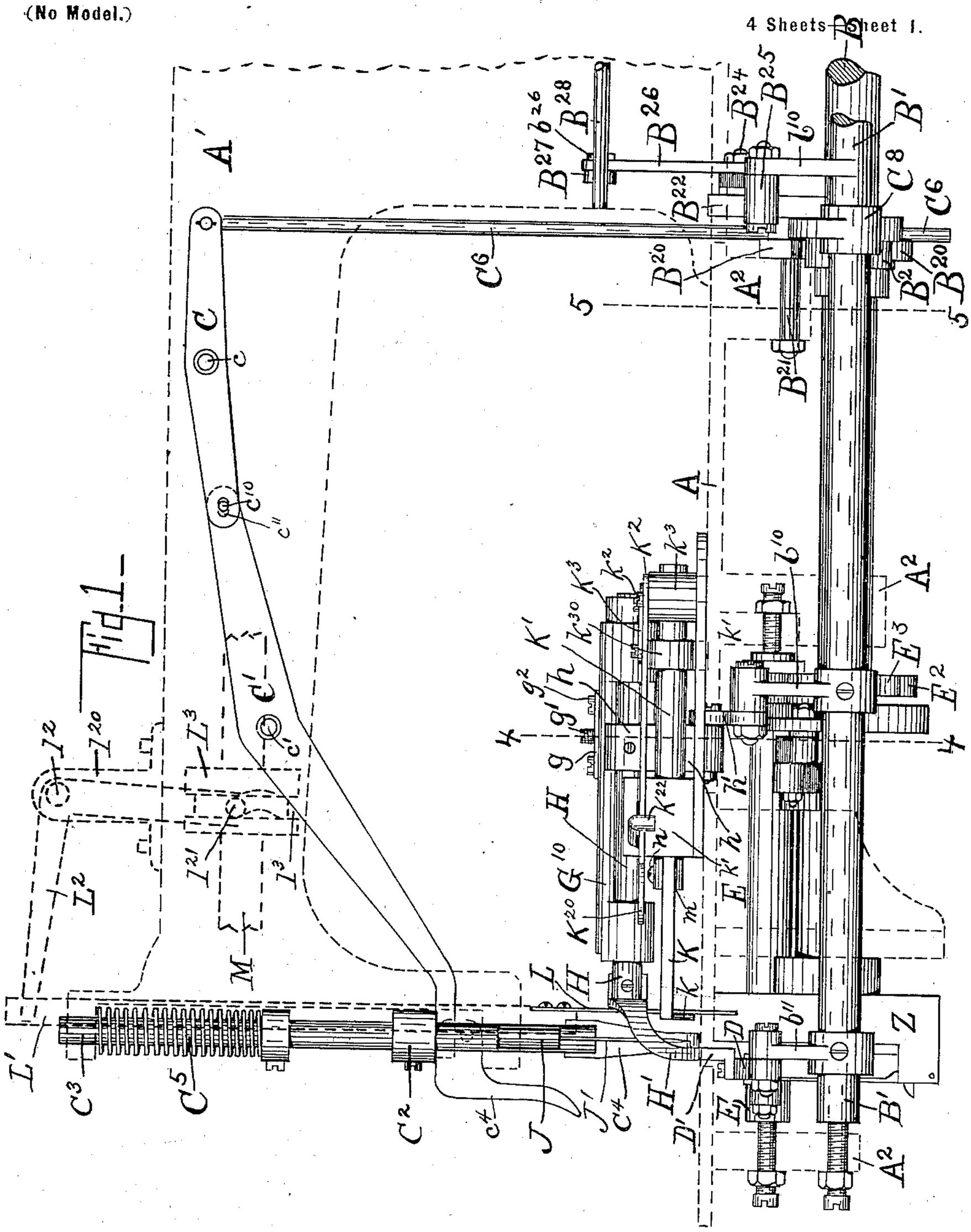
No. 662,479. Patented Nov. 27, 1900.

S. A. WEST.

FEEDING MECHANISM FOR SEWING MACHINES.

(Application filed Feb. 28, 1898.)

(No Model.) 4 Sheets—Sheet 1.



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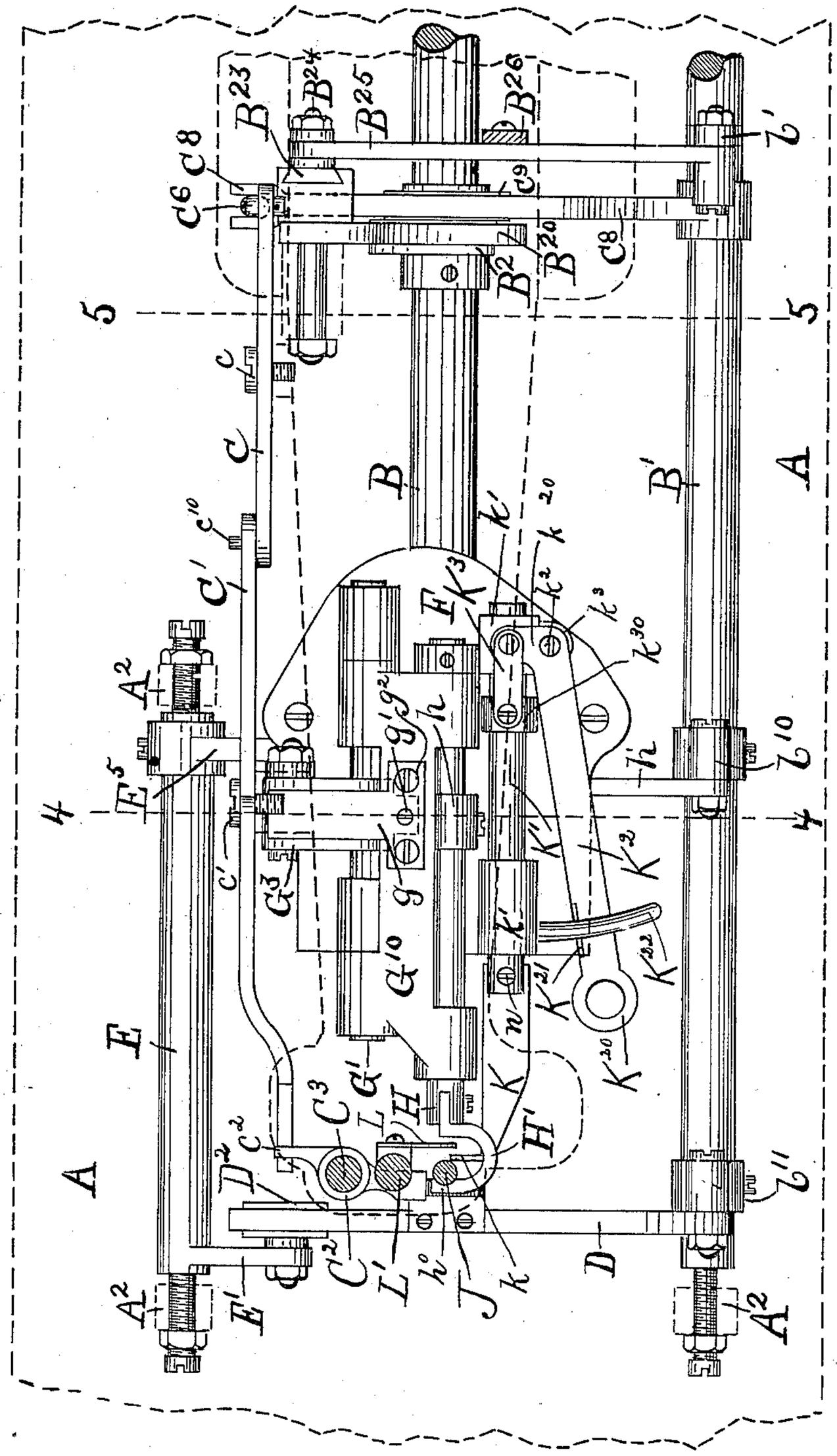
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3

Fig. 3.

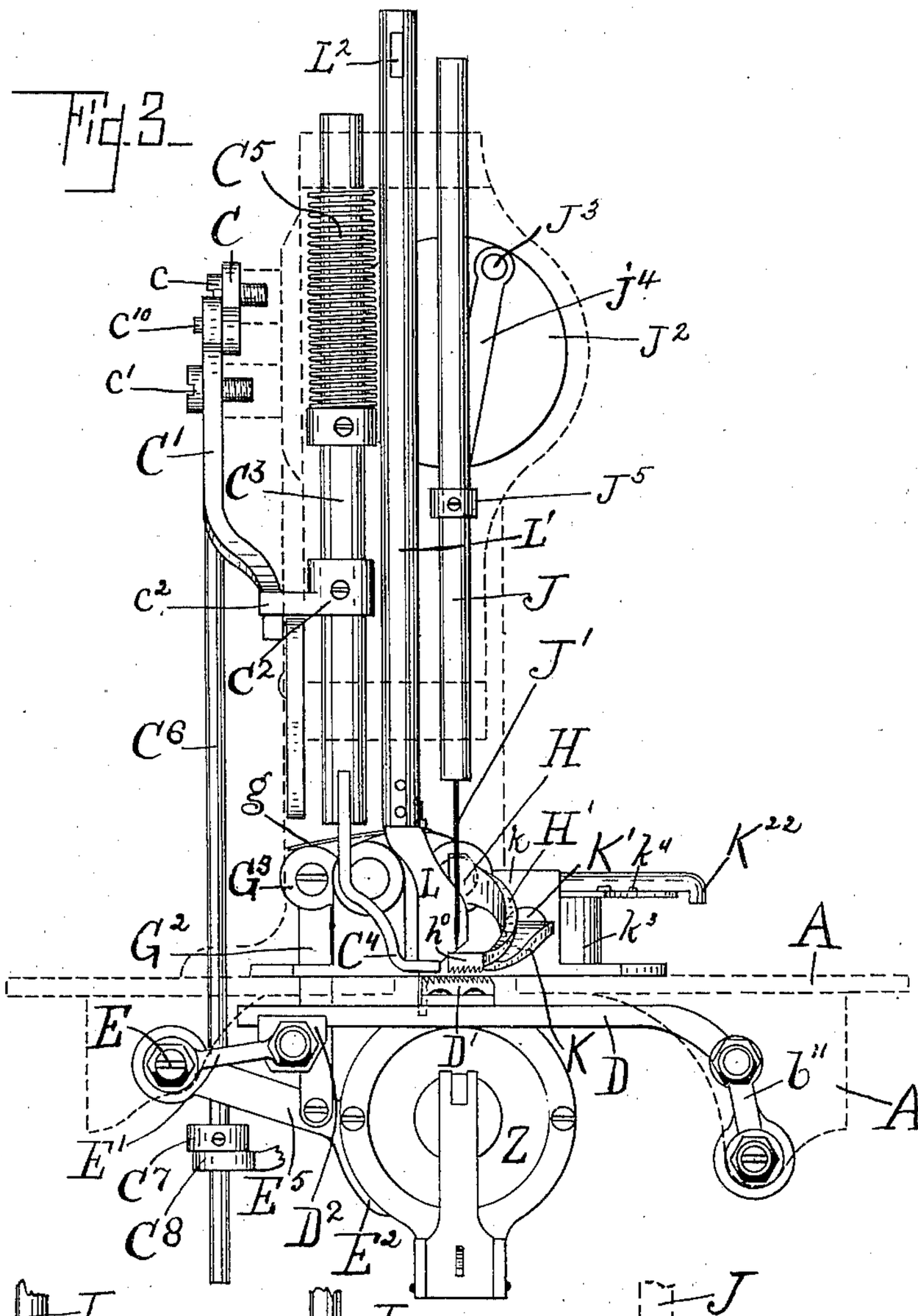

Fig. 7.

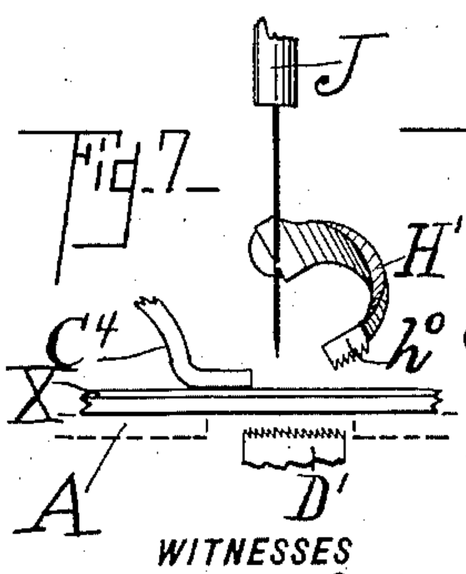

Fig. 8.

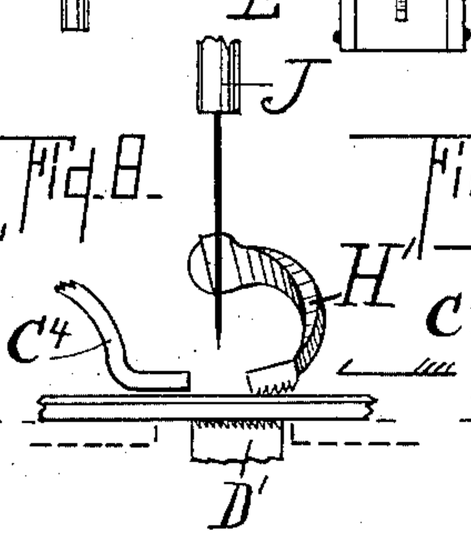

Fig. 9.

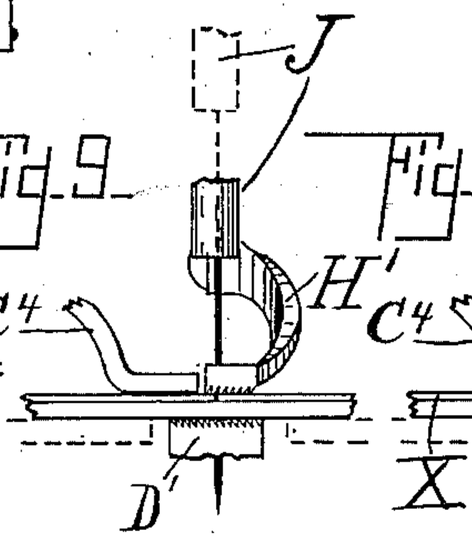

Fig. 10.

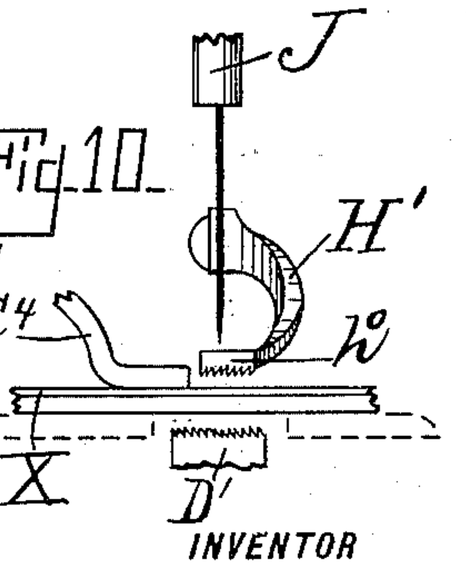

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Fig. 4.

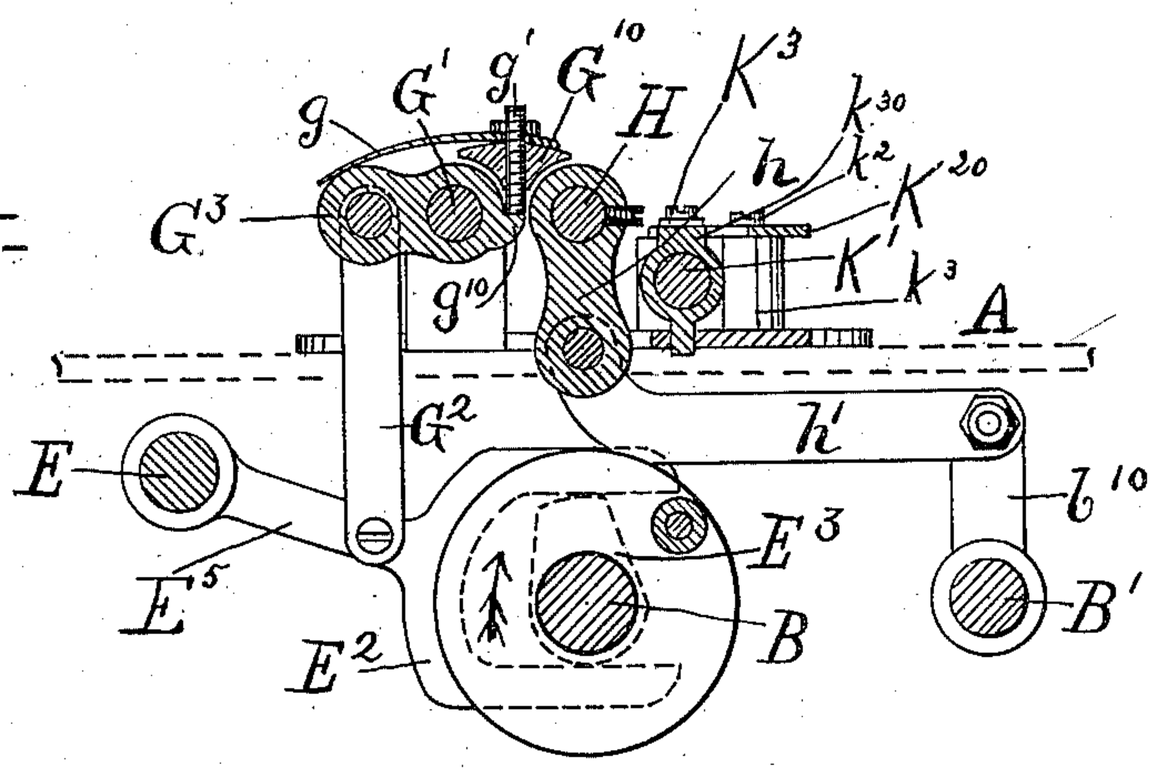


Fig. 5.

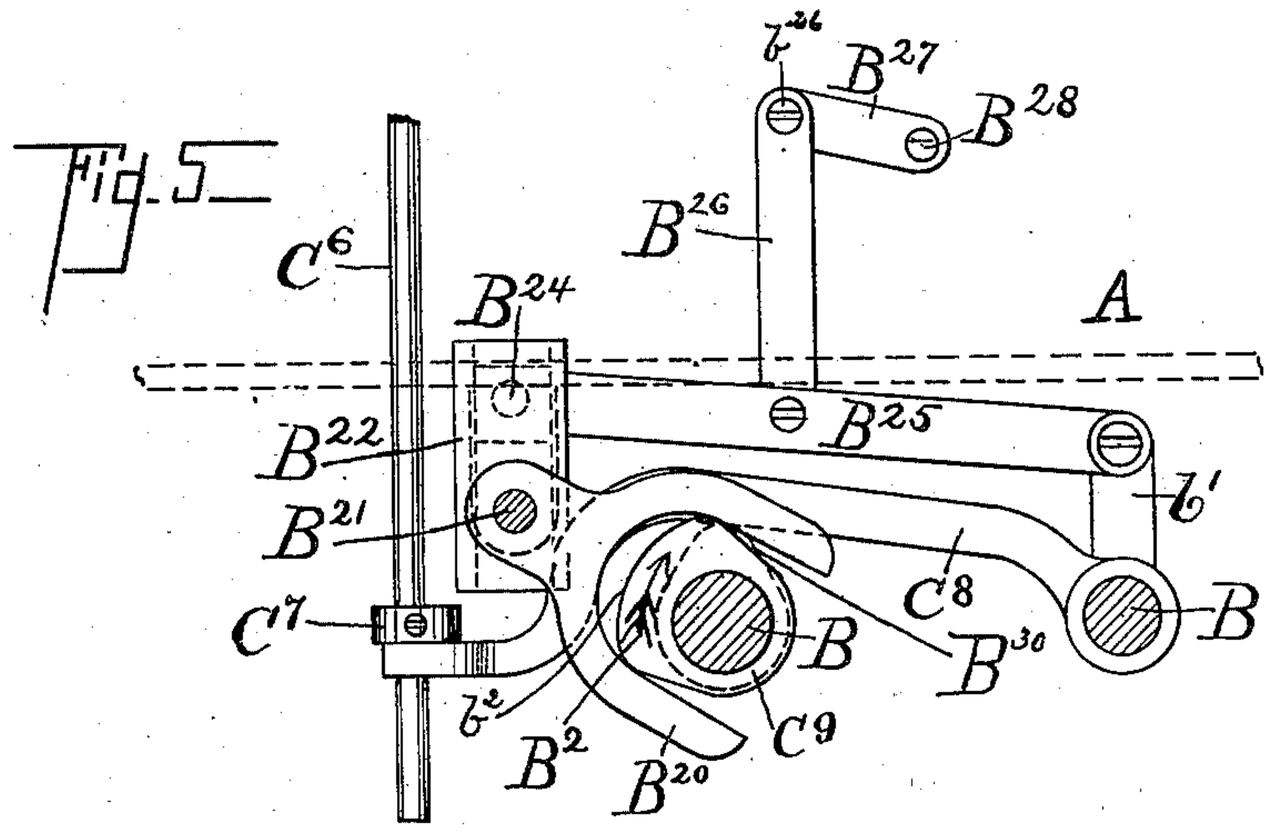
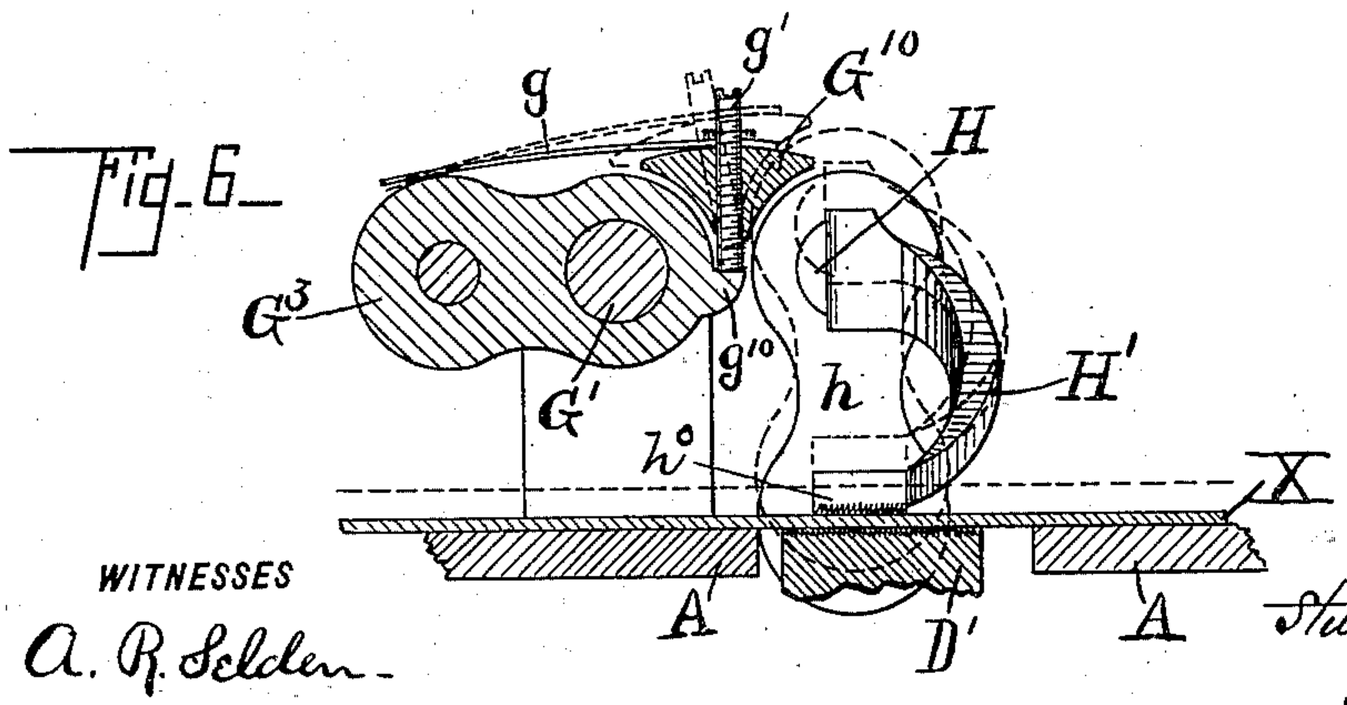


Fig. 6.



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UNITED STATES PATENT OFFICE.

STILLMAN A. WEST, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE UNION WELT INSOLE COMPANY.

FEEDING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 662,479, dated November 27, 1900.

Application filed February 28, 1898. Serial No. 672,008. (No model.)

To all whom it may concern:

Be it known that I, STILLMAN A. WEST, a citizen of the United States, and a resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention relates to sewing-machines; and it consists of certain novel features of improvement hereinafter set forth.

One part of my invention has reference to four-motion feed mechanisms for sewing-machines, including particular mechanisms comprising the upper feed, and while the invention is applicable to different forms of sewing-machines I have herein shown the same in connection with a machine embodying a lower feed mechanism of a preferred form.

Another part of the invention has reference to a cross-feed or means for varying the distance of the stitches from the edge of the work and which means are particularly adapted to the feed mechanisms herein shown.

Figure 1 is a side view of a sewing-machine embodying my improvements, the overhanging arm or frame and the work-table being shown in dotted lines. Fig. 2 is a top plan view of the machine, the frame and work-table being indicated by dotted lines, certain parts of the frame being removed in order to show more clearly the construction of the machine. Fig. 3 is an end elevation. Fig. 4 is a transverse section of the machine on the lines 4 4 of Figs. 1 and 2. Fig. 5 is a similar view on the lines 5 5 of Figs. 1 and 2. Fig. 6 is partly a sectional view on the line 4 4 of Fig. 2 and partly an end elevation of the machine as seen from the same point as Fig. 3, said view being on a larger scale than Fig. 3 and showing the movements of the devices comprising the upper feed mechanisms. Figs. 7, 8, 9, and 10 are diagrammatic views showing consecutive positions of the presser-foot, the upper and lower feed devices, and the needle, respectively, in a complete cycle of their operations.

I will first describe the devices comprising that part of my invention first above mentioned and shall then proceed with a description of its second feature.

In order that my invention may be more fully understood, I have shown in the drawings a Wheeler & Wilson sewing-machine embodying my feed mechanism.

As shown in all of the figures of the drawings except Figs. 6 to 10, inclusive, A represents the work-table, upon which is mounted the overhanging arm or frame A′, which latter supports the usual needle-bar, knife-bar, and presser-foot and the usual mechanisms for operating these elements. Depending from the under side of the work-table, at or near the opposite longitudinal edges thereof, are suitable lugs or hangers A^2, which support suitable rock-shafts and other auxiliary parts of the machine hereinafter described.

Supported beneath the work-table A in suitable bearings is the main operating or driving shaft B, which is driven in any suitable way and which operates in the usual manner a shuttle (not shown) in the shuttle-box Z. Said shaft B is preferably placed at the approximate transverse center of the work-table A. Parallel to this shaft along the side of the machine and beneath the work-table is a rock-shaft B′, bearing three arms b', b^{10}, and b^{11}, which rock therewith. The said rock-shaft is supported with its axis in the same horizontal plane as the axis of the said main driving-shaft B. At the right of the machine the shaft B carries a cam B^2, which is more clearly shown in Fig. 5, which cam works within and actuates a yoke B^{20}, and this yoke is fitted upon a short rock-shaft B^{21}, on which is also fixed, so as to rock therewith, a block B^{22}. Said block is grooved on one side and in this groove slides a block B^{23}, bearing a pin B^{24}, to which is fixed one end of a link B^{25}, which operates the arm b' and the shaft B′, to which the latter is attached. In order to vary the extent of vibration of the said arm b', as well as to vary the degree to which the shaft B′ is rocked, the block B^{23} is made adjustable toward and away from the axis of the said rock-shaft B^{21}, and while different means can be employed to set or hold the block to either of its adjusted positions the following means are shown: Between the ends of the link B^{25} is pivoted to it one end of a link B^{26}, the other end of which is pivoted at b^{26}, Fig. 5, to the

free end of a movable arm B^{27}, which is held in place by a pin B^{28}. The pin B^{28} extends beyond the frame A′ and may be turned and fastened by suitable well-known means (not shown in the drawings) in a position which will set the block B^{24} nearer to or farther from the axis of the rock-shaft B^{21}, and the setting of said pin produces a corresponding change in the movement of the sliding block B^{23}, which in turn changes the arc of vibration of the arm b', and in consequence the extent of the rocking movement of the shaft B′.

At the left end of the machine, as is shown more clearly in Figs. 2 and 3, is the arm b^{11}, which is fast upon the rock-shaft B′ and has pivoted to it one end of a lower reciprocating feed-bar D. This latter extends beneath the work-table in a direction transverse to the machine and carries at about its center the lower feed dog or block D′, (see Fig. 3,) which latter is roughened or serrated on its upper surface in the usual manner, so that it may take into the material or work to be fed. The other or free end of the lower feed-bar D′ is movably supported in a block or saddle D^2, whose sides are flanged to constitute guides for the reciprocating movement of the said bar. This saddle is carried upon the end of an arm E′, which in turn is fastened upon a rock-shaft E, with which it rocks. The said rock-shaft E is operated from the shaft B and is supported in lugs or hangers A^2, which are pendent from the work-table on the side of the main shaft B which is opposite the said shaft B′, and its axis is in substantially the same horizontal plane as the center of the pivotal connection between the arm b^{11} and the lower feed-bar D. By thus disposing the centers the parts operate in more perfect union. There is no binding and no lost motion. Similar results are also derived from a like disposition of the rock-shaft B′ relative to the main driving-shaft B. As shown in Fig. 4, the rock-shaft E is actuated by a yoke E^2 upon the end of an arm E^5, which is rigidly connected with the shaft. Said yoke engages with a cam E^3, which is fixed in position on the driving-shaft B. As the driving-shaft revolves the said rock-shaft is rocked by this mechanism and the saddle D^2 rises once for each revolution of the said driving-shaft, and the lower feed device is thus moved up and down.

On one side of the overhanging frame A′ is supported a pair of levers C C′, each of which is independently pivoted to the said frame midway between its ends at c and c'. The adjacent ends of these levers are also pivoted together by means of a pin C^{10}, fixed on one lever, which enters a slot C^{11} in the other, thereby forming a movable connection. The said levers are so disposed as to bring the forward end of the lever C′ beneath an arm c^2, (see Fig. 3,) carried by a collar C^2, secured to the presser-foot rod C^3, which has at its lower end the presser-foot C^4. The said presser-foot rod is normally held downward by a spring C^5 and is raised during the operation of the machine by the action of the levers C C′. The levers C C′ are operated by the main shaft B by means of a rod C^6, which is attached to and passes downward from the free end of the lever C through the work-table and beneath the table engages with the free end of an arm C^8. This latter arm is journaled loosely upon the rock-shaft B′. The said rod C^6 has secured to it above the arm C^8 the collar C^7. The main shaft B is provided with a cam B^{30}, (see dotted lines in Fig. 5,) which in each revolution of the said shaft presses upward against the arm C^8, thereby lifting it, and also the rod C^6, by the engagement of the arm C^8 with the collar on the rod C^6. The inner end of the arm C′ is in consequence depressed and its outer end raised and the presser-foot C^4 elevated against the tension of the spring on the presser-foot rod C^3. The parts are so arranged and timed in the operations that the presser-foot is forced down upon the work, so as to hold it while the needle is being withdrawn from it and while the lower feed-bar is returning to take a new grasp upon the goods on the under side.

My invention herein described comprises an upper feed mechanism, which, while being well adapted to the lower feed mechanism above described, is also adapted to other lower feed mechanisms, both those having a horizontal and those having a vertical reciprocating motion to effect the feed of the goods or work operated upon. I arrange my improved upper feed mechanism upon the top of the work-table A. The main axis or shaft G′ is parallel to the shafts B, B′, and E. Upon said axis or shaft G′ is swung or suspended a frame G^{10}, having bearings for the upper feed-shaft H, which has upon its end the arm H′, which latter bears the upper feed-dog h^0. The feed-dog h^0 is in vertical alinement with the lower feed-dog D′. The upper feed-shaft H is a rock-shaft and has depending from it an arm h, which is connected to the arm b^{10} on the rock-shaft B′ by means of the link h', which is pivoted at one end to said arm h and at its other end to the said arm b^{10}. This link reciprocates in a direct line transversely of the work-table as well as in unison with the lower reciprocating feed-bar D. As the link is moved to and fro by the rocking of the shaft B′ the shaft H is rocked through the medium of the arm h and the upper feed-dog h^0 is moved with the lower feed-dog D′. In its normal position the frame G^{10} is substantially horizontal, but it is rocked vertically on its shaft G′ by means of a link G^2, which is pivoted at its lower end to the yoke-arm E^5 and at its upper end to the end of a horizontal arm G^3, loosely journaled on the shaft G′ of the frame G^{10}. As the link rises and falls with the movements of the yoke E^2 the outer end of the arm G^3 rises and falls with it. The frame G^{10}, in which the

shaft H is hung, carries a spring g, which is secured thereto by means of screws g^2, (see Fig. 2,) and the free end of the spring extends over and rests upon the arm G^3 at or near its outer end, thus offering a yielding pressure. The purpose of said spring is to furnish a yielding connection between the operating devices and the upper feed-dog, so that the vertical movements of said dog admit goods or work of increased thickness to be fed with as great facility as goods of but ordinary thickness. It is evident in this connection that other means could be used for this purpose, and I do not limit myself to the specific construction and arrangement shown. As the arm G^3 rises it presses upon the end of said spring, which being being secured to the frame G^{10} depresses the latter and with it the shaft H. Passing through the said frame G^{10} at the top is a vertical set-screw g', which engages at its lower end with a step or lug g^{10}, formed on the inner end of the horizontal arm G^3, and as the link G^2 descends the said step or lug g^{10} comes in contact with the said set-screw, raising with it the frame G^{10}, together with the shaft H and the upper feed-dog h^0. Other means for thus raising and lowering the upper feed devices could be used, and I am therefore not limited to the use of the particular means herein shown. By referring to Fig. 6 it will be seen that when the upper feed-dog h^0 is raised to the highest position shown in dotted lines in said figure and goods of considerable thickness are inserted beneath said dog the dog will descend and press upon the work without becoming jammed or caught and without jamming or locking any of the working parts, and thus stopping the machine and perhaps breaking it. These advantages result from the yielding connection between the frame G^{10} and the horizontal arm G^3.

An upper feed mechanism is thus devised that can be used in sewing several layers of material to each other, and is particularly valuable in the manufacture of shoes in which it is necessary that the feed of the upper and lower layers shall be exactly the same in order that there shall be no wrinkling or curvature of the layers when sewed together. In sewing together layers of material having smooth surfaces, which are apt to slip upon each other, it is necessary that the upper and lower feeds should be uniform and accurately timed to each other in grasping and releasing the material, and this I accomplish effectually by my invention. Moreover, it is necessary that the needle should pass through the material to make the stitch at the end of the feeding stroke, and the presser-foot must descend and hold the material while the needle is being withdrawn from it and while the upper and lower feed-dogs are making their return motion to take a new grasp upon the said material, which I accomplish by my device. The timing of the different operations is essential to the proper working of the mechanisms. In this behalf it will be seen that the arms b', b^{10}, and b^{11} are substantially parallel to each other and operate from the same shaft and that the arms b^{10} and b^{11}, actuated from the same shaft B', operate the upper and lower feeds in their feeding and return motions. A single rock-shaft E causes the said feeds to approach and separate from each other in order to first grasp and then release the work. Both the rock-shaft B' and the rock-shaft E are driven from and by the driving-shaft B, and their motions are timed, therefore, exactly to each other, so that the upper and lower feeds move together in the one direction and return together in the opposite direction by operation of the shaft B'. At the same time said feeds also approach each other and separate from each other by simultaneous movements produced by the said rock-shaft E.

The needle-bar J is operated in the usual manner by mechanism not fully shown, because well known. The relative positions of the needle-bar, the presser-foot and the upper and lower feeds at different stages in the operation of the machine are shown in Figs. 7 to 10, inclusive. In Fig. 7 the presser-foot C^4 is shown upon the work X, holding it firmly upon the work-table A, and the upper feed-dog h^0 and the lower feed-dog D' are shown in their most retracted positions, ready to move toward the left in order to produce a feeding movement of the work. The said dogs are shown in their most widely-separated positions in this figure. In Fig. 8 the presser-foot C^4 is lifted from the work, and the upper and lower feed-dogs are at the beginning of their engagement with the work ready for a feeding movement in the direction of the arrow in said figures. In Fig. 9 the feeding-dogs are shown after they have accomplished their full feeding movement. At this time, while the dogs are momentarily at rest, the needle suddenly comes down and makes a stitch. At the same time the presser-foot C^4 also comes down in order to hold the work in place upon the table. The needle-bar then rises quickly to the position shown in dotted lines in said Fig. 9. In Fig. 10 the presser-foot is shown still holding the goods upon the table, the needle being in an elevated position and the upper and lower feed devices having again separated, ready for their return movements.

The cams B^2 and E^3, by which the rock-shafts B' and E are operated, and the cam B^{30}, by which the presser-foot rod C^3 is lifted, are shown in their relative positions in Figs. 4 and 5. It will be seen that the cam E^3 has a short operating-surface for engaging with the two arms of the yoke E^2, whereby the yoke is suddenly lifted into the position shown in Fig. 4 in order to lower the upper feed-dog and simultaneously lift the lower feed-dog, so that the two corresponding devices quickly

grip the work between them at the beginning of the feeding movements thereof. The operating-surface b^2 of the cam B^2 is comparatively long, amounting to a little less than one-quarter of a revolution and when said surface is acting upon an arm of the yoke B^{20} holds the yoke stationary either in the raised or lowered position, because said surface is drawn on a center from the axis of the shaft B. When the cam-surface passes from engagement with the upper arm of the yoke, the feeding movement has occurred, and when said surface acts upon the lower arm of the yoke the return movement of the feeding-dogs is produced, and during both the feed and return movements of the dogs sufficient time is given for these complete movements by the length of the face b^2. The cam E^3 has its operating-face also drawn from its center of revolution, and its operation for separating and bringing together the feed-dogs is similar to that of the cam B^2. The proper time is thereby given to the feeding movements of the upper and lower feed devices through the connections from the shaft B and cams B^2 and E^3 to these devices. The cam B^{30}, which operates the arm C^8 and lifts the presser-foot rod against the tension of its spring C^5, has a very short actuating-surface, as seen in dotted lines in Fig. 5, and is set upon the shaft B, so as to lead both the cams B^{30} and B^2, which operate in the order named. This lead, however, is but slight, and as the operating-surface of the cam is very short the presser-foot and its rod are quickly lifted at the instant or immediately before the feeding devices grip the work and begin to move the same forward.

The cam B^2, which operates the yoke B^{20}, is set so as to act slightly behind the cam E^3 in point of time, the main driving-shaft B turning in the direction indicated by the arrows in Figs. 4 and 5.

On reference to the drawings it will be seen that the axes of shafts B, B′, E, and G′ are parallel and the actuating mechanism is disposed entirely beneath the bed-plate or work-table, and the operations of the several parts are substantially as if working on one and the same center of motion. In my device there is no lost motion, and no binding can occur, and the wear and strain are equally distributed throughout. The movements of the separating devices for the feed-dogs are uniform and positive, except that the spring connection therein prevents jamming on thick or wrinkled work, and the feeding strokes of said dogs are variable simultaneously and exactly to the same degree through a single adjusting device, and consequently there can be no variation between the movements of the upper and under feeds relative to each other. The horizontal or feeding and return movements of the said feed devices are derived from a single rock-shaft operated from the main shaft by very short and direct-acting movable connections, and the vertical or grasping and releasing movements thereof are derived from a similar shaft and short movable connections. These different movements are, in effect, simultaneous and are properly timed with reference to each other, as already explained.

My invention also relates to a cross-feed or means for adjustably regulating the distance of the stitches from the edge of the work. In the form shown K is an adjustable guide having a finger or plate k vertical with reference to the work-table and in a plane parallel to the transverse movements of the feeding devices. The said finger or plate is the guide, against which the edge of the work is set, and its position determines the position of the line of stitches with reference to said edge. To vary the distance of the stitches from the edge of the work, devices are provided for adjusting the plate in different positions at right angles to the movement of the work. Supported in suitable bearings k', Fig. 2, is a rod K′, which is movable longitudinally of the machine and in a path at right angles to the movement of the work, and an operating bell-crank lever K^2 is pivoted at k^2 to a boss k^3, fixed upon the plate which supports the said bearings k'. The short arm k^{20} of said lever K^2 (see Fig. 2) is movably connected with one end of a link K^3, the other end of which is in turn movably connected with the rod K′, as by a fixed collar k^{30} or other projection. From the construction it will be seen that whenever the free end K^{20} of the lever K^2 is carried outward or toward the operator the rod K′ is moved in the direction of the needle and that said rod is carried in the opposite direction whenever the free end of the said lever is carried in the direction of the shaft H or away from the operator. It is necessary very often to vary the position of the line of stitches gradually while the machine is in operation and without changing the position of the hands upon the work, thus requiring a cross-feed for coöperation with the usual longitudinal feed. This may be readily done, for the operating-lever K^2 extends from its pivotal point k^2 toward that portion of the work-table A upon which the work rests, and the free end of the lever is in such position, adjacent to the longitudinal feed and sewing devices, that the operator may use one of the fingers of the right hand to manipulate the lever and to adjust the position of the guide-plate K, while at the same time the hand remains near the work. In order that the operating-lever K^2 may be secured in place, if desired, whenever an adjustment or change in the position of the guide-plate is made, I make the lever of spring material and of such strength as to be depressible by pressure of the finger of the operator upon its free end K^{20}, and on the lever is an upturned flange or edge K^{21}, which engages in any one of a series of notches K^4 in the under side of a

fixed bar K^{22}, secured in position in any suitable way. The normal tendency of the said lever K^2 is to spring upward against the said bar K^{22}, so that as soon as the pressure of the finger upon the free end of the lever is relieved the said flange or edge K^{21} enters one of the notches of the bar, and thereby locks the lever and guide-plate in position.

With a little practice the operator is enabled to effect the proper adjustments quickly without difficulty and without stopping the machine or interrupting continuous sewing. The end of the bar K′ nearest the needle is slotted at *m*, and the guide K is inserted in the slot and fastened to the bar by means of a screw *n*. In this way guides of different forms and sizes can be used interchangeably, and I am thus enabled in some cases to fasten a hemming-guide to the end of the said bar and can change the position of the folded edge of an upper layer with reference to the edge of a lower layer of a piece of work. I can also, if desired, make the guide-plate adjustable relative to the bar which carries the same.

In this machine I provide also a trimming-knife L, which is adapted to trim the edge of the work and moves vertically into and through a narrow slot in the work-table A. This knife has a flat blade with a cutting edge set at a cutting angle on the entering side thereof with reference to the work-table. (See Fig. 3.) The knife is fixed in the end of a knife-rod L′, which moves vertically in suitable guides in the frame A′ of the machine and is operated, as shown in dotted lines in Fig. 1, by a bell-crank lever L^2, pivoted at l^2 to a bracket l^{20}, extending upwardly from the top of the frame A′. One member of the bell-crank lever L^2 is substantially horizontal and passes through a slot in the upper end of the knife-rod L′. The other arm of the bell-crank lever has a pin l^{21}, which extends horizontally into a waved groove l^3 in a cam-wheel L^3 upon a shaft M, extending lengthwise of the machine and substantially parallel to the shaft B. The shaft M is operated in the usual and well-known manner from the driving-pulleys (not shown) and is the same shaft which operates the crank-plate J^2, having the crank-pin J^3 connected by a link J^4 to a collar J^5 upon the needle-bar J, and whereby the latter is operated.

What I claim is—

1. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; and an upper feed mechanism comprising a rock-shaft above the level of the work-plate, and an upper feed-dog on said rock-shaft oscillating in an arc whose plane is substantially vertical, and a vertically-swinging frame for vibrating said rock-shaft to and from the lower feed mechanism substantially as described.

2. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; and an upper feed mechanism comprising a rock-shaft above the level of the work-plate, and an upper feed-dog on said rock-shaft oscillating in an arc whose plane is substantially vertical, and a vertically-swinging frame for vibrating said rock-shaft to and from the lower feed mechanism; and a spring connection between said frame and said rock-shaft adapted to permit the rock-shaft to tilt in order to adapt the position of the upper feed-dog automatically to different thicknesses of work substantially as described.

3. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; an upper feed mechanism having corresponding motions and comprising a swinging frame mounted on a suitable axis, a rock-shaft supported by said frame and carrying the upper feed-dog, an arm loosely mounted on the axis of the frame and connected to the operating mechanism, and a spring secured to the frame and exerting a pressure upon the arm substantially as described.

4. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; an upper feed mechanism having corresponding motions and comprising a swinging frame mounted on a suitable axis, a rock-shaft supported by said frame and carrying the upper feed-dog, an arm loosely mounted on the axis of the frame, formed at its inner end with a lug or shoulder, and connected at its outer end with the operating mechanism, a set-screw passing through the frame and engaged by the shoulder, and an elastic connection between the frame and the outer end of the arm substantially as described.

5. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; and an upper feed mechanism comprising a vertically-swinging frame having a yielding resistance, and an upper feed-dog supported by said frame and having an independent horizontal motion substantially as described.

6. In a sewing-machine, a lower feed mechanism having both a vertical and a horizontal motion; and an upper feed mechanism comprising a swinging frame, an upper feed-dog supported by said frame and having an independent horizontal motion, and means for varying the extent of the horizontal motions of both the said mechanisms substantially as described.

7. In a sewing-machine, a feed mechanism; and an adjustable cross-feed guide mechanism for the work operated upon, comprising the longitudinally-movable guide-bar K′, the spring-lever K^2 extending substantially in the same direction as the bar K′, and connected to said guide-bar, the notched holder-bar K^{22}, and means upon said lever for en-

gaging the notches of said bar, whereby the lever is held in different positions as desired substantially as described.

8. In a sewing-machine, an adjustable cross-feed mechanism comprising a plate against which the edge of the work is guided, a movable rod carrying said plate, a stationary notched bar, an operating hand-lever of resilient material and normally pressed against said bar, a projection on said lever for engaging the notches of the bar, and a link connecting one arm of the lever with the rod substantially as described.

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Witnesses:
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