No. 612,150. Patented Oct. 11, 1898.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Nov. 7, 1894.)

(No Model.) 9 Sheets—Sheet 1.

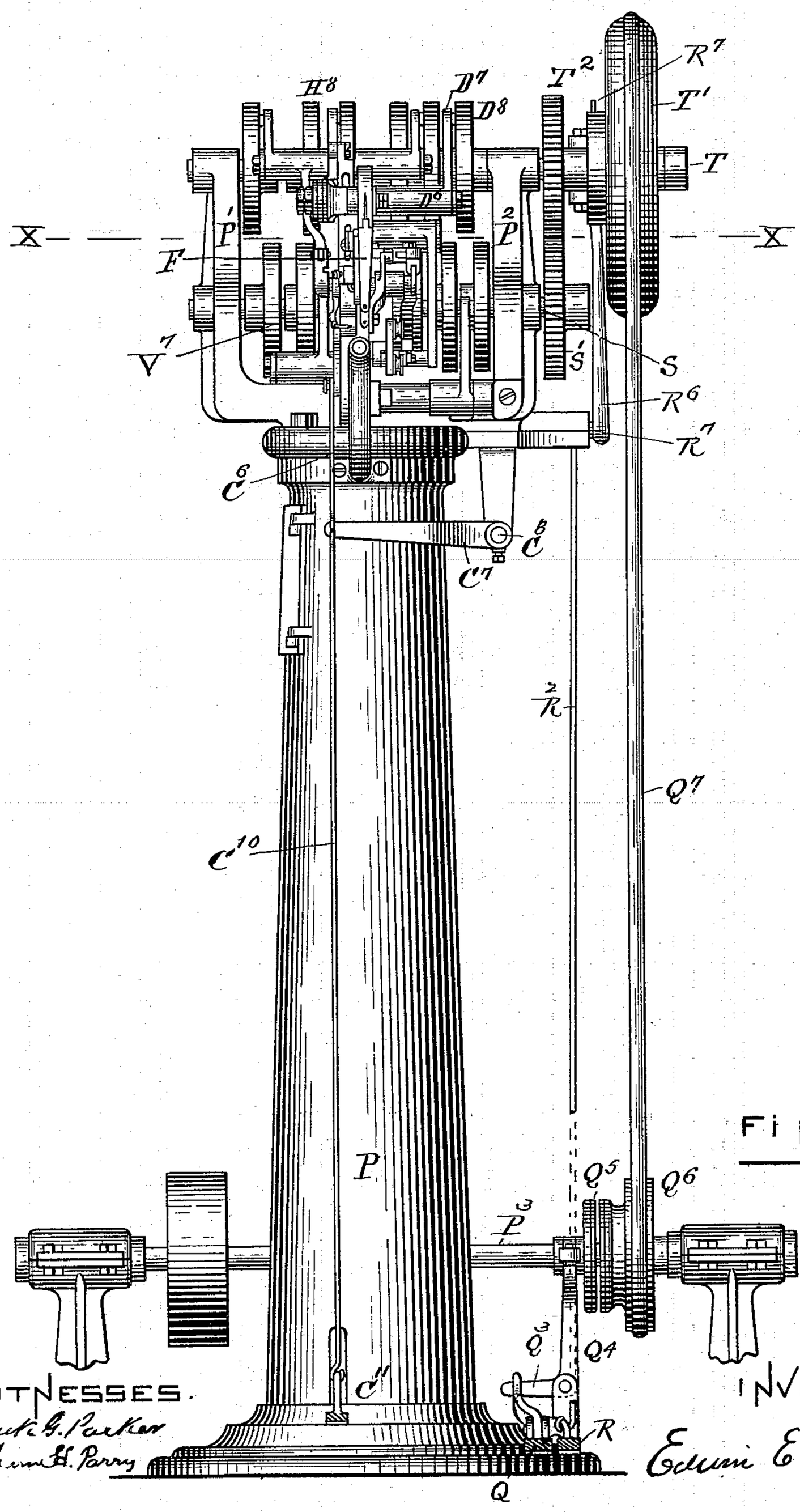

Fig. 1.

WITNESSES.
Frank G. Parker
William H. Parry

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Edwin E. Bean

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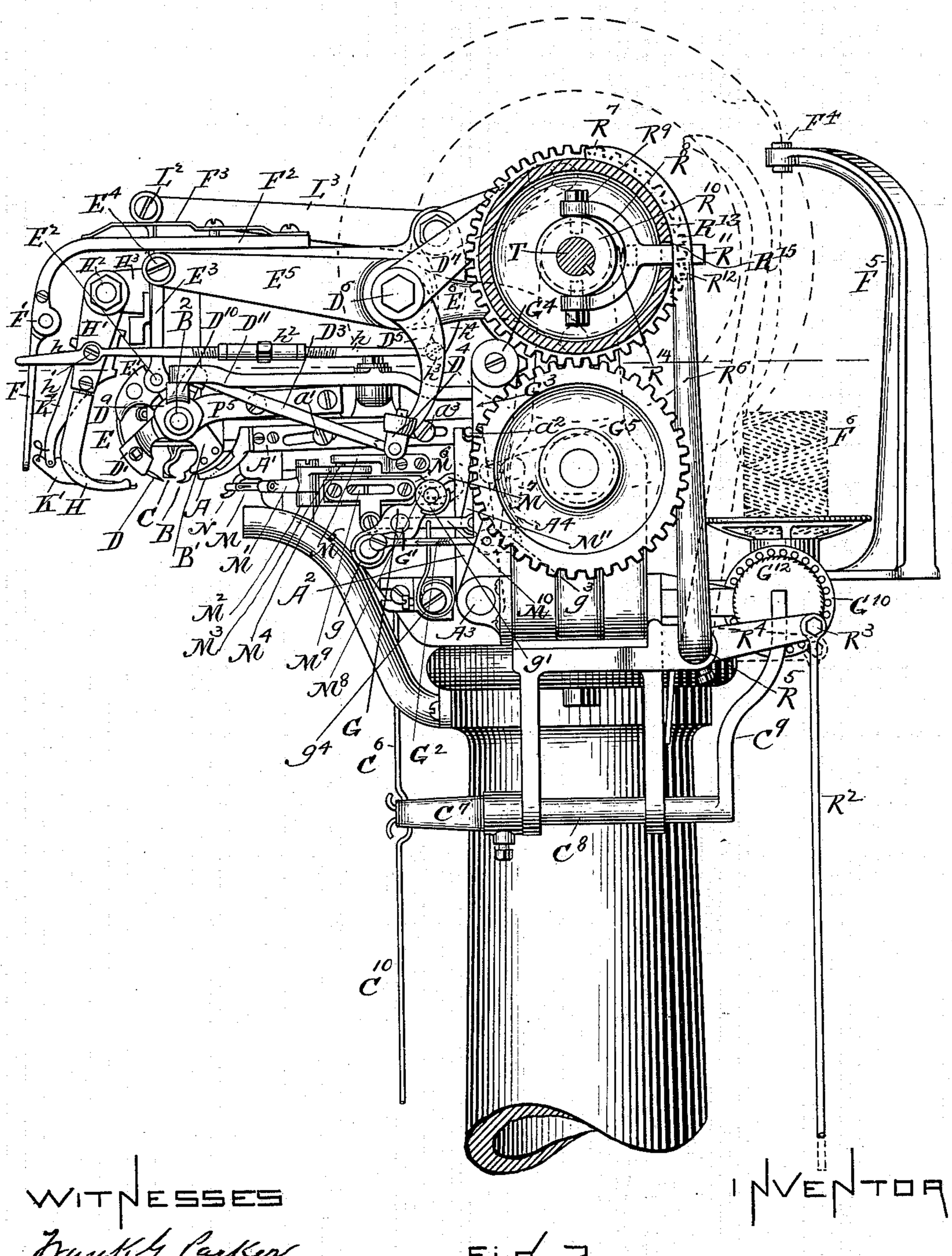

WITNESSES
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William H. Parry.

INVENTOR
Edwin E. Bean

Fig. 2.

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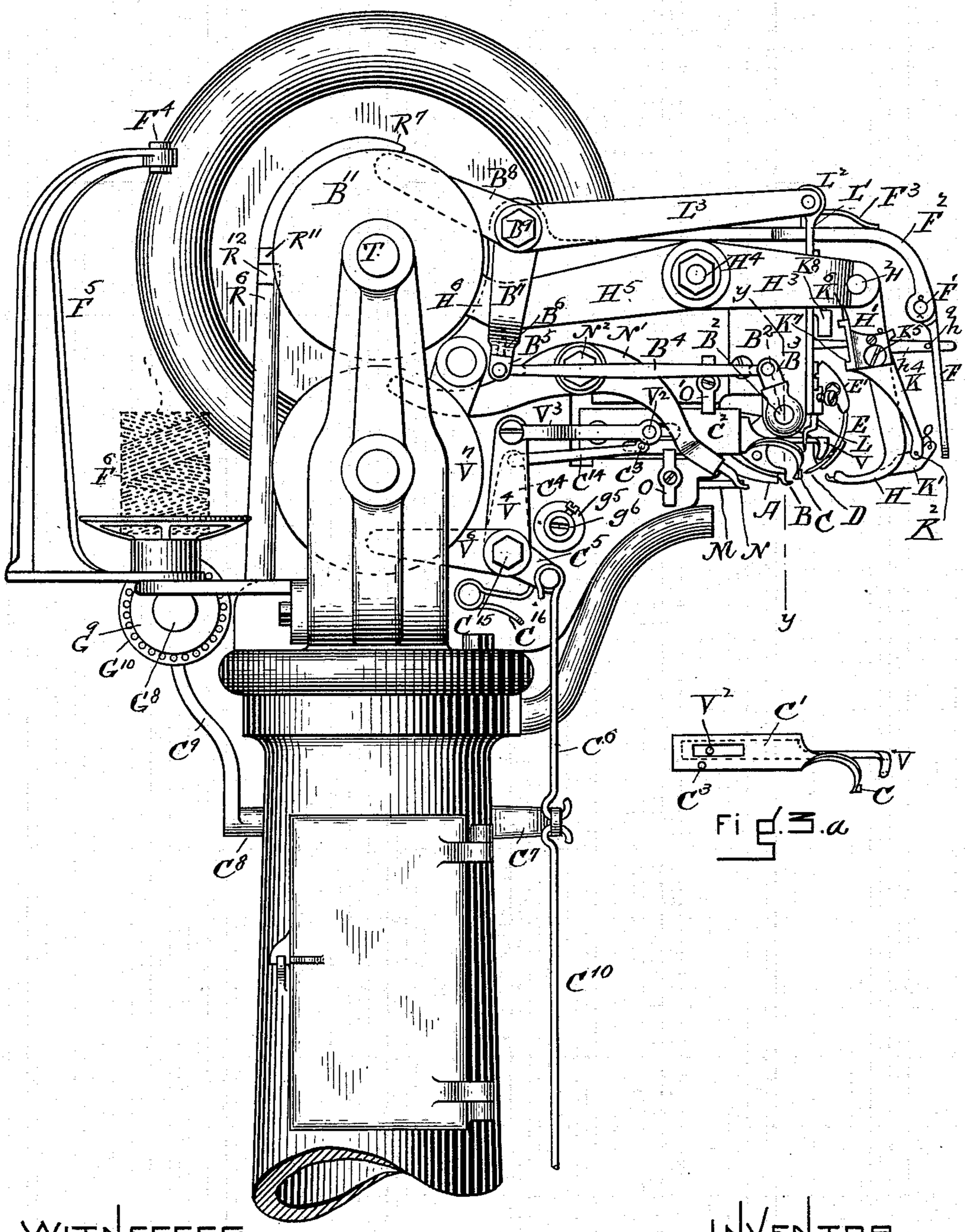

Fig. 3.

Fig. 3.a

Witnesses
Frank G. Parker
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9 Sheets—Sheet 4.

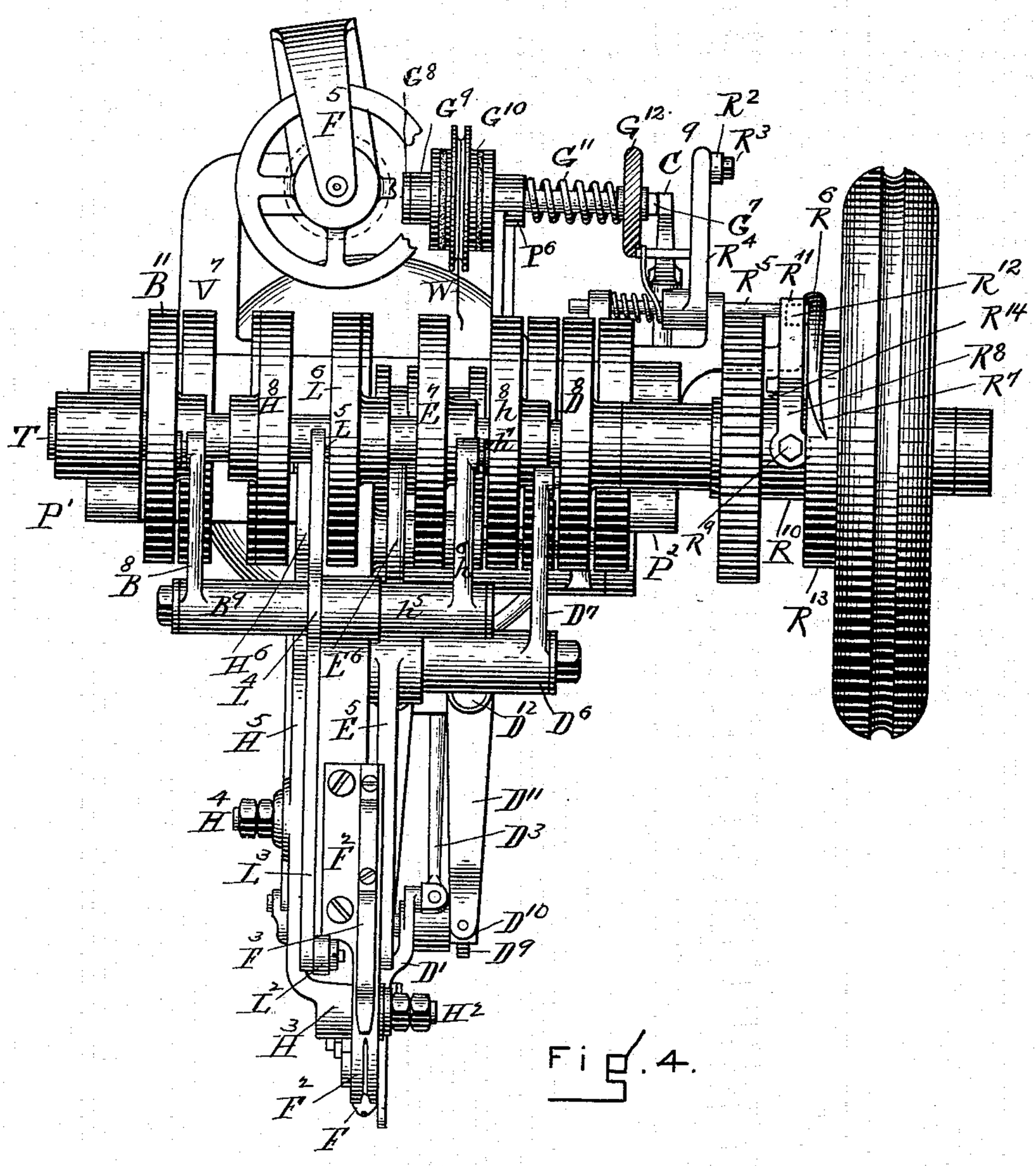

Fig. 4.

WITNESSES.

Frank G. Parker

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9 Sheets—Sheet 5.

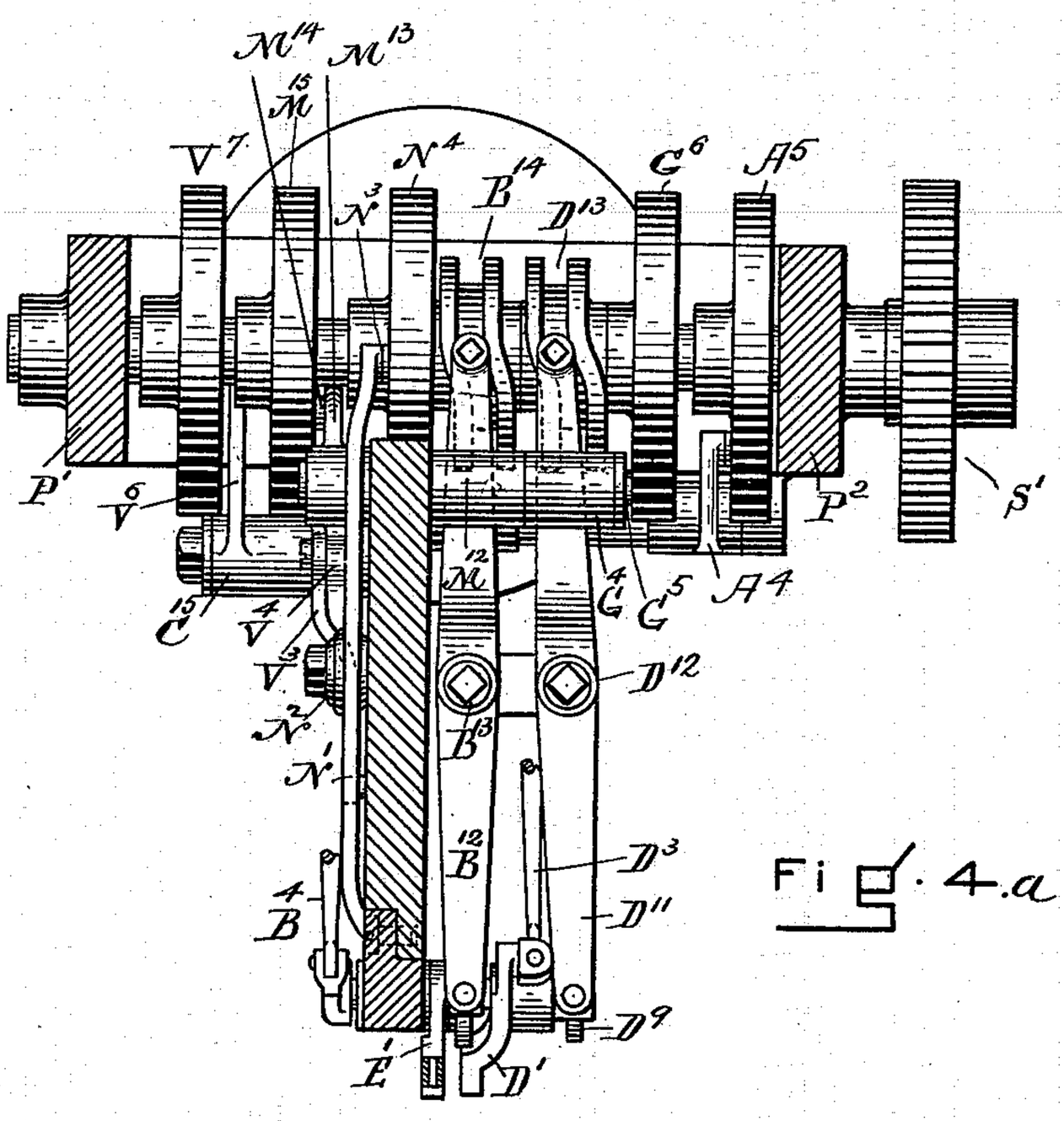

Fig. 4.a

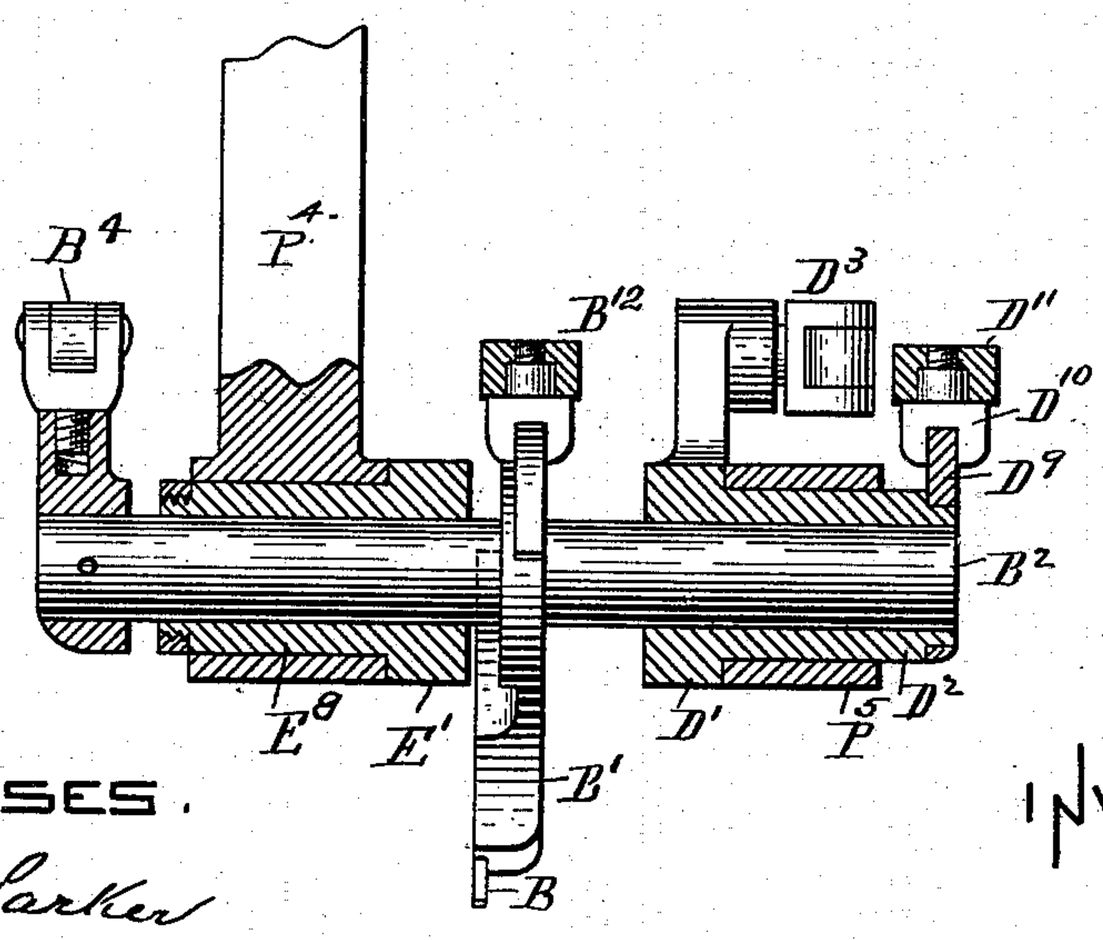

Fig. 4.b

WITNESSES.

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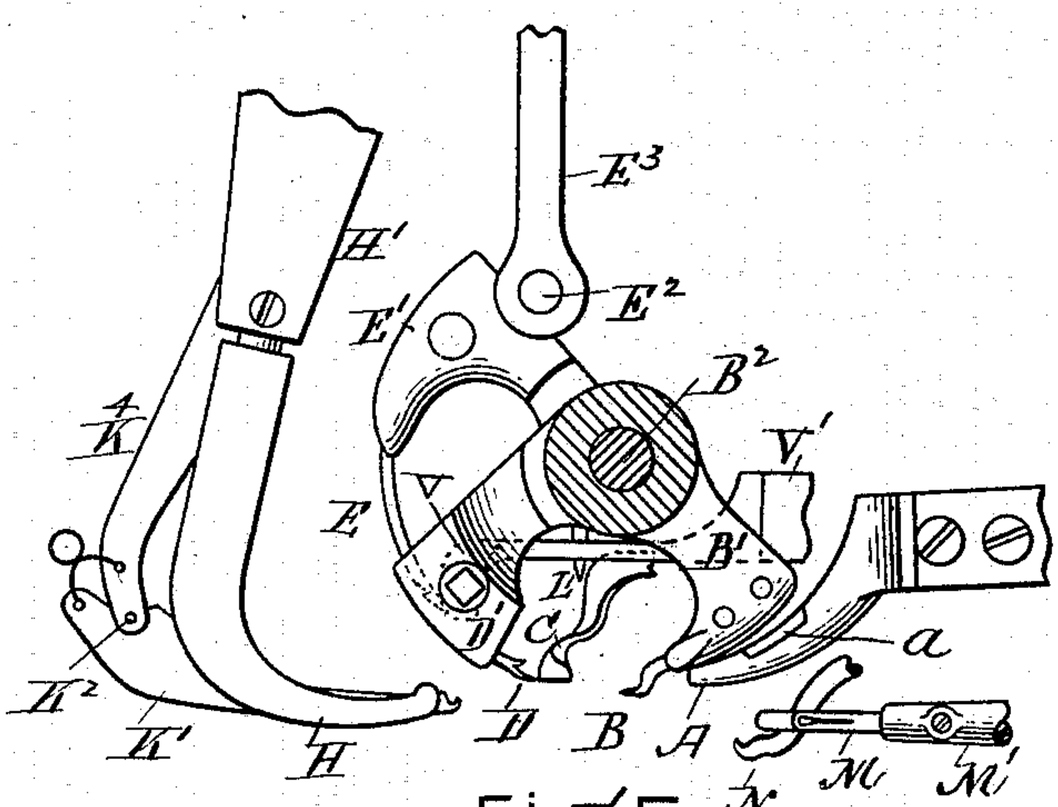

Fig. 5.

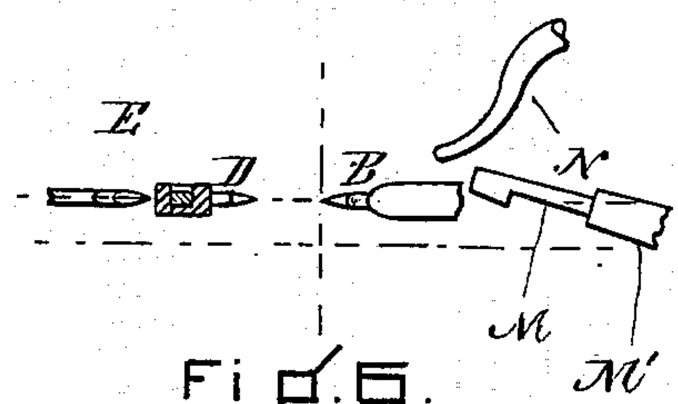

Fig. 6.

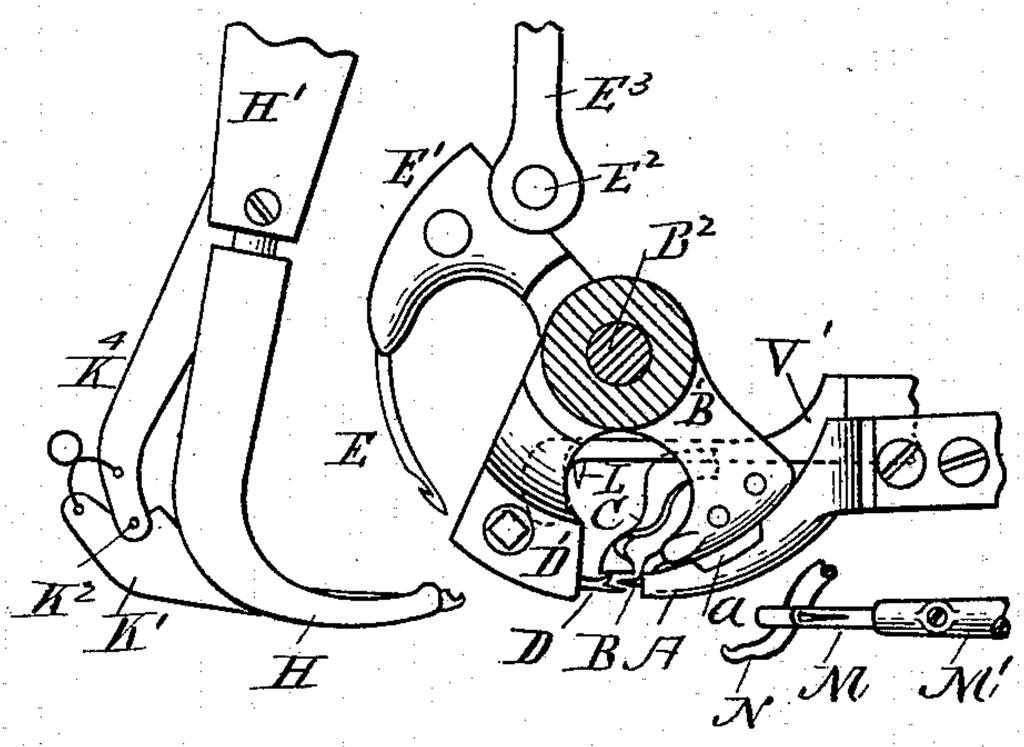

Fig. 7.

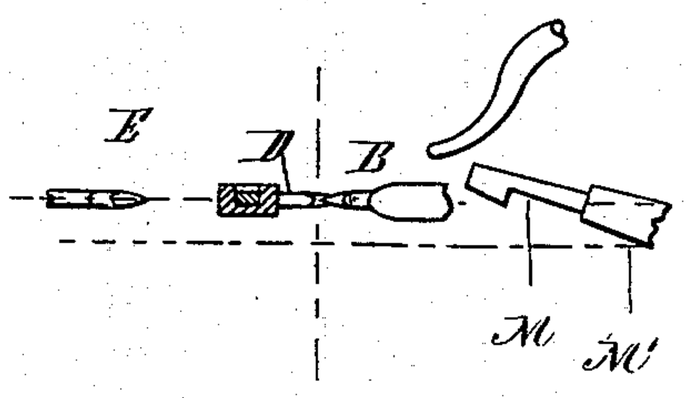

Fig. 8.

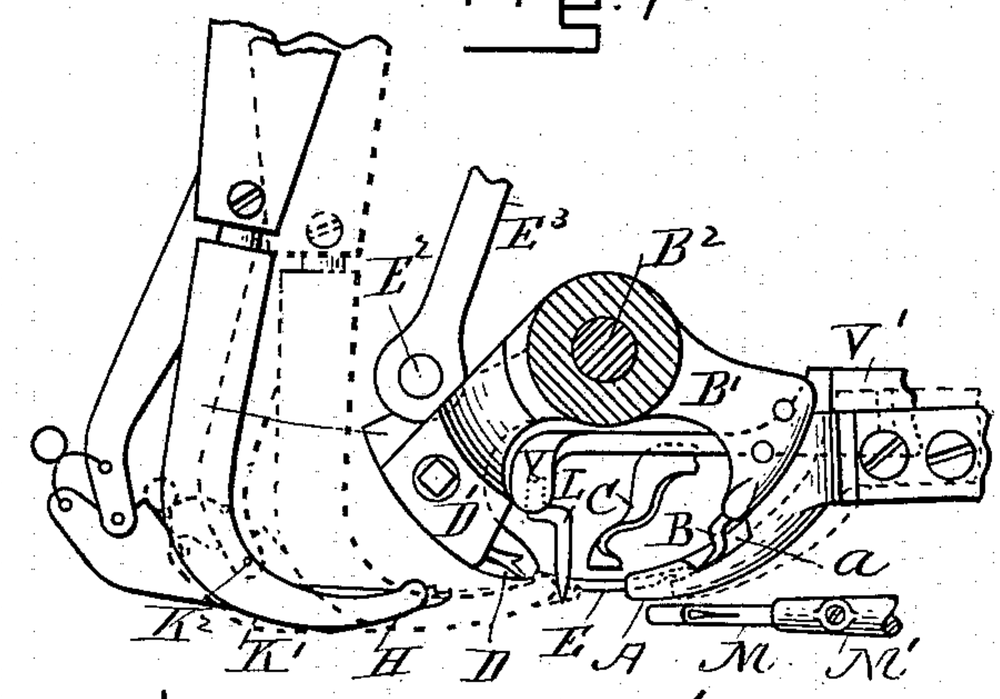

Fig. 9.

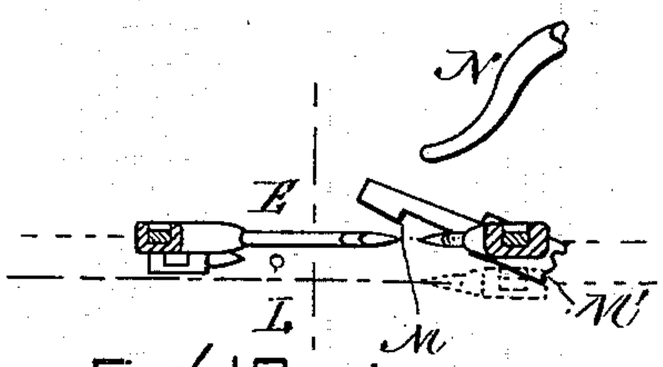

Fig. 10.

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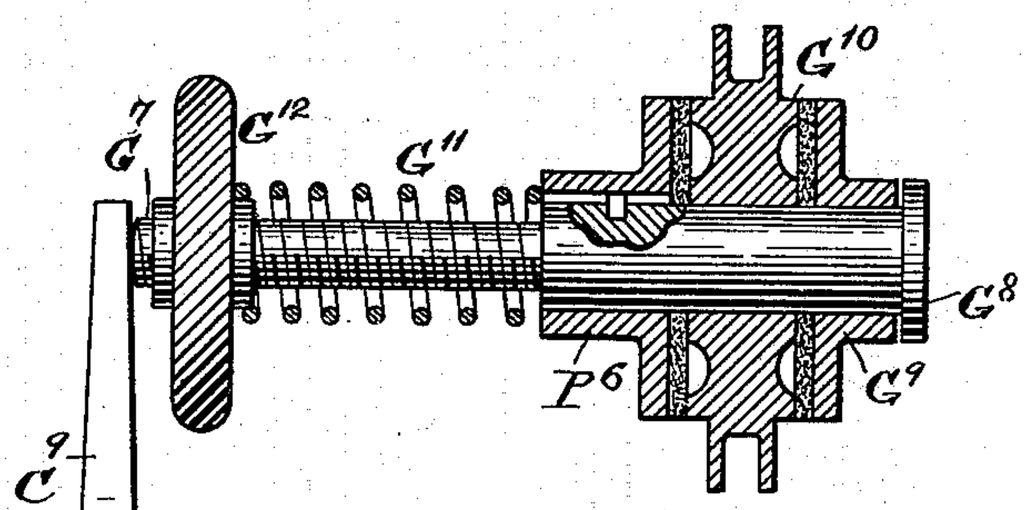

Fig. 11.

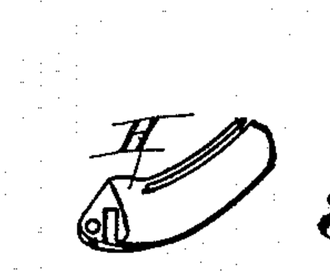

Fig. 15a.

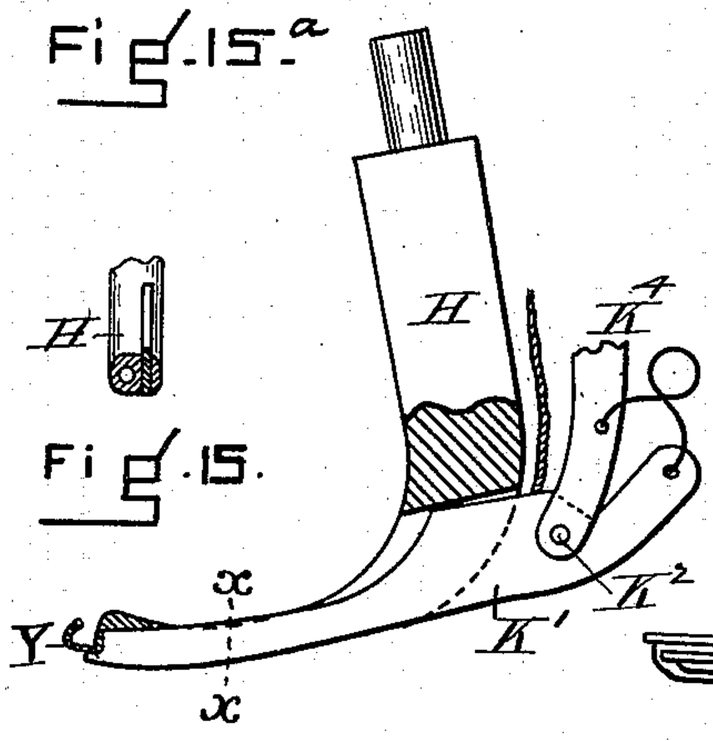

Fig. 15.

Fig. 13.

Fig. 14.

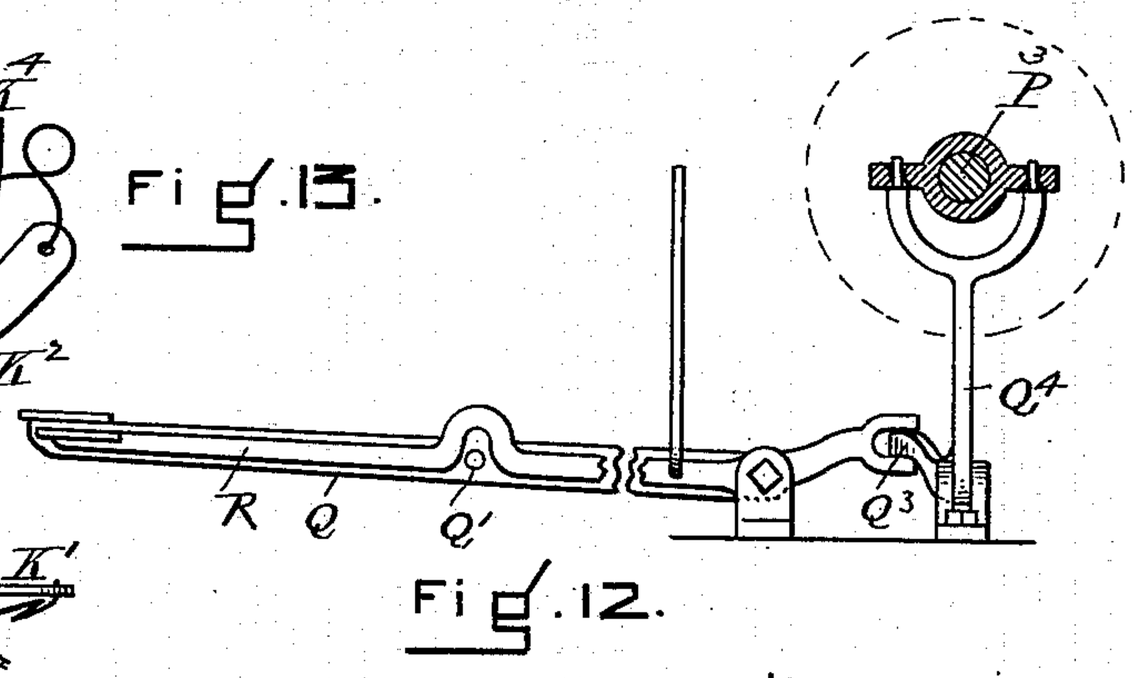

Fig. 12.

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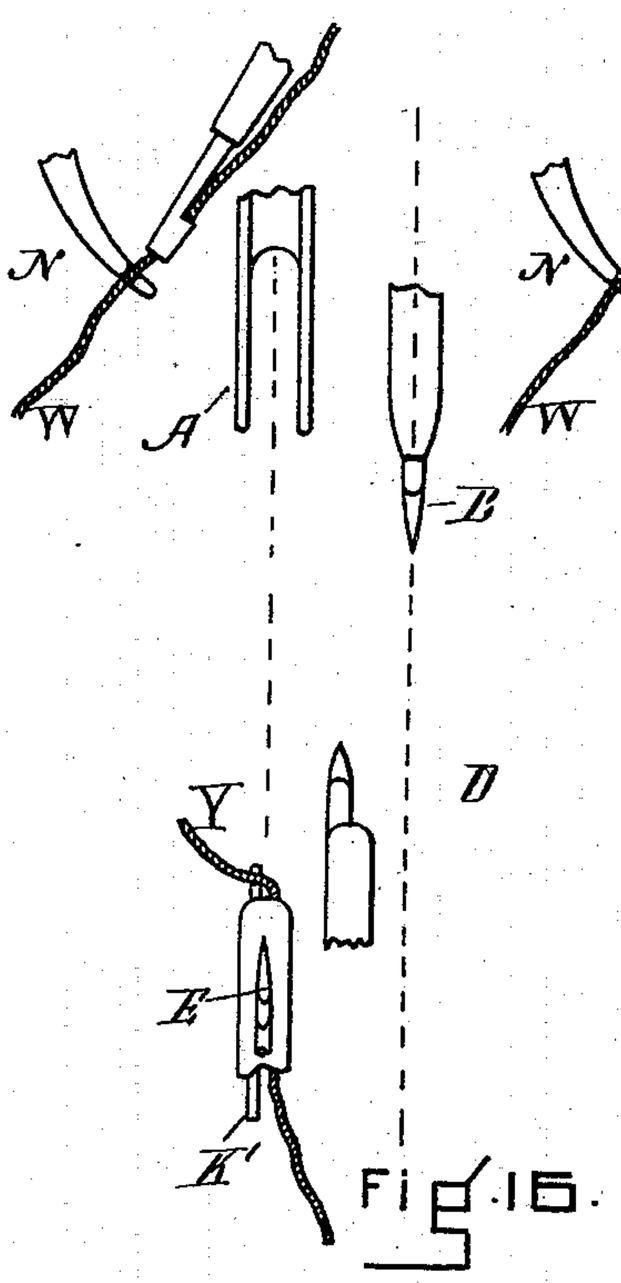

Fig. 16.

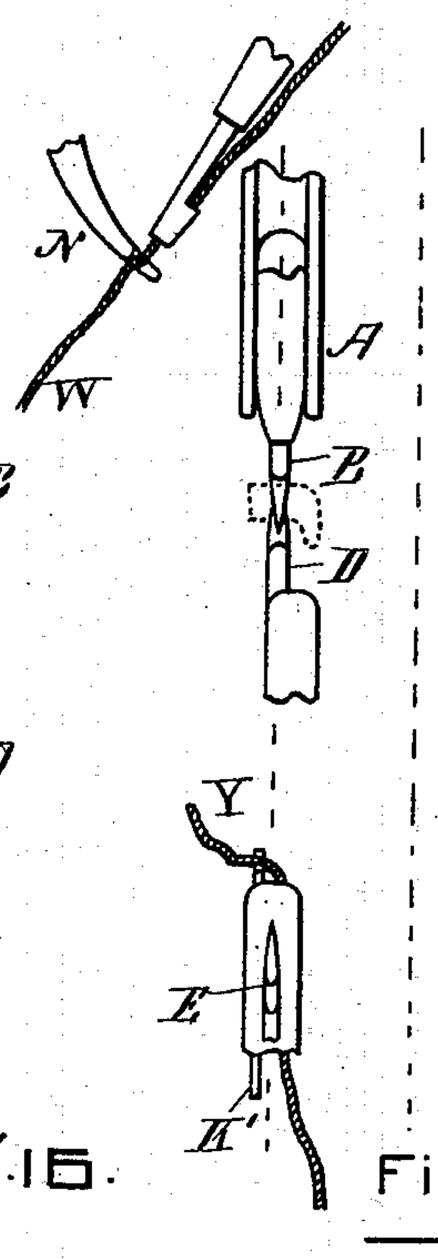

Fig. 17.

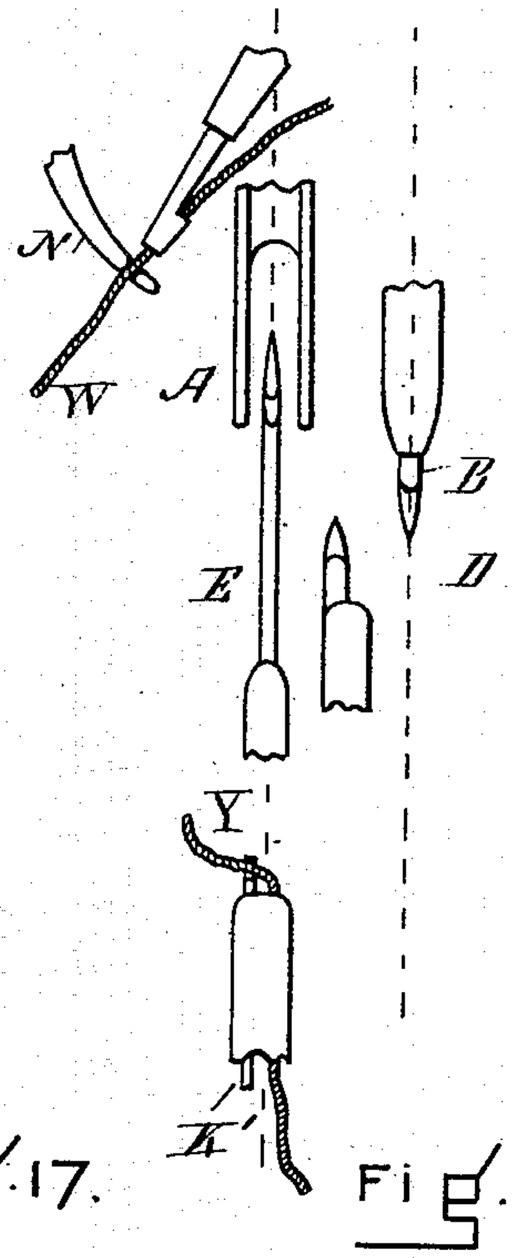

Fig. 18.

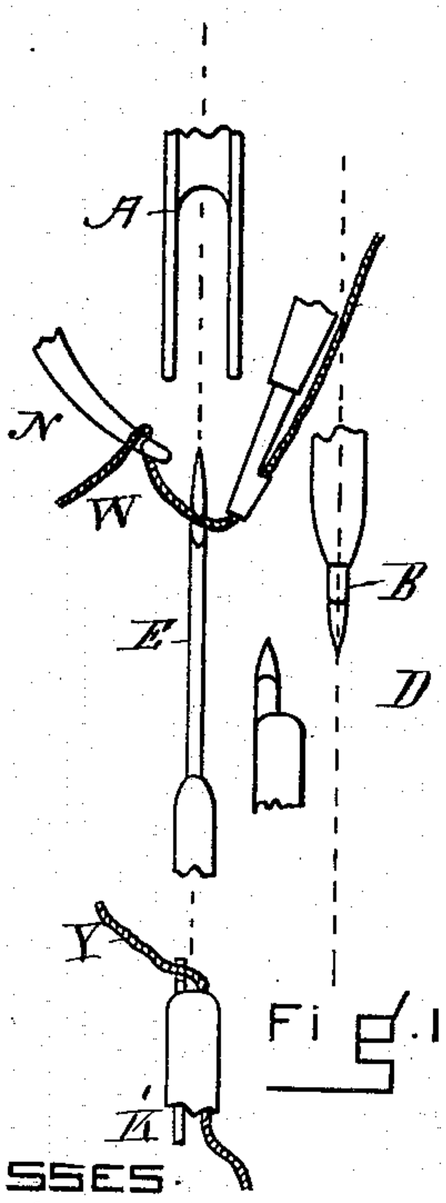

Fig. 19.

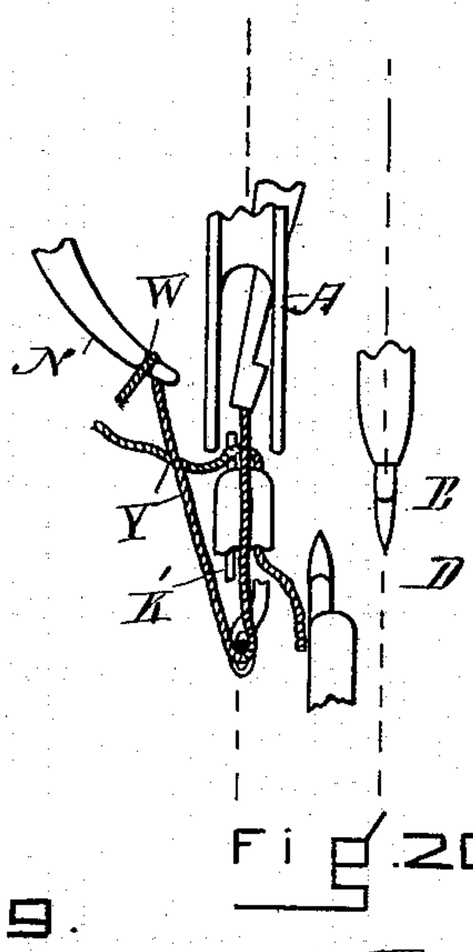

Fig. 20.

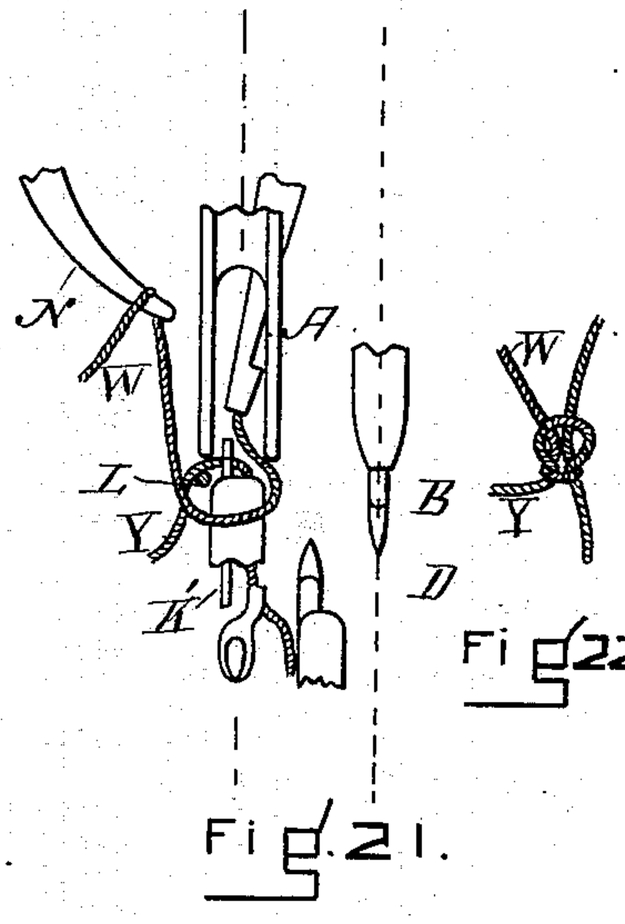

Fig. 22

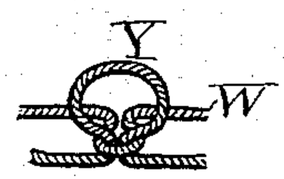

Fig. 23.

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William L. Parry

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Patented Oct. 11, 1898.

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SHOE SEWING MACHINE.

(Application filed Nov. 7, 1894.)

(No Model.)

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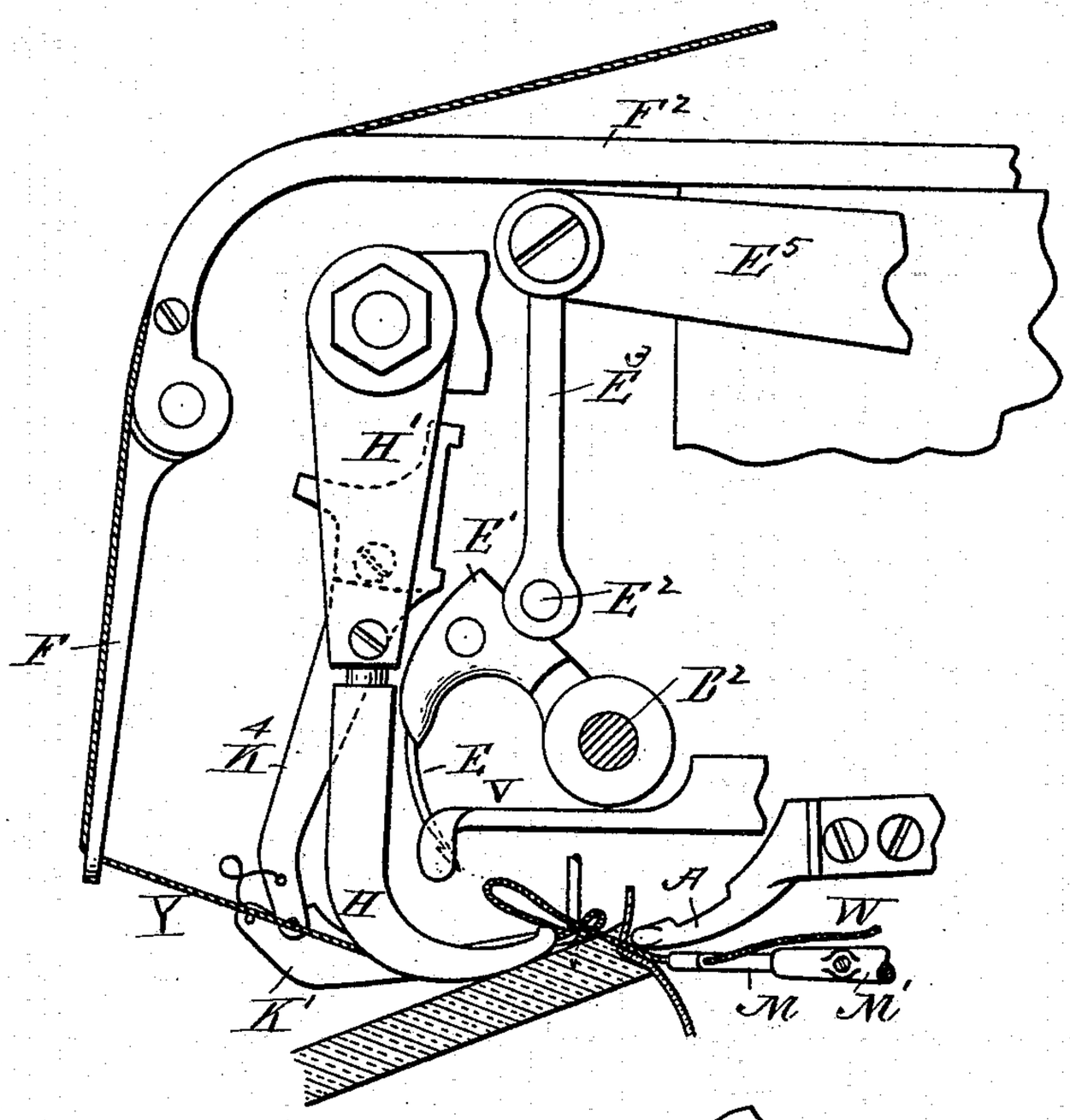

Fig. 24.

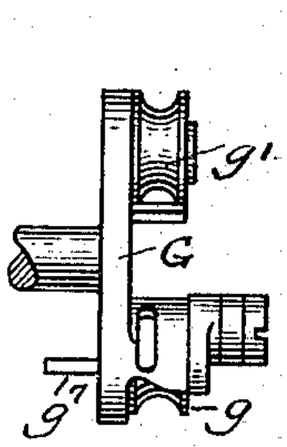

Fig. 26.

Fig. 25.

WITNESSES.

William L. Perry

Edward S. Day

INVENTOR

Edwin E. Bean

by Frank G. Parker Atty

UNITED STATES PATENT OFFICE.

EDWIN E. BEAN, OF BOSTON, MASSACHUSETTS.

SHOE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 612,150, dated October 11, 1898.

Application filed November 7, 1894. Serial No. 528,153. (No model.)

To all whom it may concern:

Be it known that I, EDWIN E. BEAN, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Shoe-Sewing Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to that class of sewing-machines that are used for sewing turned shoes; and it consists in the organization and construction of a machine which forms a stitch with two threads, but one of the threads alone passing through the stock, the other thread acting simply as a stay or lock for the stitch formed by the first thread, the object being to produce a machine that will work safely and rapidly in making this class of stitches for the purpose of sewing turned shoes. This object I attain by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a front elevation of my machine. Fig. 2 is a right-side elevation showing all parts of the machine except the treadles, counter-shaft, and their connected parts. Fig. 3 is a left-side elevation of my machine, showing all of the parts except treadles, counter-shaft, and their connected parts. Fig. 3ª shows details relating to gage and cast-off. Fig. 4 is a plan view of my machine. Fig. 4ª is a plan view of the parts of my machine that lie below the line *x x* of Fig. 1. Fig. 4ᵇ is a vertical section of a part, taken on line *y y* of Fig. 3. Figs. 5, 6, 7, 8, 9, and 10 are views for showing the construction of the stitch-forming mechanism and its movements. Fig. 11 is an enlarged view of some of the details relating to the rear-thread tension device. Fig. 12 is a view showing in side elevation the treadles and connected parts used in stopping and starting the machine. Fig. 13 is a view, partly in side elevation and partly in vertical section, of the front-thread carrier, &c. Fig. 14 is a view from the under side of the front-thread carrier, &c. Fig. 15 is a section taken on line *x x* of Fig. 13. Fig. 15ª is a perspective view of the end of the front-thread carrier. Figs. 16 to 23, inclusive, are for the purpose of illustrating the method of forming the stitch. Fig. 24 is a side view showing the position of the shoe and the threads forming the stitch. Figs. 25 and 26 are views to illustrate the take-up mechanism.

In the drawings, P P′ P² represent the post and frame to which the working parts are attached.

P³, Fig. 1, is a counter-shaft having pulleys, as shown, and a constantly-rotating disk which is forced against a disk on the belt-pulley Q⁶ for starting the machine and released for stopping it.

Q⁶ is a loose pulley on the counter-shaft P³ and is put in motion by the treadles and connecting mechanism, as shown. The belt Q⁷ drives the pulley T′ and through it the upper cam-shaft T. The lower cam-shaft S is driven by gear T² on the upper cam-shaft acting through the gear S′ on the said shaft S.

I will now describe piece by piece the instruments that are directly employed in preparing for and in making the stitch and also their motions and the means for producing the said motions.

The throat-piece A, Figs. 2, 3, 5, 7, and 9, acts as a back rest for the edge of the shoe while the feed or back awl is being withdrawn from the stock and also to resist the thrust of the needle when passing through the stock. The throat-piece A is forked, as shown in Figs. 16 to 21, and has a groove cut longitudinally in its upper side for the feed or back awl B and needle E to traverse in their back-and-forth motions, and is provided with a lateral opening *a*, Figs. 5, 7, and 9, to admit of the lateral retreating of the feed or back awl from the groove. The throat-piece A has a simple back-and-forth motion in a curved line produced by the following-described mechanism: The throat-piece A is attached to a sliding plate A′, Fig. 2, which is attached to the frame of the machine by means of the screws *a′* *a*³, which pass through slots, as shown. The slot that *a′* passes through is inclined, so that the movement of the throat-piece A will be in a curved line, the throat-piece ascending as it retreats.

*a*² is a pin projecting from the sliding plate A′ and engages with the upright arm A² on the rocker-shaft A³. A second arm A⁴, Fig. 4ª, transmits motion from the cam A⁵ to the said rocker-shaft A³ and thence mediately to the throat-piece A.

The back or feed awl is designated by B,

Figs. 2 and 3, and is also shown in Figs. 5, 7, and 8, and is adapted to operate as an awl for partially puncturing the stock and also as a "four-motion feed." It is directly attached to an oscillating segment B′, which is rigidly attached to the rocking and sliding arbor B^2. Rocking motion is given to the arbor B^2 by the cam B^{11}, Figs. 3 and 4, which acts, through the bent lever B^8 B^7, pivoted at B^9, swivel-joint B^6 B^5, link B^4, swivel-joint, and arm B^3, on the said arbor B^2. A sliding motion is given to the arbor B^2 and to the feed-awl B by the following-described means: The segment-piece B′ has attached to its upper part a short segment, semicircular in form, that is embraced by a forked piece, in which it moves easily when the feed-awl segment is being oscillated, (see Figs. 4^a and 4^b,) the forked piece being provided with a stud at its upper part, the said stud fitting into a hole in the end of lever B^{12} and forming a swivel-joint to allow the lever B^{12} to move laterally and slide the feed-awl segment back and forth a sufficient distance to produce the required length of stitch, the lever B^{12} being pivoted to the frame at B^{13}, and its other end has a friction-roll and stud that engages with the cam B^{14}, from which it receives its motion. From the above it will be seen that the feed-awl B swings back and forth in an arc of a circle and also has a lateral movement.

The gage C, Figs. 2 and 3, (shown in connection with other details in Figs. 5, 7, 8, and 9,) has a back-and-forth horizontal motion. It is shown in its forward or proper position (to introduce the work into the machine) in Fig. 5 and in position for the shoe to rest upward against (while being sewed) in Figs. 7 and 9. A forward motion is imparted to the gage C by a foot-lever C^{11}, Fig. 1, which acts through the rods C^{10} C^6 and the arm C^5, Fig. 3, which is pivoted to the frame at C^{15}, arm C^4, (shown in dotted lines,) link C^{14}, pivot C^3, (working in a slot in slide-holder C^2,) and slide C′. The function of the gage C is to so hold and guide the shoe that the awl and needle will enter the stock at the required distance from the outer surface of the sole as it is being sewed. The reverse motion is effected by means of a spring C^{16}, Fig. 3.

The gage C can be adjusted up and down to conform to the varying thickness of the soles by the following means: The slide C′ fits in a groove in the slide-holder C^2, which is pivoted to the frame at its inner end, and its outer end can be raised and lowered, as desired, and secured by the clamp-pieces O O′, Fig. 3. As both rods are connected to the lever C^7, which acts through the rocker-shaft C^8 and arm C^9 and bears against the back-thread-tension-device shaft G^7, it is evident that the tension on the back thread is governed by the foot-lever C^{11}, so that when the gage C is moved forward the tension on the back thread is also thrown off. The tension device will be more fully explained farther on.

The front awl D, Figs. 2 and 3, with details Figs. 5, 7, and 9, serves to penetrate the stock from the opposite side from the puncture made by the back or feed awl and also to hold the shoe against the draft of the needle when pulling in its loop, the two awls making a hole nearly through the stock, so that the needle E can easily pass through. The motions of the front awl are similar to those of the back or feed awl, with the exception that the front awl D has two oscillating forward and backward movements to one of the feed-awl—one for the purpose of making a hole for the needle to enter and another to enter and hold the shoe nearly opposite to the feed-awl while the needle is being withdrawn from the shoe and drawing in its loop. Its motions are imparted by the following-described mechanisms: The front awl D is attached to the segment-arm D′, which is made solid with the hollow arbor D^2, Fig. 4^b, which turns on the arbor B^2 and is journaled in an arm P^5, extending from the frame of the machine. The segment D′ (to which the awl D is attached) is connected by a swivel-joint (in an upward-extending arm) to the link D^3, (see Figs. 4^a, 4^b, and 2,) and this link D^3 is in turn connected by swivel-joint D^4 to an arm D^5, Fig. 2, on the rocker-shaft D^6. (See Fig. 4.) A second arm D^7 extends from the rocker-shaft D^6 to the cam D^8, by which motion in an arc of a circle is given to the awl D. The lateral motion is given to the awl D by the following-described means: The hollow arbor D^2, Fig. 4^b, to which the front-awl segment D′ is attached, has formed on its outer end a flange D^9, which engages with a pivoted fork-shaped piece D^{10} in the end of a lever D^{11}, swinging on the pivot D^{12}, which connects the forked piece D^{10} with the actuating-cam D^{13}.

The needle E, Figs. 2 and 3, is attached to a segment-piece E′, which is made solid with the hollow arbor E^8, (see Fig. 4^b,) and is journaled in an arm P^4, extending from the frame of the machine and oscillates freely on the arbor B^2, Fig. 4^b, and is driven by the cam E^7, Fig. 4, acting through the oscillating lever E^6 E^5, Figs. 2 and 24, which is connected to the needle segment-piece E′ by a link E^3, said link being connected to the end of the lever E^6 E^5 at E^4 (see Fig. 2) and to the needle segment-piece E′ at E^2. The motion of the needle is simply in the arc of a circle. As it is essential to tip the heel and toe of the shoe upward when sewing along the shank, it is imperative that the overhanging journals of the needle and front-awl segments should be so near together as not to come into contact with the shoe at that point, and the arrangement I have made in this respect, as shown in Fig. 4^b, gives the largest amount of wearing-surface allowable in the limited space between the bearings.

The front-thread carrier H and carrier-arm H′, Figs. 2 and 3, are connected by a joint H^2 to the lever H^3 H^5 H^6, Figs. 3 and 4. The said lever H^3 H^5 H^6 oscillates on a pivot H^4, Fig.

3, and is actuated by the cam H^8. By this means the front-thread carrier H is moved up and down. A swinging motion is imparted to it by the cam h^8, Fig. 4, acting through a friction-roller h^7 and arm h^6, rocker-shaft h^5, Fig. 4, arm h^4, Fig. 2, joint h^3, rod h, and pivot h'. The rod h is made adjustable as to length by means of a right and left hand screw-nut h^2.

The construction of the thread-carrier H and connected parts is shown in Figs. 13, 14, and 15. The point of the carrier H is wedge-shaped, as shown in Fig. 15, so as to pass between the threads easily. The thread-pusher K′ slides back and forth in a groove in the lower part of the carrier H (see Figs. 13 and 14) and has a projecting point extending from its lower part to prevent the loop from slipping off its end while being pushed forward. It is operated by the following-described means: K^4 is a lever pivoted at K^2 to the pusher K′ and is arranged to swing on a pivot K^5, attached to the arm H′. (See Fig. 3.) K^6 and K^7 are small projections connected to the upper part of the lever K^4 and so located in relation to the vertically-moving trip-piece K^8, which is attached to the vertical slide L′, that as the arm H′ moves downward the projection K^6 will engage with its upper corner, which will cause the lower end of the lever K^4 to swing inward, forcing the pusher K′ to slide forward in the lower part of the thread-carrier H, and thus carry a loop of the thread forward and beyond the end of the carrier H, and as the slide L′ moves down and carries the bight-holder L through the aforesaid loop the projection K^7 will be engaged by the trip-piece K^8 and the arm K^4 will be thrown outward, thus causing the pusher K′ to retreat and be in position to repeat the operation. A spring, Fig. 13, acts between the pusher K′ and lever K^4, so as to cause the pusher to react at the proper time.

The front thread Y is guided by the arm F, which has a hole in its lower end for the thread to pass through. The arm F is attached by a clamp-hinge F′ to the fixed bracket F^2 and is moved forward by the thread, which pulls it toward the stitch, and it is forced back to its normal position by the pin h^9 on the rod h.

F^3, Fig. 2, is an adjustable spring which acts in connection with the bracket F^2 to form a tension device for the front thread, the object being to keep the locking-thread taut, so that it will use only the proper amount of locking-thread to form a stitch.

F^5 is a curved standard, the upper end of which acts as a guide for the front thread as it leaves the spool F^6.

The device which I have used for holding the loop of the front thread after it has passed through the loop of the back thread is indicated by L, Fig. 3, also shown in relation to detail in Figs. 5, 7, 9, and 21. This instrument I will call hereinafter the "bight-holder." Its function is to hold the loop of the front thread (after it has been carried through the loop of the back thread) until the loop of the back thread is drawn tightly onto it. An up-and-down motion is given to the bight-holder L through the sliding rod L′, joint L^2, lever L^3, (see Figs. 3 and 4,) pivoted at L^4, friction-roller L^5, and cam L^6. It is to be noticed that the lever L^3 is pivoted at L^4 on the same shaft that the lever B^8 is pivoted on.

The cast-off V (shown in Figs. 3, 9, and 21 and in detail in Fig. 3^a) has a hole drilled down through its outer end (see Figs. 3^a and 21) of a proper size to admit of the barbed end of the needle passing down into it when in its forward position, and the center of the hole is tangent with the point of the needle, which serves to disengage the loop from the hook of the needle, in order that the needle-loop may be drawn down tightly around the locking-loop, after which the cast-off is drawn back out of the way. It has a simple forth-and-back motion, which is produced by the cam V^7 acting through the bell-crank lever V^6 V^4, pivoted at C^{15}, link V^3, pin V^2, (working in a slot in C^2 and C′,) and sliding piece V′, that slides in a groove in the frame, Fig. 3^a.

The thread-guide M has a horizontal, lateral, and vertical movement and carries the back thread W into the hook of the needle and is actuated in the following manner: The thread-guide M is attached to a piece M′, Fig. 2, which swings on a vertical pivot at M^2 (on a sliding piece M^6) and has a slotted arm M^3 extending backward, as shown. The curved slot in the arm M^3 engages with a fixed pin M^4 on the bracket M^5, so that as the thread-guide is made to slide forth and back it will have a lateral movement to the right or left of the needle. A vertical movement is given it by a sliding and tilting piece M^6, which has a slotted extension M^7, the slot of which engages with a fixed pin, (indicated by dotted lines at M^8,) so that as the part M^6 moves back and forth it will also tilt on a pivot at M^9. The back-and-forth motion is given to these parts by the link M^{10}, arm M^{11} on rocker-shaft M^{12}, (see Fig. 4^a,) arm M^{13}, friction-roll M^{14}, and cam M^{15}.

The back-thread measurer N moves up and down in the arc of a circle and is operated by the cam N^4, (see Fig. 4^a,) acting through the friction-roller N^3 and lever N′, the lever N′ being pivoted at N^2, Fig. 3.

The back thread W passes around the tension-wheel G^{10}, Figs. 2, 4, and 11, thence to the take-up G, Fig. 2, and thence to the thread-guide M.

The back-thread take-up mechanism performs three functions—viz., first, to deliver the thread to the needle with sufficient tension to insure its being properly seized by the needle; second, to reinforce the tension of the thread just before the needle has drawn its loop to its fullest extent for the purpose of drawing the thread that lies outside and along the edge of the shoe tightly against the

upper (before completing the stitch,) and, third, to draw the loop of the needle-thread tightly around the loop of the locking-thread, which result is accomplished by the following instrumentalities: The lever G, Fig. 2, is fulcrumed at G′ to the frame of the machine by a short shaft, that extends through the upright part of the frame and is provided with a spring-washer g^5, Fig. 3, at its end and has an adjusting-screw g^6 for pressing the said washer against the frame for the purpose of creating the desired amount of friction necessary to keep the thread taut enough to insure the threading of the needle and also to prevent the thread from rendering in the hook of the needle while it is being drawn through the stock and forming its loop. The take-up lever G, Fig. 2, is pivoted to the frame of the machine at G′ and has at its ends grooved thread-wheels $g\ g'$ for the thread W. The lower arm of the take-up lever has attached to it a link G^2, said link G^2 being connected by means of a slot g^3 and a pin (working in said slot) to the swinging arm G^3, the said swinging arm being pivoted to the frame of the machine at G^4. (See Figs. 2 and 25.) Motion is communicated to the arm G^3 by means of a friction-roll and stud attached to it at G^5, (see also Fig. 4^a,) which engages with a slot in the face of the cam G^6. The movements of the take-up G may be explained as follows, reference being had to Fig. 25, in which the upper end of the take-up lever is represented as being thrown back to its extreme position to the right, in which position it, acting through the thread-wheel g', exerts its greatest tension action on the thread W: It is obvious that when the cam G^6 is in such position that the lower end of the swinging arm G^3 swings to the right then the upper end of the take-up lever can be drawn by the thread W forward or to the left—that is, the take-up lever will move toward the vertical position, allowing the thread W to yield to the stitch-forming mechanism. This movement of the take-up lever G is retarded by the action of the adjustable spring g^4, which engages with a pin g^7 (see Figs. 25 and 26) on the lower end of the said lever. This action takes place when the loop of the needle-thread is drawn nearly to its full extent and tightens the thread extending along the outer edge of the shoe, drawing the upper firmly against the edge of the sole. Now the stitch-forming mechanism is in position for the direct action of the take-up lever G to take place, which is effected by the cam G^6, which, acting through the arm G^3 and link G^2, Fig. 2, throws the take-up lever into the position shown in Fig. 25. This action will bring the full tension upon the thread W and draw it firmly around the loop of the locking-thread Y, and thus finish the stitch.

The parts controlling the tension mechanism for the thread W may be described as follows: The tension-wheel G^{10}, about which the thread W is wound one or more times, turns freely on the shaft G^7, Fig. 11, between the fixed part P^6 and the sliding friction-washer G^9. The washer G^9 is controlled by the flange G^8 on the shaft G^7, which is acted upon by the spiral spring G^{11}, said spring acting against the fixed part P^6 as a buttress and pressing against the hand-nut G^{12}, screwed onto the shaft G^7. By forcing the shaft G^7 and nut G^{12} against the spring G^{11} the friction-washer G^9 is moved away from the tension-wheel G^{10}, and the thread W is left free to be drawn forward in order to remove the work easily. The shaft G^7 is operated by the bent lever $C^9\ C^7$, rod C^{10}, and foot-treadle C^{11}, Fig. 1. The tension on the thread may be increased or diminished by the hand-nut G^{12}.

For starting and stopping my machine I have a combination of two levers R and Q, Fig. 12, so placed in relation to each other that the operator may, when desirable, operate both with a single movement of the foot, or he may operate them separately. The foot-lever Q acts, through the bent lever Q^3 Q^4, Fig. 1, to press the revolving disk Q^5 against the disk on the driving-pulley Q^6, which causes it to rotate and give motion to the machine through the belt Q^7. The foot-lever R operates a stopping and releasing mechanism which I will now describe. The shaft T, Figs. 1 and 4, has keyed to it a collar R^{10}, and to this collar a forked arm $R^8\ R^{11}$ is attached by trunnion-pins R^9. The upright arm R^6 is hung on a rocker-shaft R^5, which has an arm R^4, to which is attached by a pivot R^3 a rod R^2, the lower end of which is connected to the lever R. By depressing the foot-lever R the upper end of the upright R^6 is swung back, as indicated by dotted lines in Fig. 2. A projection R^{12} (indicated by dotted lines, see Fig. 4) on the upright R^6 serves as a stop for the forked arm $R^8\ R^{11}$—that is, when the upright is in the position shown in full lines in Fig. 2 the shaft T stops when the arm R^{11} comes in contact with the projection R^{12}, Fig. 4. To start the machine, the upright R^6 is thrown back, as indicated in dotted lines, Fig. 2, releasing the arm R^{11} from the projection R^{12}, and is held back by the treadle as long as it is desired to have the machine run. While the upright R^6 is held back the arm R^{11} is thrown by a spring against the disk R^{13}, attached to the pulley T′, where it engages with a notch R^{15}, and the motion of the said pulley is communicated to the shaft T. To stop the machine, the upright R^6 is allowed to resume its normal position, in which case the arm R^{11} will come in contact with the wedge-shaped end R^7 of the upright R^6 and be forced away from the notch R^{15} on the disk R^{13} and come in contact and be stopped by the projection R^{12} on said upright R^6. The friction resulting from the contact of R^{11} with the curved wedge R^7 tends to check the momentum of the machine and prevents a violent shock when R^{11} and R^{12} collide. The foot-levers R and Q are forced upward by springs, (not shown,) thus allow-

ing the upright R^6 to assume its normal position in contact with the arm R^{11}, the said arm resting on the projection R^{12}. This same movement of the levers will throw the friction-disk Q^5 out of contact with the disk on the pulley Q^6. When the machine stops with R^{11} resting on the projection R^{12}, it is in the proper position to introduce or remove the work to or from it, which is a desirable thing, as it allows the operator the use of both his hands with which to manipulate the work being done.

It is also desirable at times to operate the machine by hand, and the lever R and its connections serve to unlock the machine for the purpose of doing so without stopping the revolution of the driving-shaft P^3.

The joint use of the two foot-levers R and Q may be explained as follows: When the operator wishes to start the machine by hand, he depresses the foot-lever R enough to throw the upright R^6 back, so that the projection R^{12} is out of the way of the arm R^8 R^{11}. Then the machine may be operated by moving the pulley T′ either directly or by pulling up the belt Q^7. If the operator wishes to have the machine go by power, he can depress the lever R still more, so that it will come in contact with the pin Q′ on the lever Q, and thus force that lever down, which will press the disk Q^5 against the disk on the driving-pulley Q^6, as has been explained. If the operator wishes to start the machine by power at once, he puts his foot upon both of the treadles at the same time. This action will throw off the upright R^6 and set the driving-pulley into operation.

The operation of the machine is as follows: The back thread W, Fig. 4, after being waxed passes around the tension-wheel G^{10}, thence to and around the take-up G, thence to and through the thread-guide M. The front thread Y passes from the spool F^6 through an opening F^4 in the upper end of the arm F^5, thence to and under the tension-spring F^3, thence through a channel made in the front of the bracket F^2, thence down and through a hole made in the lower end of the arm F, thence through a hole extending longitudinally through the lower part of the front thread-carrier H. (See Figs. 13, 14, and 15.) As the thread leaves the hole in the carrier H it passes across the end of the thread-pusher K′. (See Fig. 14.) Now the machine being threaded, the operator draws the gage C forward by depressing the foot-lever C^{11} (see Figs. 1 and 5) and places the edge of the shoe against the back feed-awl B, which is in its forward position, forcing it through the upper and into the edge of the sole, the throat A being drawn back, as shown in Fig. 5. Now he lets the gage C slide back on the sole until it reaches the upper. (See Fig. 17.) The machine is then started and the shoe is fed along to the extent of one stitch and the feed-awl is in line with the needle. The front awl D also having moved laterally into line with the back awl and into line with the needle E (see Fig. 8) now moves forward and punctures the sole opposite to the puncture made by the back awl. (See Figs. 7 and 8.) Now the throat A has advanced to its fullest extent and forms a back rest for the edge of the shoe. (See Fig. 7.) Now the front and rear awls D and B withdraw from the stock (see Fig. 9) and also move laterally back out of the path of the needle immediately forward and engage with the stock ready for the next stitch. Now the needle advances through the puncture made as above. (See Figs. 9 and 10.) Now the throat A withdraws out of the way of the barb of the needle and the thread-measurer N now moves upward in the arc of a circle, carrying with it a loop of slack thread which it has drawn from the thread-guide M and take-up G, (instead of from the tension-wheel G^{10},) and in doing so the strain on the thread moves the arms of the take-up G, bringing the upper arm to the left and the lower arm to the right, so as to yield the amount of thread required, the thread being held sufficiently taut by the resistance of the spring-washer g^5, Fig. 3. The thread-guide M now moves forward and laterally until it is on the opposite side of the needle to that of the measurer N, (see Fig. 19,) when it moves upward, past, and above the needle, drawing the thread into its hook. Now the needle retreats with the thread, and when its hook is in the material the measurer N retreats to its original position, giving up its slack thread to the action of the needle, the thread-guide retreating simultaneously with it to the position shown in Figs. 20 and 21, and the needle, still retreating, draws the slack thread supplied by the measurer up against the upper of the shoe, at the same time drawing enough extra thread from the take-up to form nearly the other half of its loop, turning the arms of the take-up still farther in a reversed direction to that shown by the arrow before referred to. At this point and just before the needle has moved backward to its fullest extent the pin in the lower end of the take-up arm comes into contact with the spring g^4, which resists a further turning of the take-up G, and as the needle still retreats the added resistance of the spring causes the needle to draw the thread that lies outside the upper and extends from a previous stitch to the one being made tightly at that point, thereby securing a tight seam. When the needle has traveled about half its backward movement, as above, the thread-carrier H moves upward and forward in the arc of a circle, and its wedge-shaped point enters between the two threads that form the needle-loop, and still moving forward and upward as the needle moves back the carrier H forces the needle-loop open and passes through it, both needle and carrier arriving at the end of their respective movements almost simultaneously, when the throat A again moves forward against the edge of the shoe for the purpose of resisting

the take-up when drawing up the loop. The needle now for a short time remains at rest and the carrier H descends until it almost touches the surface of the sole, and in its descent the projection K^6, Fig. 3, comes into contact with the piece K^8, which forces the pusher K′ forward, carrying with it a loop of the thread Y beyond the end of the carrier H and past the point of the bight-holder L. The bight-holder now descends and passes through the aforesaid loop, and in doing so the piece K^8 strikes the projection K^7 and draws the pusher K′ back flush with the end of the carrier H. The carrier now retreats, leaving its loop through the needle-loop and held in that position by the bight-holder. When the thread-carrier H above described starts to move forward, the arm F is held outward in the position shown in Fig. 1 by the stop-pin in the rod *h*, and as the stop-pin recedes from it with the thread-carrier it still retains its position by reason of the friction of the joint F′, (which is adjustable.) The thread extending from the tension-spring F^3 (which is also adjustable) to the stitch is held taut, and as the carrier advances (together with the pusher) it requires more thread to form its loop, and the increased strain on the thread pulls the lower end of the arm F forward to supply it, and when the arm F is again forced back to its normal position by the action of the pin it draws sufficient thread to make another stitch from the spool F^6, giving the proper tension to the locking-thread. Simultaneously with the forward movement of the carrier H and the backward movement of the needle described above the cast-off V moves forward in the direction in which the needle is retreating until the center of the hole in its outer end is tangent with the arc of the circle in which the needle moves. (See Fig. 5.) The needle now moves forward until its barbed point enters the hole in the cast-off a sufficient distance to force the thread out of the hook of the needle, which leaves it free to be drawn up tightly around the loop of the locking-thread, and the needle immediately retreats out of the way of the cast-off to its fullest extent, and the cast-off immediately retreats to its normal position. (See Fig. 7.) The needle now being at rest and the thread-carrier H drawn back with its loop through the needle-loop and held by the bight-holder, the take-up G is forced to move in the direction of the arrow, Fig. 2, and the loop of the needle-thread is drawn up tightly around the loop of locking-thread, completing the stitch. (See Fig. 22.) The take-up has sufficient movement to draw up the needle-loop tightly and also a further movement sufficient to draw thread enough for another stitch from the tension-wheel G^{10}. The awl D now withdraws from the stock to allow the feed-awl B to move the shoe along for another stitch. The throat A also recedes from contact with the shoe simultaneously with the awl D, and at the same time the thread-guide M moves back and laterally to its full extent, where it rests, as shown in Figs. 16, 17, and 18, thus completing one revolution of the shaft T, and the several parts of the machine are in the proper position to repeat the operation.

I claim—

1. In a sewing-machine of the class described the combination of a front-thread-carrying arm having a wedge-shaped point on its upper side, and a longitudinal thread-passage, and parallel thereto a channel in which the pusher reciprocates, and the pusher; with the needle, thread-carrier and bight-holder substantially as and for the purpose set forth.

2. In a sewing-machine of the class described, a front-thread-carrying arm having a longitudinal thread-passage, a thread-pusher adapted to receive the thread at the working end of said arm and advance it in the form of a loop beyond the said end into position for engagement with the bight-holder, the bight-holder and needle substantially as and for the purpose set forth.

3. In a sewing-machine of the class described the combination of the thread-tension arm F pivoted to the bracket F^2, and the bracket F^2, tension-spring F^3 and pin h^9; with the thread-carrying arm H, pusher K′ and bight-holder L all operating together substantially as and for the purpose set forth.

4. In a sewing-machine of the class described, a sliding throat-piece A, having a channel for the longitudinal passage of the back or feed awl and the needle, and a lateral passage *a* for the lateral movement of the back or feed awl, and the back or feed awl and the needle, substantially as and for the purpose set forth.

5. In a sewing-machine of the class described, the combination of a vertically-moving bight-holder L, front-thread carrier H having a longitudinal hole in its lower end and adapted to convey the front thread as described; and the pusher K′ adapted to slide in a groove in the said arm H and having a notched end adapted to seize the loop of the front thread and push it beyond the path of motion of the loop-bight holder, substantially as and for the purpose set forth.

6. The combination of a foot-lever R, rod R^2 adapted to receive the upright R^6, the upright R^6 having a projection R^{12}, main shaft T having the collar R^{10} secured thereto, and the forked arm R^8 R^{11}; the disk Q^5 with the treadle Q adapted to operate the disk Q^5 and the disk of the driving-pulley Q^6 and the driving-pulley Q^6, the treadles R and Q being so located as to be operated simultaneously by one foot movement, all operating together substantially as and for the purpose set forth.

7. In a sewing-machine of the class described, the combination and employment of the following instrumentalities: a gage for

the surface of the sole to rest upward against to guide the shoe; a feed-awl to move the shoe along; an awl to puncture the sole for the needle to pass through and also to hold the shoe against the draft of the needle when drawing the thread into the shoe; a needle to enter said puncture and pass through the sole and upper and engage with the thread and draw it into the material; a thread-measurer to supply slack thread to the needle; a thread-guide to carry the thread into the hook of the needle; a thread-carrier to carry a locking-thread through the needle-loop; a pusher working in conjunction with said carrier to deliver a loop to a loop-bight holder; a loop-bight holder for passing through and holding said loop; a take-up mechanism to pay out and draw up one thread for the needle-loop, a tension device for keeping the locking-thread taut, substantially as and for the purpose set forth.

8. In a sewing-machine of the class described the combination of the front-thread guide F, having a hole in its lower end for the thread to pass through, and being attached to its supporting-bracket F^2 by a clamping-hinge F′, the said bracket F^2 and clamping-hinge F′, with the pin h^9 on the rod h, the rod h and its actuating mechanism substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 29th day of September, A. D. 1894.

EDWIN E. BEAN.

Witnesses:

FRANK G. PARKER,

WILLIAM H. PARRY.