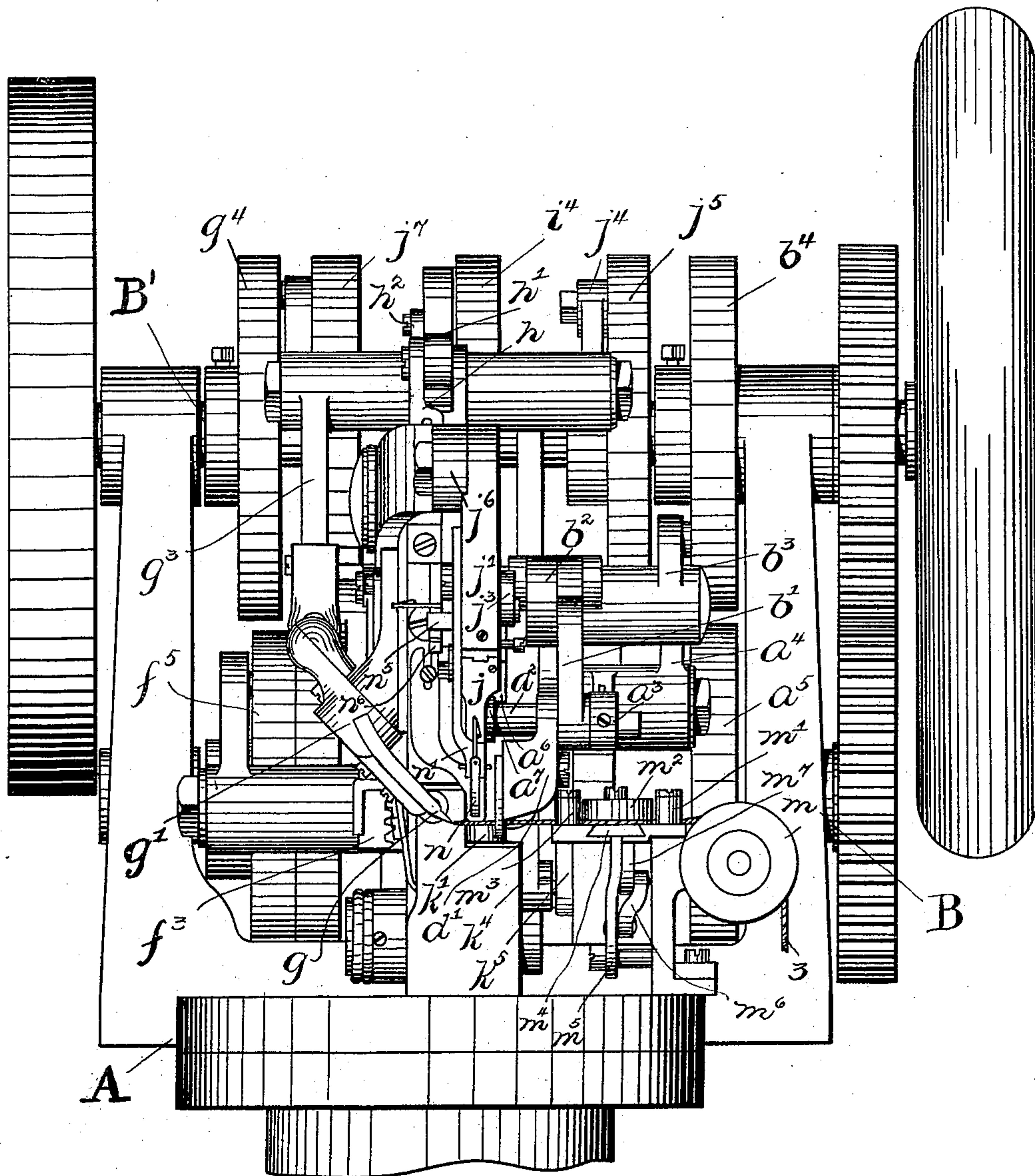


Fig. 1.

WITNESSES.

Irving V. Hay.

*Parker Davis*

INVENTORS.

G. A. Knox

by E. E. Bean  
Knight, Brown & Horsley,  
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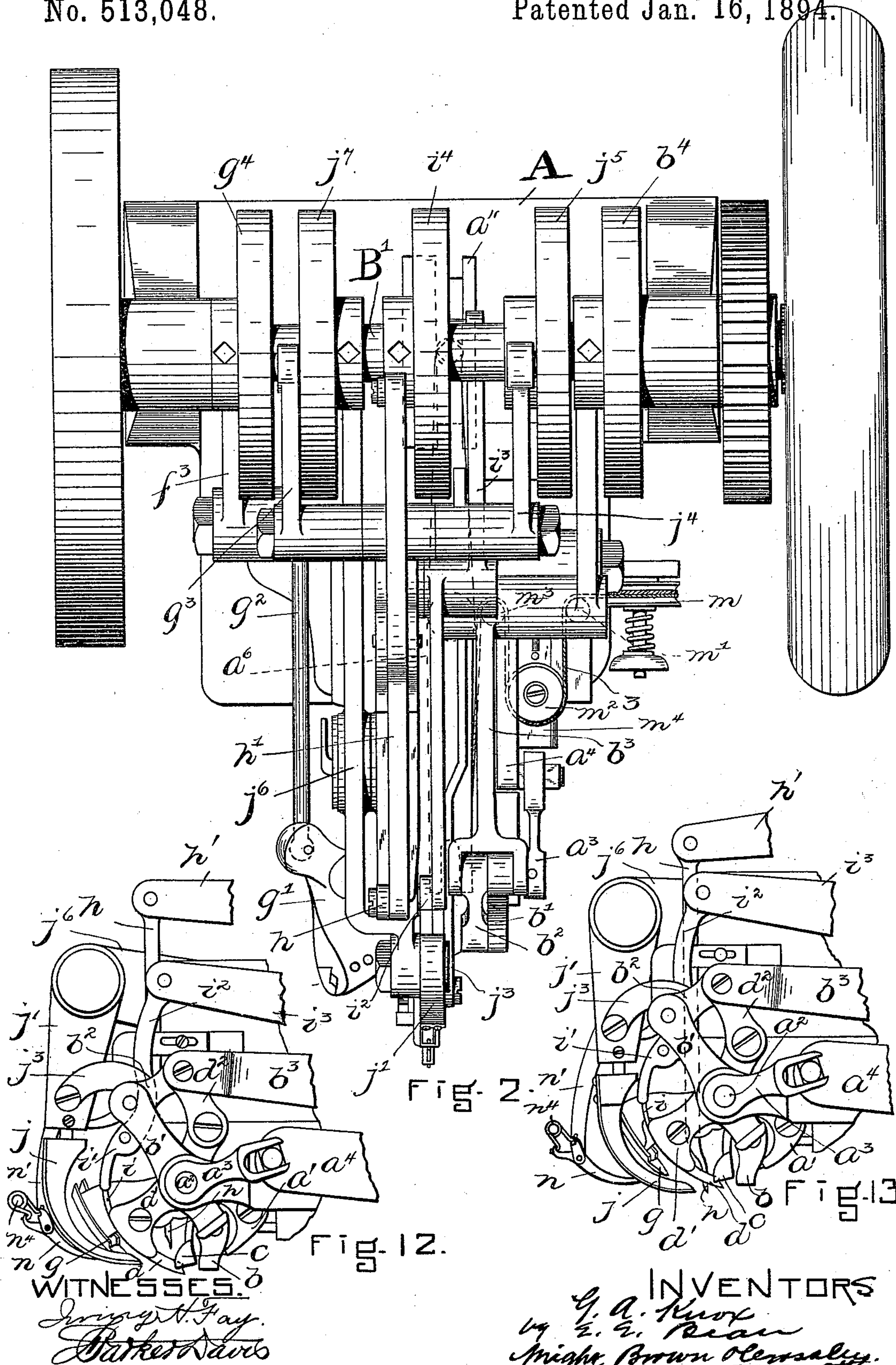
(No Model.)

6 Sheets—Sheet 2.

G. A. KNOX & E. E. BEAN.  
SHOE SEWING MACHINE.

No. 513,048.

Patented Jan. 16, 1894.





(No Model.)

6 Sheets—Sheet 3.

G. A. KNOX & E. E. BEAN.  
SHOE SEWING MACHINE.

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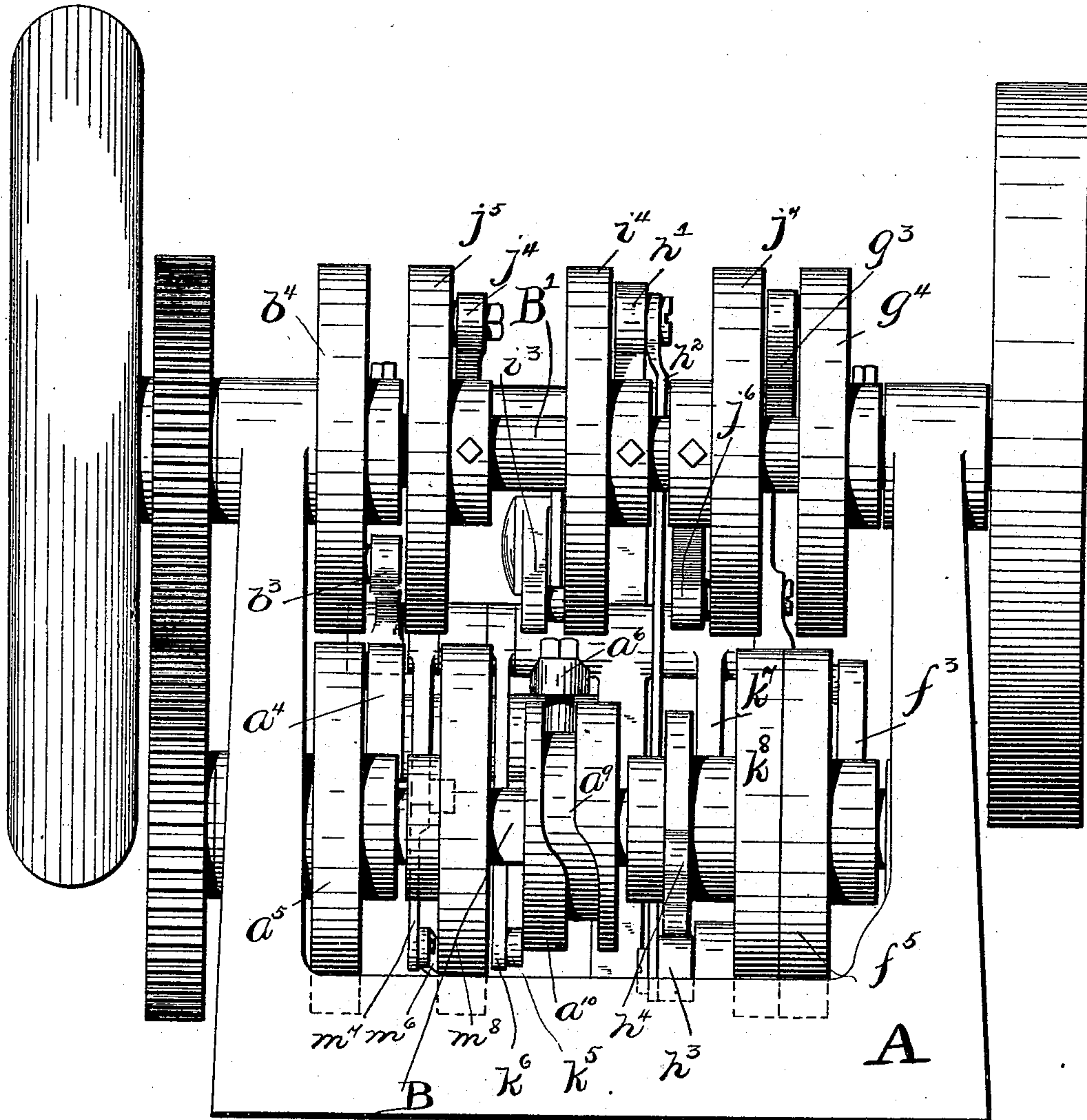


Fig. 3

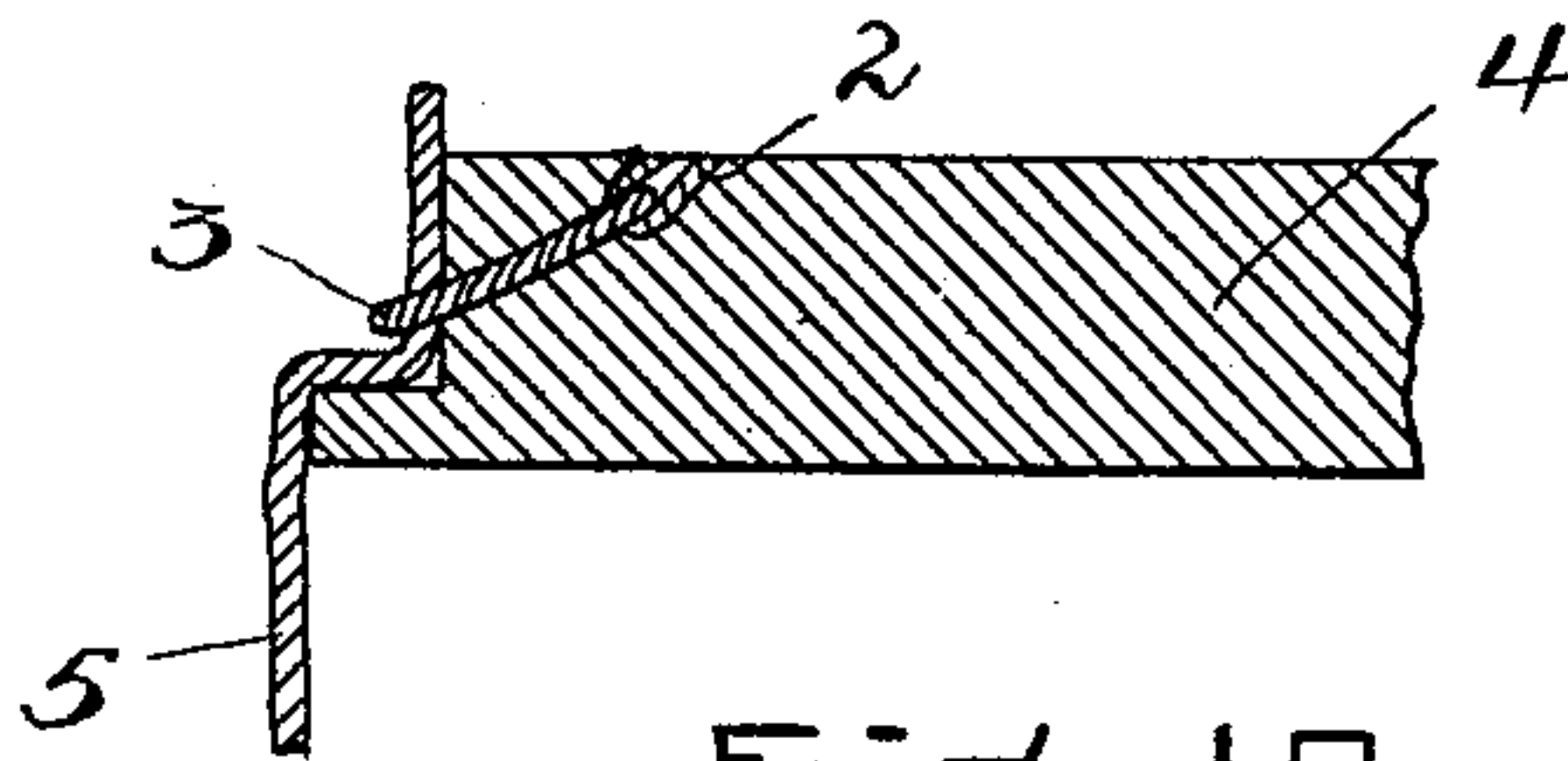


Fig. 16.

WITNESSES

*Irving H. Fay*  
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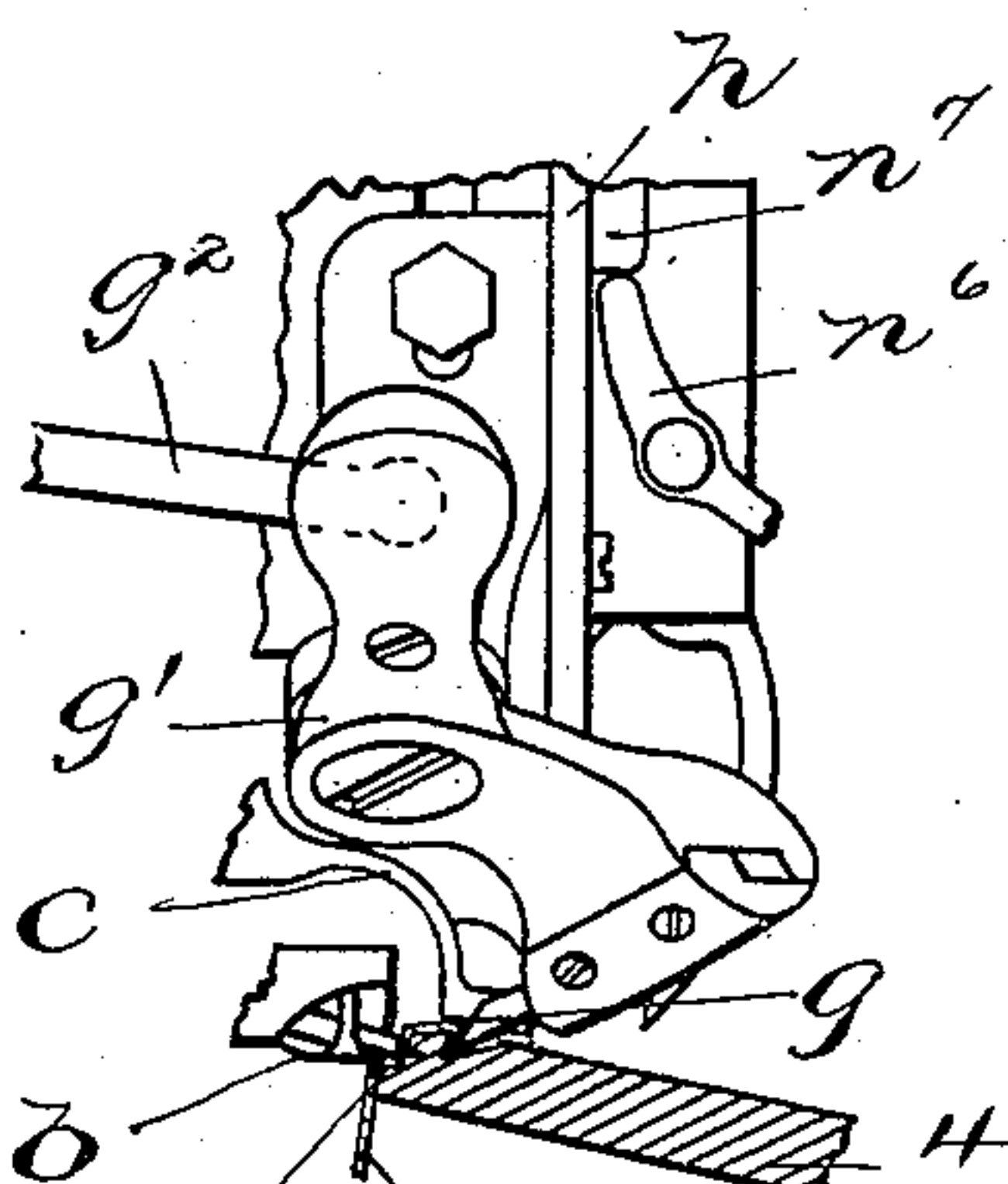
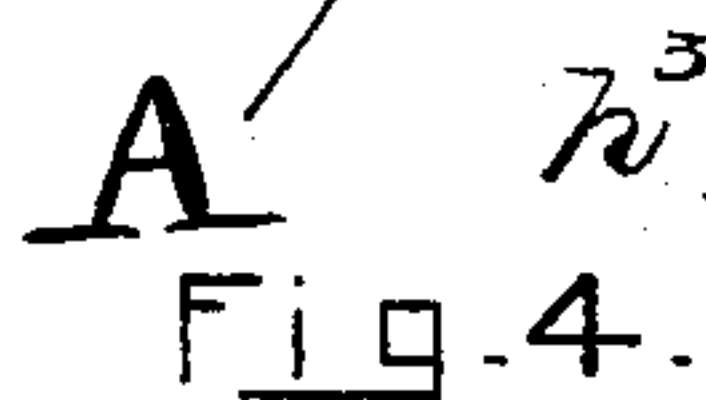
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6 Sheets—Sheet 4.

No. 513,048.

Patented Jan. 16, 1894.



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Fig. 6.

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G. A. KNOX & E. E. BEAN.  
SHOE SEWING MACHINE.

6 Sheets—Sheet 5.

No. 513,048.

Patented Jan. 16, 1894.

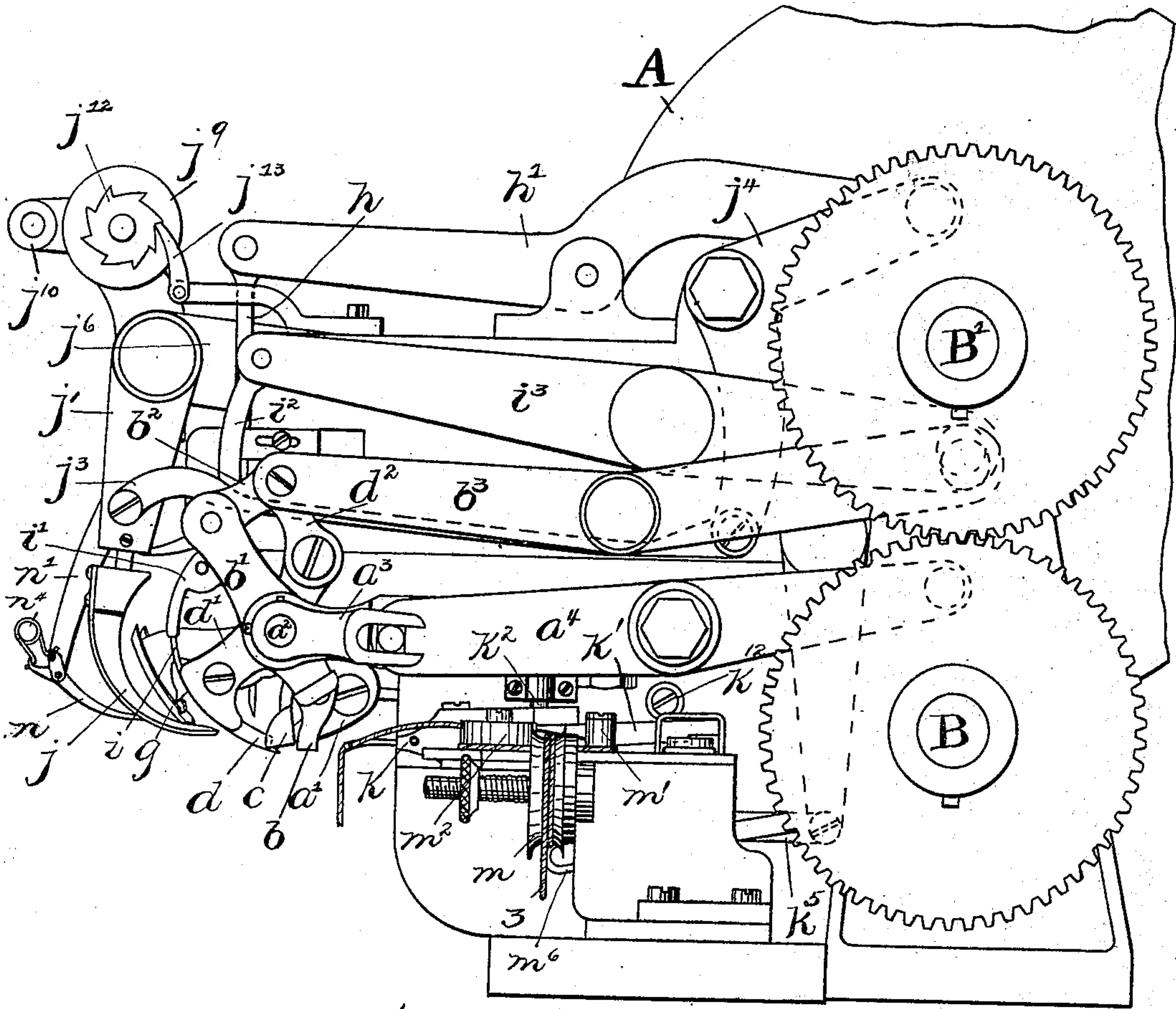


Fig. 5.

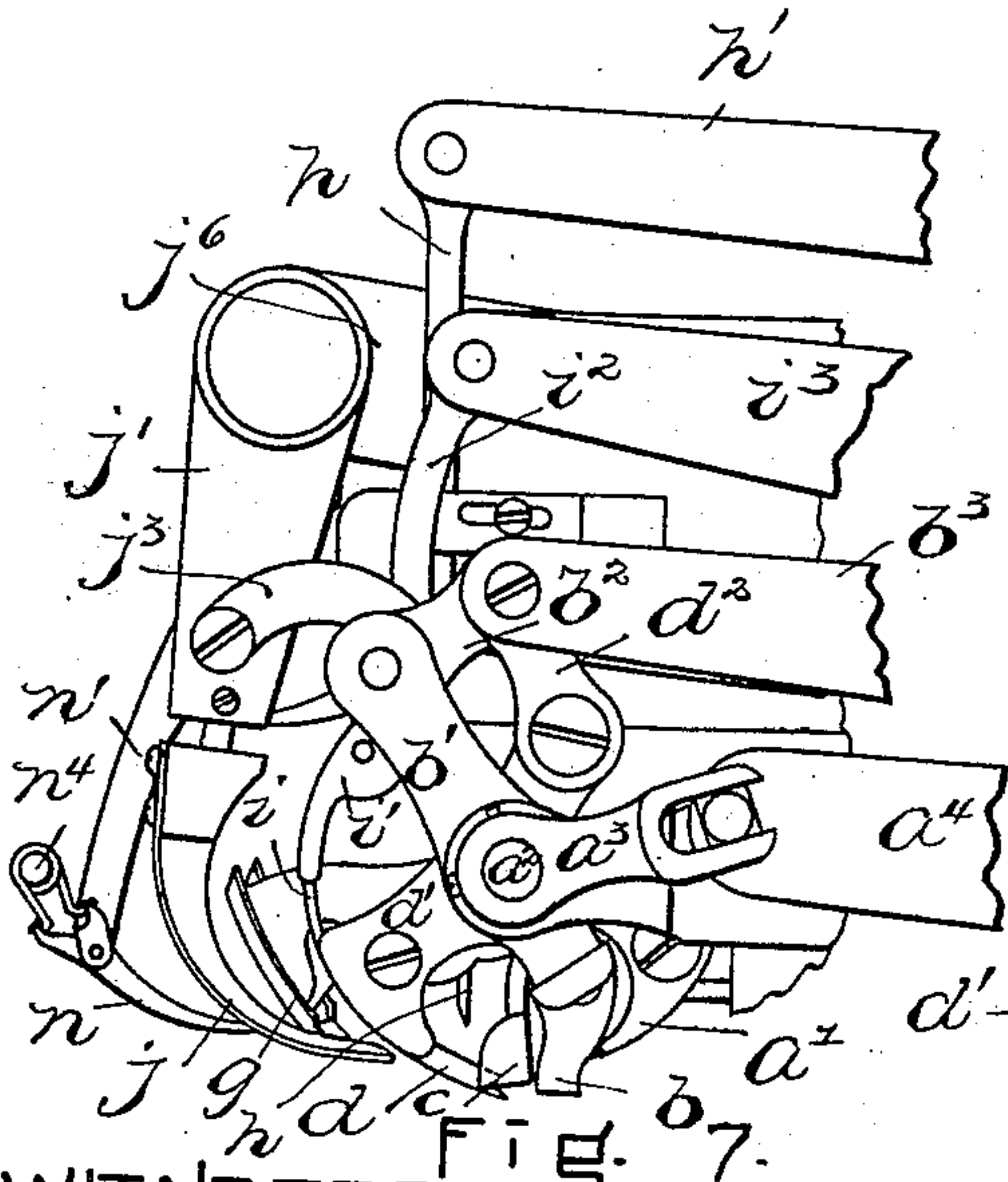


Fig. 7.

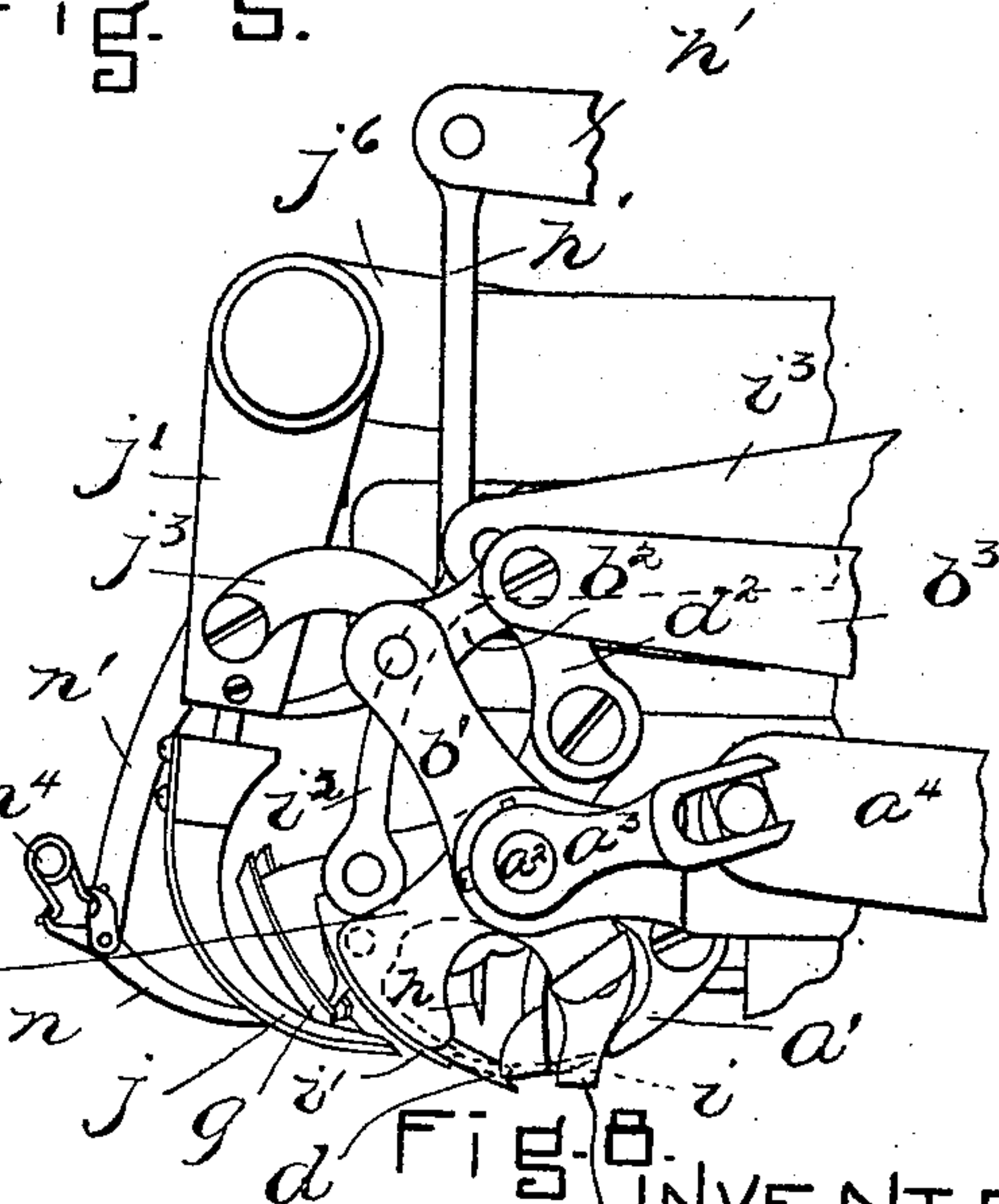


Fig. 8.

WITNESSES.

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(No Model.)

6. Sheets—Sheet 6.

G. A. KNOX & E. E. BEAN.  
SHOE SEWING MACHINE.

No. 513,048.

Patented Jan. 16, 1894.

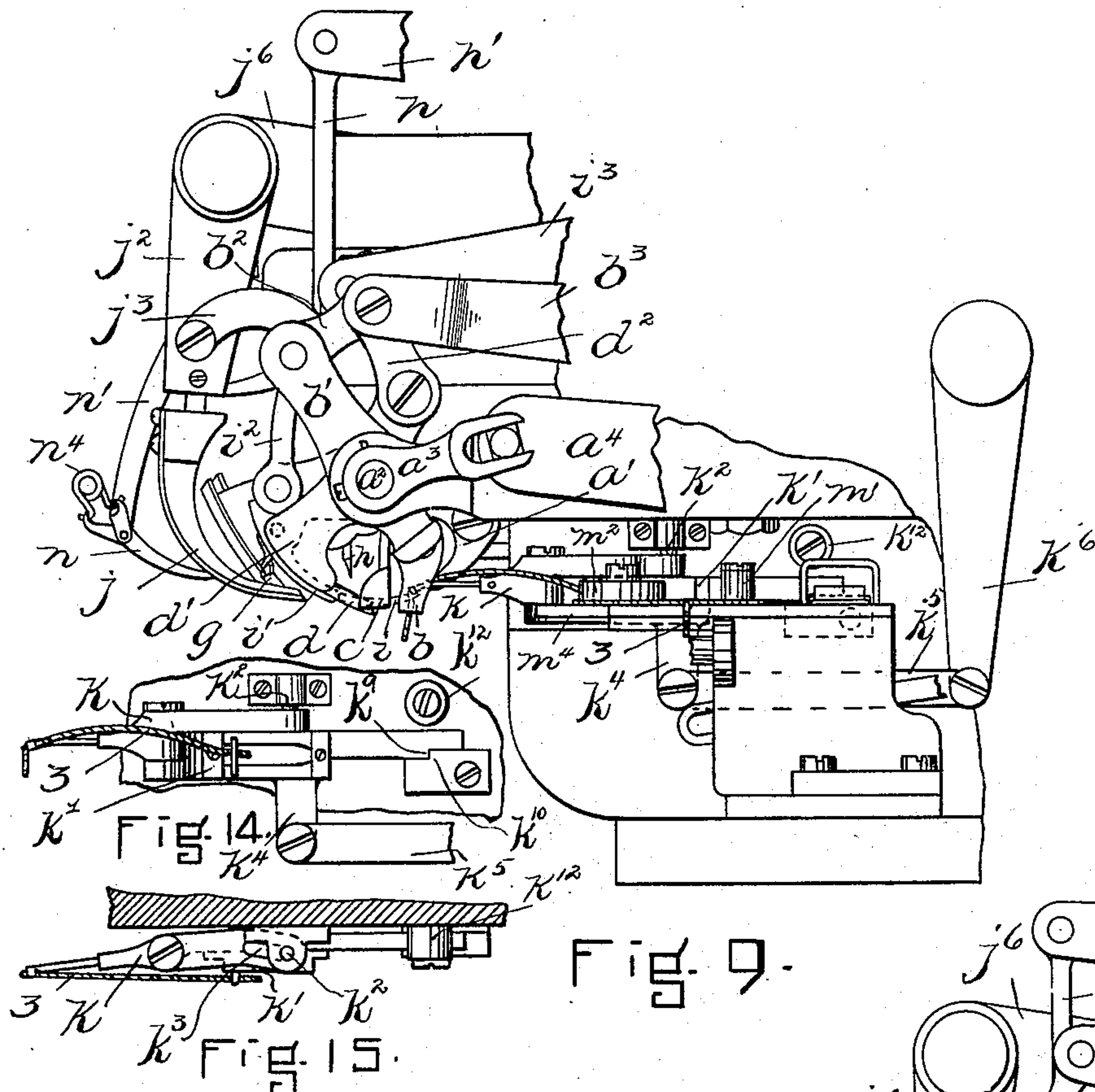


Fig. 9.

Fig. 15.

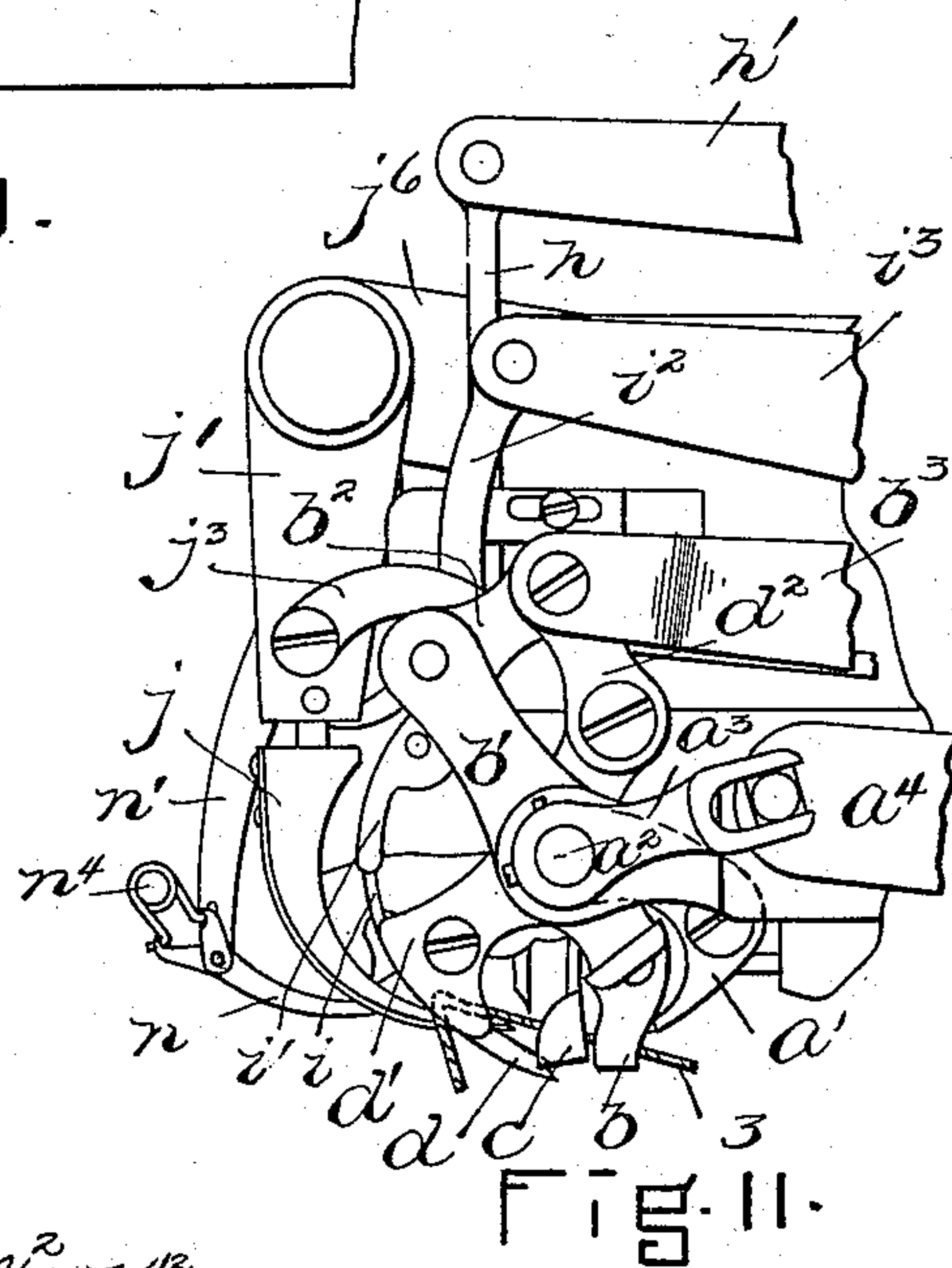


Fig. 11.

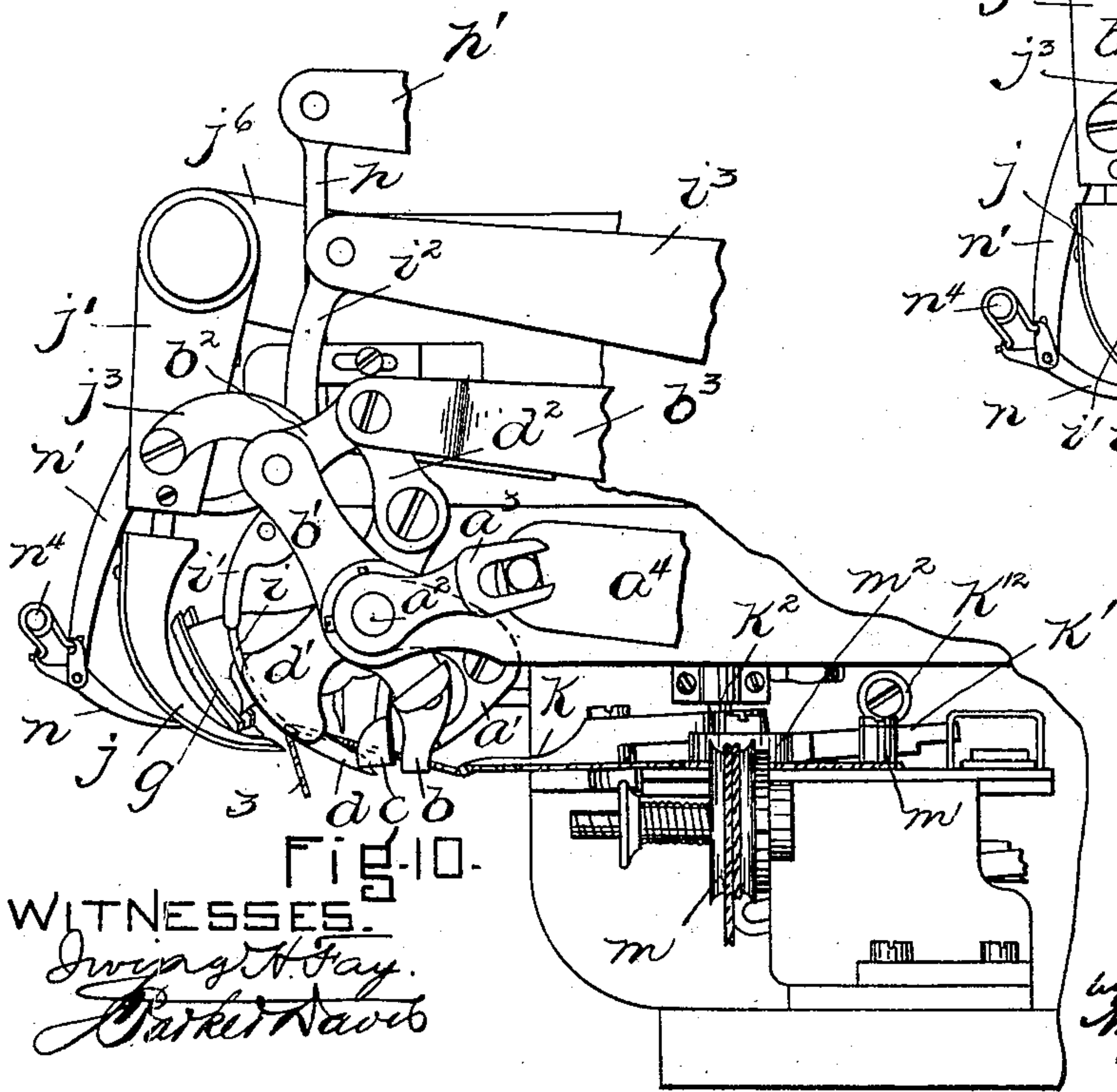


Fig. 10.

WITNESSES.  
*Swing H. Fay.*  
*Barth H. Webb*

INVENTORS:  
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by *Might, Brown & Crossley* ATTYS



# UNITED STATES PATENT OFFICE.

GEORGE A. KNOX, OF LYNN, AND EDWIN E. BEAN, OF BOSTON, MASSACHUSETTS.

## SHOE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 513,048, dated January 16, 1894.

Application filed July 26, 1893. Serial No. 481,514. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE ALFRED KNOX, of Lynn, in the county of Essex, and EDWIN E. BEAN, of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Shoe-Sewing Machines, of which the following is a specification.

The present invention relates to a machine for sewing shoes by a seam, formed of a continuous thread from which loops are drawn through the upper and sole, and short lengths of a strip or tongue of suitable material, such lengths being inserted transversely through the loops and constituting keys which lock the same. The principal advantage of this form of stitch is that a shoe sewed with the same possesses great flexibility.

The machine here illustrated is especially designed for sewing a turn-shoe.

Of the accompanying drawings, which illustrate the invention: Figure 1 shows a front elevation of the machine. Fig. 2 shows a top plan of the machine. Fig. 3 shows a rear elevation of the machine. Fig. 4 shows an elevation of one side of the machine, with the supporting head in section and the parts in what may be termed the first position, *i. e.*, the position which they occupy when a shoe is started in. In this figure a shoe-sole and portion of an upper are shown in section. Fig. 5 shows an elevation of the other side of the machine, with the parts in the next or second position. Fig. 6 shows a fragment of the machine, viewed from the same side as in Fig. 4, and showing the parts in the third position. Figs. 7, 8, 9, 10, 11, 12 and 13 show elevations from the same side as Fig. 5, of the parts in the successive positions they assume. Figs. 14 and 15 show detail views of a looper. Fig. 16 shows an enlarged section of a shoe-sole and upper secured together by the new stitch.

The same letters and numerals of reference indicate the same parts in all the figures.

In the description of the machine, the various parts which contribute to the formation of the stitch will first be severally enumerated, with their actuating means, and then the order of their operation will be set forth. The details of cam-actions are not entered into as being so common in this class of ma-

chines as to be understood without special description.

The letter A designates the supporting-frame or head, having bearings for two cam-shafts B and B', which rotate continuously, and are geared together, as shown in Fig. 3. A sliding presser-foot *c* is supported in an adjustable block *c'*, and is adapted to bear on the sole 4 of the shoe during the stitching. This presser-foot may be thrown forward so as to permit the introduction of the shoe, by means of a pivoted handle *c''*, having a slot-and-pin connection with said presser-foot. A spring *c'''* retracts the presser-foot. An awl *a* (see Fig. 4), adapted to pierce the upper 5 and the shoulder of the sole, is fastened in a head *a'* (see Fig. 5), which is affixed to a horizontal shaft *a''*, supported in stationary bearings and adapted to slide laterally therein. (See Fig. 1.) An arm *a'''* is affixed to the outer end of the shaft *a''*, and has a bifurcated end, receiving a square pin carried by a lever *a''''* (see Fig. 5), the pin being of sufficient length to allow for the lateral movement of the shaft *a''* and consequent movement of the arm *a'''*. The lever *a''''* is pivoted to the frame at a point intermediate of its ends, and at its rear end it carries a roller which engages a cam-groove in a disk *a'''''* on the shaft B (see Fig. 3) and is reciprocated thereby at the proper time. Lateral motion is imparted to the awl by a lever *a''''''* (indicated in broken lines in Fig. 2), pivoted to the frame so as to move in a horizontal plane, and straddling a collar *a'''''''* (see Fig. 1) on the shaft *a''* at its front end, while its rear end carries a roller engaging a cam-groove *a''''''''* in the periphery of a disk *a'''''''''* on the shaft B. (See Fig. 3.)

The letter *b* designates what we term the "throat," which is a part having an elongated slot or opening through it, in which the awl *a* works. This throat stands in position to receive the edge of the shoe against its lower side, and it is carried by a lever *b'* (see Fig. 5), which is pivoted on the shaft *a''* and is connected at its upper end by a link *b''* with a lever *b'''*. Said lever *b'''* is pivoted to the frame at a point intermediate of its ends, and at its rear end carries a roller, which engages a cam-groove in a disk *b''''* (see Fig. 3), whereby it is reciprocated.



A part which we term the "stabber," and which is designated by the letter  $d$ , is for the purpose of holding the shoe fixed during the formation of a stitch. This stabber works simultaneously with the throat  $b$ , and is carried by a lever  $d'$  (see Fig. 5), pivoted on the shaft  $a^2$ , and connected at its upper end by a link  $d^2$  with the lever  $b^3$ , the connecting-pin being common to both the links  $b^2$  and  $d^2$ . It will be seen that these links and the levers  $b'$  and  $d'$  form toggles, which, by extending, move the throat and stabber away from each other and vice versa.

The letter  $g$  (see Fig. 4) designates a chisel, which makes a pocket where the loop comes through the sole. This chisel is carried by an oblique-angle lever  $g'$ , pivoted to the frame, and connected by a ball-and-socket joint with a rod  $g^2$ , which is jointed to a bent lever  $g^3$ , whose upper arm carries a roller engaging a cam-groove in a disk  $g^4$  on the shaft  $B'$ . (See Fig. 3.) It will be seen that the chisel will be reciprocated through the connections described.

The letter  $f$  designates a thread-measurer, which, by an upward movement measures off the amount of thread required for a stitch, the thread passing over a lateral arm of said measurer. (See Fig. 4.) This measurer is carried on the end of a rock-shaft  $f'$ , supported in bearings on the machine-frame and carrying a bevel-gear  $f^2$  at its inner end. This bevel-gear is engaged by a rack formed on the inner side of a bent lever  $f^3$ , whose opposite end carries a roller, engaging a cam-groove  $f^4$  in a disk  $f^5$  on the shaft  $B$ . Through these connections, the measurer receives an intermittent reciprocal movement.

The letter  $i$  designates the needle, which is circular and is carried by a head  $i'$ , pivoted on the shaft  $a^2$ , said head being connected by a link  $i^2$  (see Figs. 5 and 8) with a lever  $i^3$ , which is pivoted at a point intermediate of its ends to the frame, and at its rear end carries a roller in engagement with a cam-groove in a disk  $i^4$  on the shaft  $B$ . (See Fig. 5.)

The letter  $k$  designates a looper, through which the thread passes, and which loops the thread around the needle at the proper time, the motion by which this is performed being effected through the following means: The looper is pivoted to a slide-piece  $k'$ , so that it may move in a horizontal plane, and the tail of the looper has a curved slot  $k^3$ , which is engaged by a stationary pin  $k^2$ . (See Fig. 15.) The slide  $k'$  has a downward-extending arm  $k^4$ , to the lower end of which is jointed a rod  $k^5$ . The opposite end of this rod is jointed to the lower end of an arm  $k^6$ , which is affixed to a rock-shaft supported in a bearing on the machine-frame, and carries affixed to it another arm  $k^7$  (see Fig. 3), having a roller in engagement with a cam-groove in a disk  $k^8$  on the shaft  $B$ . The slide  $k'$  is reciprocated through these connections, and in its reciprocations produces a lateral movement of the looper  $k$  on its pivot, by reason of the en-

gagement of the stationary pin  $k^2$  in the curved slot  $k^3$  of the looper. At the same time that the lateral movement takes place, the looper is moved vertically, by reason of the rocking of the slide in a vertical plane. When the looper is to take the thread over the needle, the slide  $k'$  moves forward, and the propelling-rod  $k^5$  being connected below the longitudinal center of the slide, when the pin  $k^2$  reaches the end of the slot  $k^3$ , the slide rocks and its front end rises. At the same time, the looper is moved outward laterally. When the looper returns, the slide rocks again, oppositely from at first, so as to take the looper downward. This latter movement is insured by forming the tail of the slide with a shoulder  $k^9$ , which engages a corresponding shoulder  $k^{10}$  of a block fastened to the frame. The rocking motion of the slide is limited by a roller  $k^{12}$ .

The letter  $j$  designates a curved carrier for the strip or tongue 2, of which the fastening-keys for the stitches are formed. (See Fig. 4.) This curved carrier is fastened to a pendent arm  $j'$ , which is pivoted at its upper end to a lever  $j^6$ , extending rearwardly and carrying a roller in engagement with a cam-groove in a disk  $j^7$  on the shaft  $B'$ . (See Fig. 3.)

The arm  $j'$  is moved on its pivot through the following connections: A rod  $j^3$  (see Fig. 5) connects it with a bell-crank lever  $j^4$ , which is pivoted to the frame of the machine, and whose upper arm carries a roller, in engagement with a cam-groove in a disk  $j^5$  on the shaft  $B$ . (See Fig. 3.) It will be observed that the pivot of the arm  $j'$  is movable vertically, whereby the carrier is enabled in moving forward, to enter the wide upper part of the loop, and then descend to place the strip on the sole. The strip or tongue 2 is carried in a coil on a drum  $j^8$  supported above the machine, and it passes between rollers  $j^9$ ,  $j^{10}$ , which have frictional bearing against it. One of said rollers carries a ratchet  $j^{12}$ , which is engaged by a pawl  $j^{13}$ , and by this means the strip or tongue 2 is prevented from recoiling but is allowed to feed forward. Said strip or tongue occupies an elongated channel in the under side of the carrier  $j$ , the walls of said channel supporting the strip so that it cannot yield or buckle in entering the loop. The channel is covered by a plate  $j^{14}$ , having a slot at one part for a feed-dog  $n$ , having a sharp prong which takes a hold in the strip or tongue 2. This feed-dog is pivoted to the lower end of an arm  $n'$ , which is pivotally connected with the arm  $j'$ , and held by a spring  $n^2$  against a stop  $n^3$ . The feed-dog is actuated by a spring  $n^4$  into engagement with the strip or tongue. The pivoted arm  $n'$  has a lug  $n^5$ , adapted to ride over and be engaged by a latch  $n^6$ , which is pivoted to the frame and has a rounded upper end positioned below a rounded lug  $n^7$  on a vertical cutter-bar  $h$ . The latter is reciprocated in ways on the frame, and cuts off the lengths of the strip or tongue which form



the locking keys or pins. The upper end of this cutter-bar is jointed to a lever  $h'$  (see Fig. 4), which is pivoted to the frame at a point intermediate of its ends, and at its rear end is jointed to a rod  $h^2$ , extending downwardly and connected at its lower end with a spring-actuated lever  $h^3$ , having an upturned nose contacting with the periphery of a cam  $h^4$ . Reciprocation of the cutter-bar is brought about at the proper time through the means described.

The letter  $e$  designates a hollow cast-off, to cast the loop off the needle. This cast-off has a rectilinear movement and fits a slide-way in the frame. It is reciprocated through the following means: A pin  $e'$  projecting from the cast-off slide-piece, protrudes through a slot in the block  $c'$ , and is engaged by the bifurcated end of a bell-crank lever  $e^2$ , pivoted to the frame and held by a spring  $e^3$ , whereby the cast-off is retracted. A rod  $e^4$  is jointed to the upper arm of the bell-crank  $e^2$ , and extends behind the lever  $f^3$ , where it is slotted, as at  $e^5$ , and receives a pin  $e^6$  fastened in said lever  $f^3$ .

The take-up mechanism for tightening the stitch is arranged as follows: The thread 3 passes around a roller  $m$ , supported on a horizontal axle, and thence around a vertical fixed post  $m'$  secured in the frame of the machine. A horizontally-reciprocating slide  $m^4$  carries a roller  $m^2$ , around which the thread is carried from the post  $m'$ , and said thread thence passes around a fixed post  $m^3$  in line with the post  $m'$  and on the opposite side of the slide  $m^4$ . The thread passes from the post  $m^3$  to the looper  $k$ .

The slide  $m^4$  is retracted by the tension of the thread, and is projected through the following instrumentalities: A lever  $m^5$  is pivoted at the upper end to the slide and at its lower end to the frame (see Fig. 1), and a rod  $m^6$  is connected by a slot and pin with said lever and extends to the rear of the machine, where it is jointed to a pendent swinging arm  $m^7$ , which carries a roller in engagement with a cam-groove in a disk  $m^8$  on the shaft B. (See Fig. 3.)

All the cams being properly timed, the operation is as follows: The presser-foot  $c$  is thrown out by manipulating the handle  $c^2$ , and the lasted shoe is introduced and the presser-foot released. The shoe is pressed against the awl  $a$  by the operator, the parts being in the relation shown in Fig. 4, and the edge of the shoe engages the lower side of the throat  $b$ , which is then in its rearward position, the awl piercing the upper where it covers the shoulder of the sole and entering the sole. The machine is started, and the throat moves toward the shoe, while at the same time the stabber  $d$  comes down upon the sole (see Fig. 5), and takes a hold in the same, and retains the hold during the formation of the stitch, whereby the shoe is held stationary. The chisel  $g$  next descends (see Fig. 6), and makes a depression or pocket in the sole,

and then recedes. The needle  $i$  advances, and the awl recedes in front of it (see Fig. 7), the needle piercing the sole and upper and passing through the throat  $b$ , while the awl moves laterally out of the needle's path and takes a new position for feed. (See Fig. 8.) The looper  $k$  then passes the thread 3 around the needle (see Fig. 9), by advancing and turning in an outward and upward direction. The needle recedes with the loop of thread (see Fig. 10), and draws it through the upper and sole, and the looper returns to its normal position. As the needle recedes, the thread-measurer  $f$  goes down behind the throat to be in readiness for measuring off the thread for the next stitch, and the cast-off  $e$  takes position over the needle-point. The tongue-carrier  $j$  now advances through the outer spread part of the loop held by the needle (see Fig. 11), and carries the lug  $n^5$  over the latch  $n^6$ . The tongue-carrier is moved down upon the sole by the lever  $j^6$ , and recedes, turning on the pivot by which it is connected with said lever. The feed-dog  $n$  for feeding the strip being held by the engagement of the latch  $n^6$  with the lug  $n^5$ , when the tongue-carrier recedes, a length of the tongue is fed out of the carrier (see Fig. 12) and left lying in the lower part of the loop. The needle now advances far enough through the cast-off  $e$  to cast the loop, and immediately the take-up operates to draw the loop tight down upon the tongue, which is drawn into the depression or pocket made by the chisel (see Fig. 16) and locks the loop. While this takes place, the awl is projected into the sole from its new position. The throat  $b$  and stabber  $d$  recede, and the needle moves back almost out of the cast-off. The cutter-bar  $h$  next descends (see Fig. 13), to sever the length of tongue which projects from the carrier and lies in the loop. As the cutter-bar descends, its lug  $n^7$  moves behind and trips the latch  $n^6$ , and the feed-dog is released. The cutter-bar returns to its normal position, the awl  $a$  moves laterally, feeding the shoe to position for the next stitch, the measurer  $f$  goes up in front of the throat and measures off the thread for the stitch, and the cast-off returns to normal position. The parts have now assumed their first position, ready to make the next stitch.

It is evident the invention might be embodied in different form from that here shown, and hence it is not limited to the construction illustrated.

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

1. A machine of the character described, comprising in its construction means for passing loops of a continuous thread through the work, and a reciprocating carrier which enters the said loops under one direction of movement and has an elongated channel adapted to carry and support a locking-piece, and to leave said locking-piece in the loops under the reverse direction of movement.



2. A machine of the character described, comprising in its construction means for passing loops of a continuous thread through the work, a reciprocating carrier which enters the said loops under one direction of movement and has an elongated channel adapted to carry and support a locking-piece, and means for retaining the locking-piece in the loops when the said carrier withdraws therefrom.
3. A machine of the character described, comprising in its construction means for passing loops of a continuous thread through the work, a carrier which reciprocates over the work and also moves toward and from the work, said carrier entering the loops and carrying a locking-piece with it, means for moving said carrier toward the work while in the loops, and means for retaining the locking-piece in the loops when the carrier withdraws therefrom.
4. In a shoe-sewing machine, the combination of means for carrying loops of a continuous thread through the upper and sole of a shoe, a carrier to take a locking strip or tongue through the loops, means for moving said carrier forward and back and up and down, whereby it may take the tongue through the outer large part of a loop and then carry it toward the sole, a feed-dog on the carrier for engaging the strip or tongue therein and capable of movement independent of said carrier, a latch to hold said feed-dog when the carrier moves outwardly, and a cutter to sever a length of the strip or tongue and constructed to trip the said latch, substantially as described.
5. A machine of the character described, comprising in its construction means for passing loops of a continuous thread through the work, a reciprocating carrier which enters the said loops under one direction of movement and is adapted to carry with it a locking-piece and to leave said locking-piece in the loops under the reverse direction of movement, means for taking up the loops, and a cutter which severs a length of the locking-piece for each loop.

6. A machine of the character described, comprising in its construction a recessing device which forms pockets in the work, means for passing loops of a continuous thread through the work, said loops emerging from the said pockets, a reciprocating carrier which enters the loops and carries a locking-piece with it, means for retaining the locking-piece in the loops when the carrier withdraws therefrom, take-up mechanism for drawing the loops tight and the locking-piece into the pockets, and a cutter for severing a length of the locking-piece for each loop.
7. In a shoe-sewing machine, the combination of a channel or pocket former, a curved oscillating hooked needle adapted to draw loops of a continuous thread through the sole and upper of the shoe, a looper, a cast-off device, a carrier adapted to take a locking strip into the loops, a take-up mechanism adapted to draw the strip into the pockets of the sole, and a cutter for severing the locking strip.
8. A machine of the character described, comprising in its construction a work-supporting throat, an awl therein, a stabber which engages and holds the work during the formation of each stitch, a recessing device for forming pockets in the work, an oscillating hooked needle adapted to draw loops of a continuous thread through the work, said loops emerging through the pockets, a reciprocating carrier which enters said loops and takes a locking-piece with it, means for retaining the locking-piece in the loops when the carrier withdraws therefrom, a cast-off device, a take-up mechanism, and a cutter which severs a length of the locking-piece for each loop.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 18th day of July, A. D. 1893.

GEORGE A. KNOX.  
EDWIN E. BEAN.

Witnesses:

A. D. HARRISON,  
ARTHUR W. CROSSLEY.