(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.

SEWING MACHINE.

No. 574,574. Patented Jan. 5, 1897.

Fig. 2.

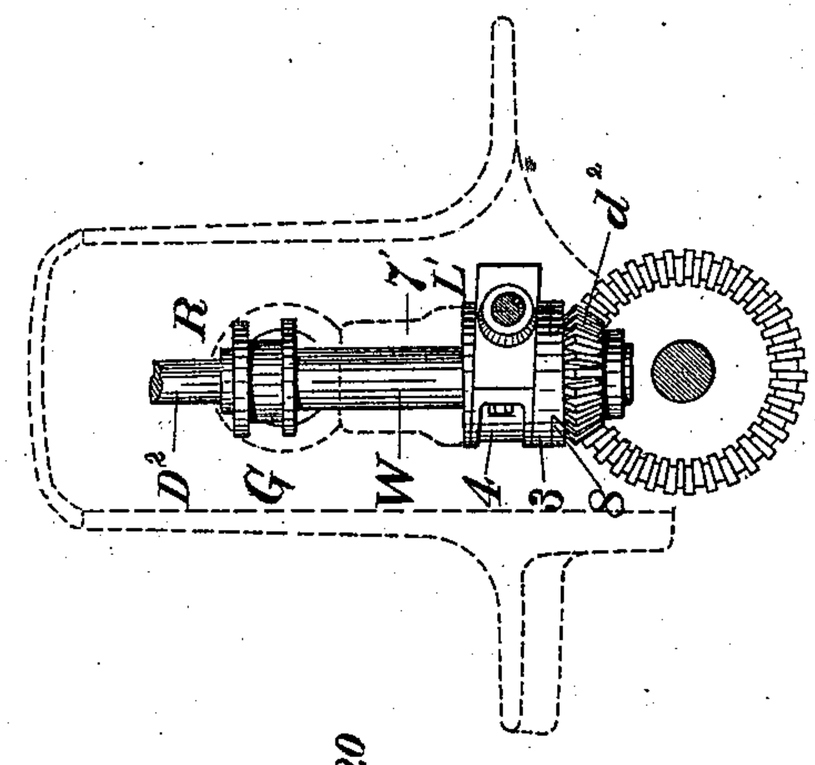
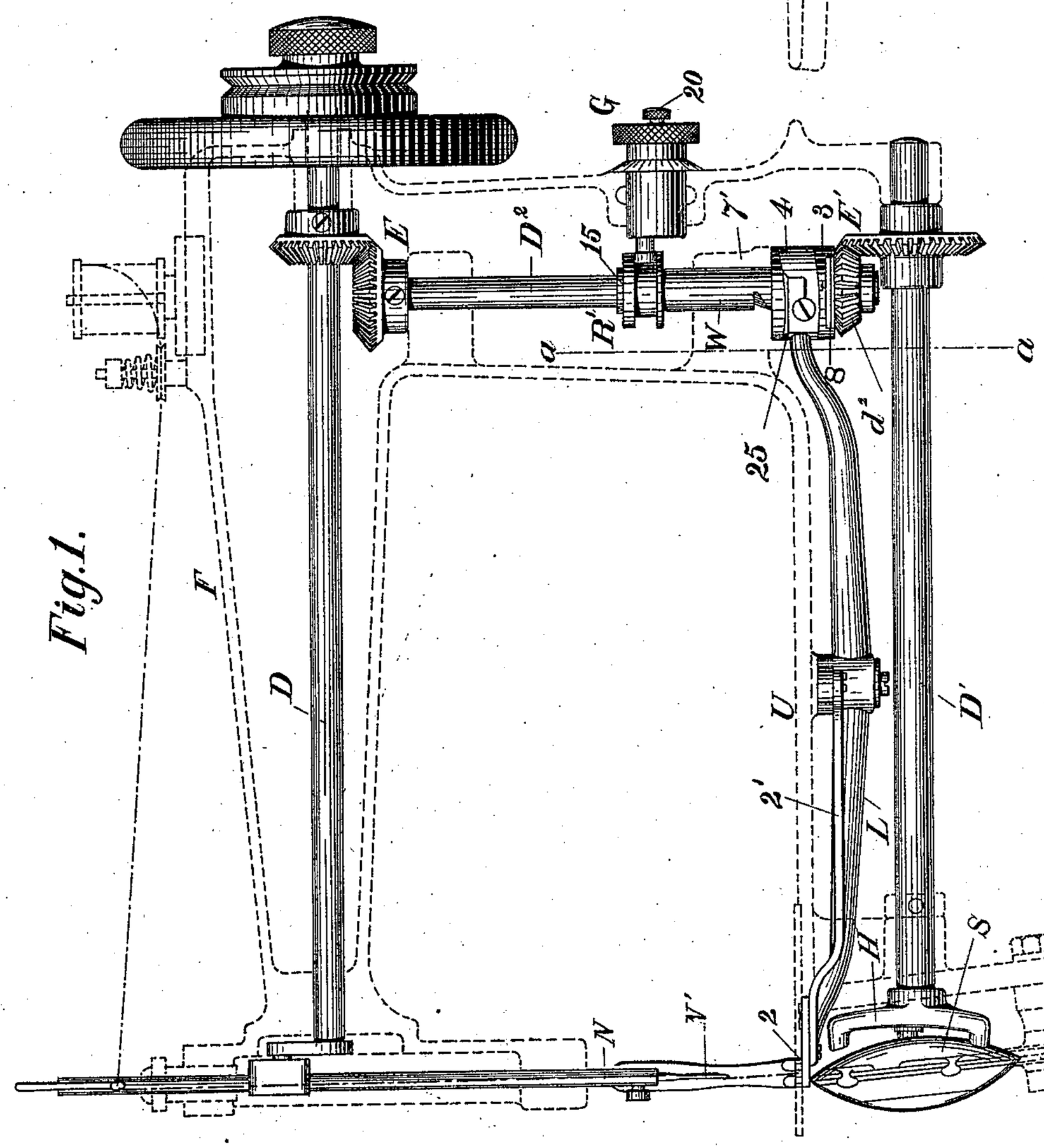


Fig. 1.



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Inventor:
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(No Model.) 3 Sheets—Sheet 2.

F. H. RICHARDS.

SEWING MACHINE.

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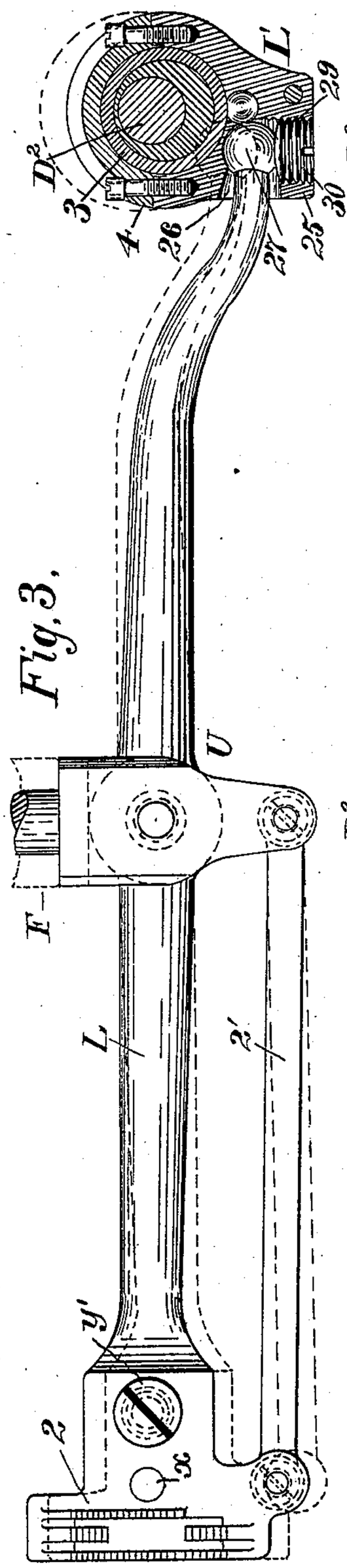

Fig. 3.

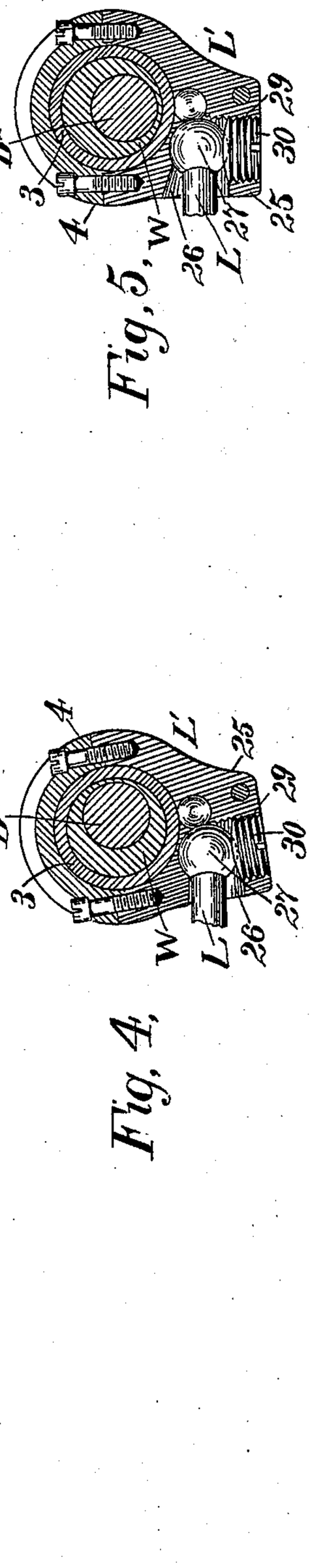

Fig. 4.

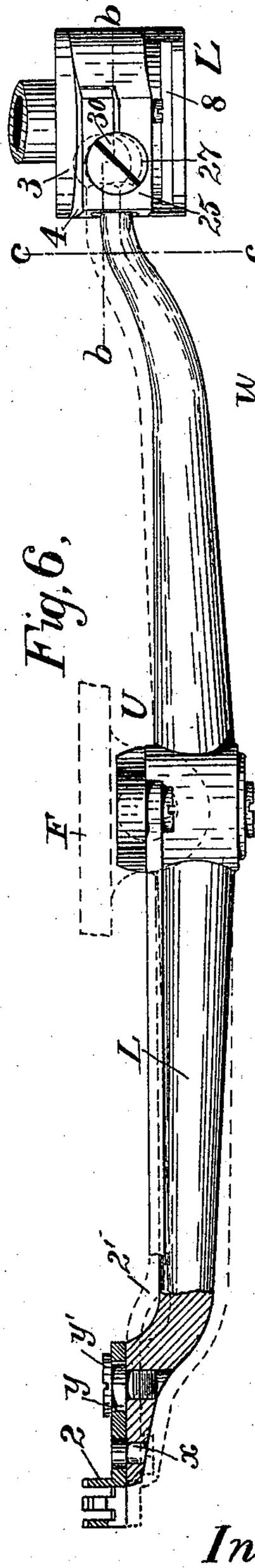

Fig. 6.

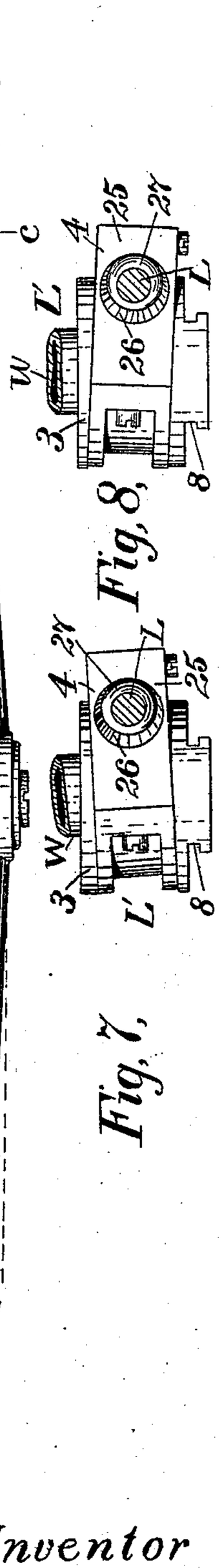

Fig. 8.

Fig. 7.

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(No Model.) 3 Sheets—Sheet 3.

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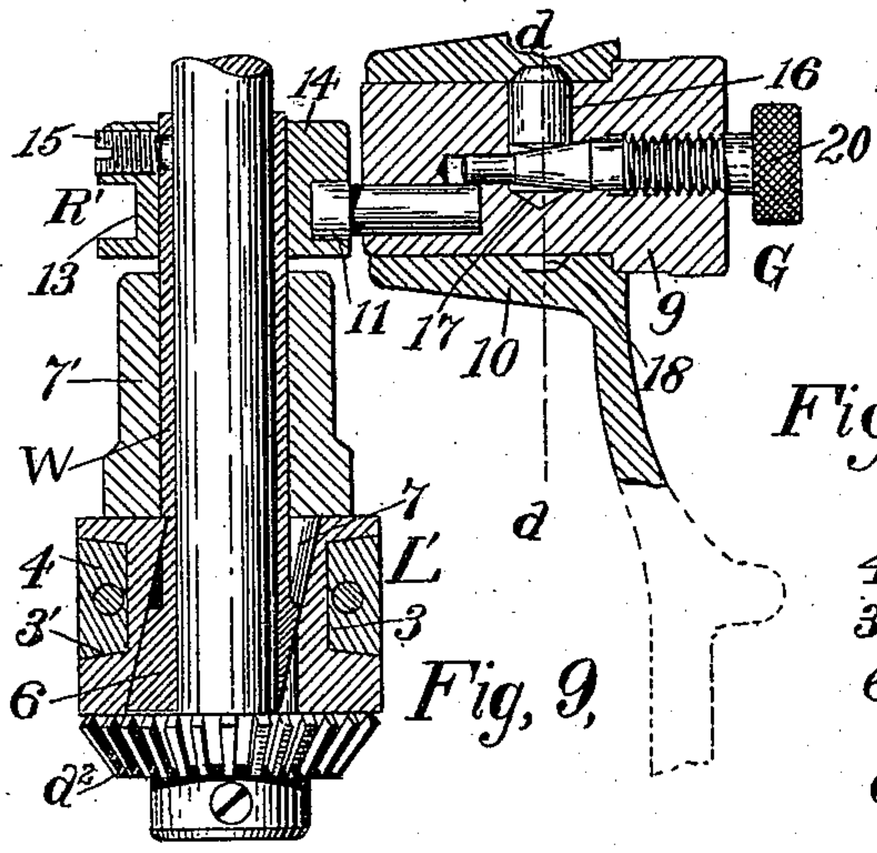
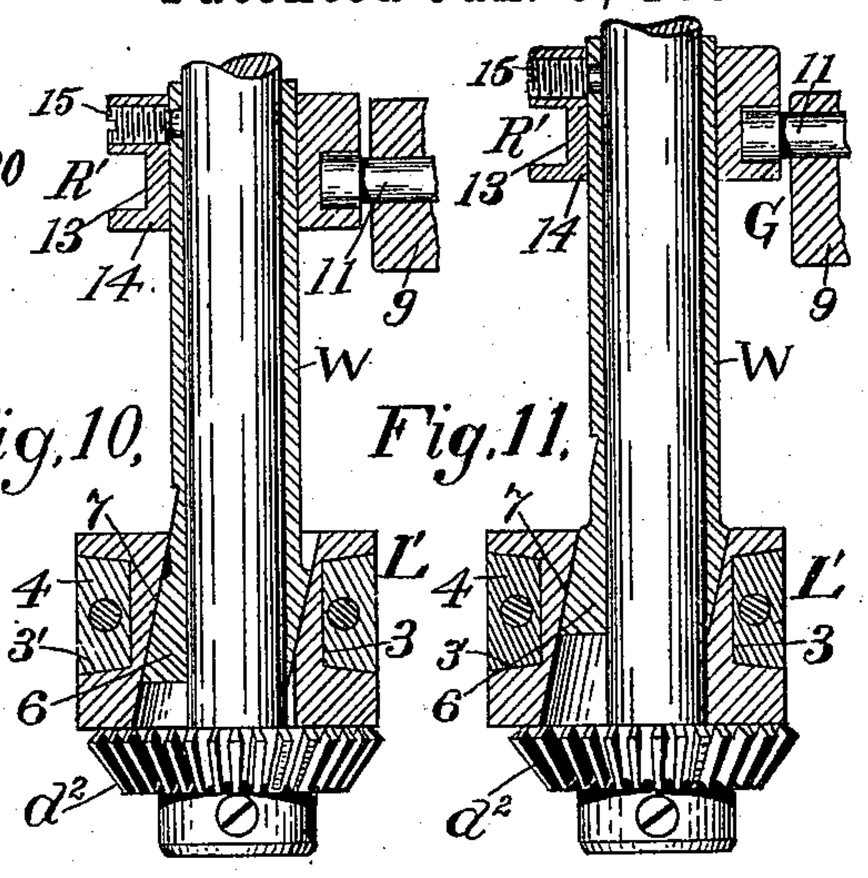
SEWING MACHINE.

No. 574,574. Patented Jan. 5, 1897.



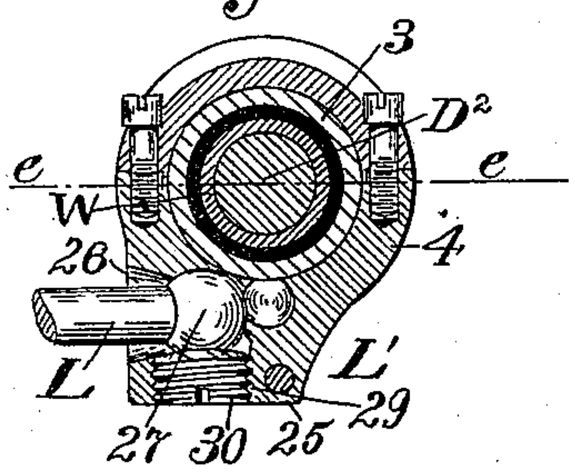
Fig, 9.



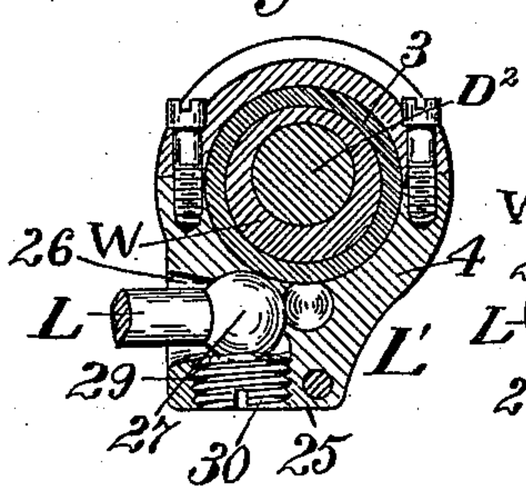
Fig, 10.

Fig, 11.

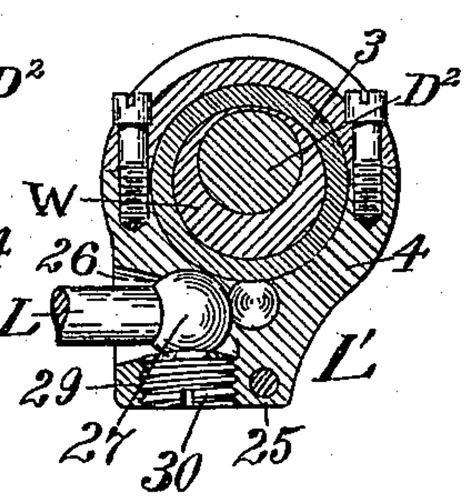
Fig, 12.



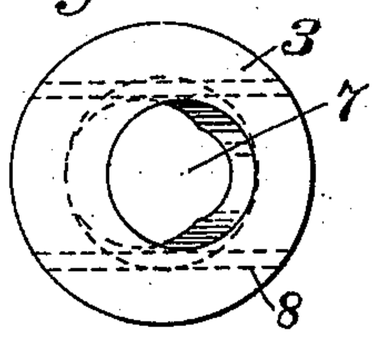
Fig, 13.



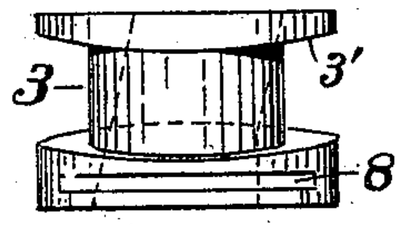
Fig, 14.



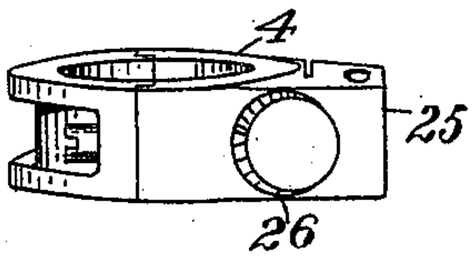
Fig, 15.



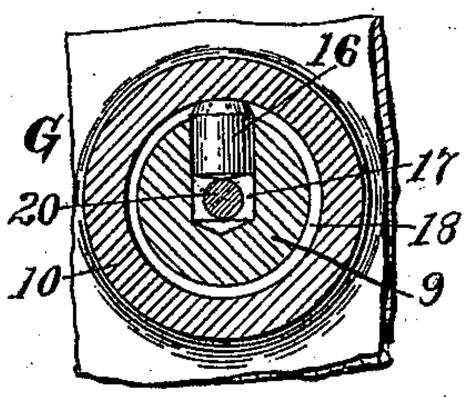
Fig, 16.



Fig, 17.



Fig, 18.



Witnesses
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Fred. J. Dole.

Inventor
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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 574,574, dated January 5, 1897.

Application filed March 21, 1895. Serial No. 542,632. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Sewing-Machine Feed Mechanism, of which the following is a specification.

This invention relates to a sewing-machine feed mechanism, one object of the invention being to furnish an improved feed mechanism of simplified construction and organization, comprising a feed-lever supported near the middle portion thereof to have a movement of the ends thereof, and held as against rotative movement about its longitudinal axis, and an actuator for imparting movement to opposite ends of said feed-lever.

Another object of my invention is to provide, in connection with a pivotally-supported feed-lever, in feed mechanisms of the class specified, an improved adjustably-supported actuator for imparting variable elliptical movements to the outer end of the feed-lever, and an adjusting device in operative connection with the actuator and operable for varying the range of elliptical movement of said feed-lever.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of the operative parts of a sewing-machine with my improved feed mechanism applied thereto, the framework being shown in dotted lines and as if in vertical section. Fig. 2 is a cross-sectional view of a portion of the sewing-machine mechanism, taken in dotted line *a a*, Fig. 1, and looking toward the right in said figure, parts being in elevation. Fig. 3 is a plan view, partly in section, of my improved sewing-machine feed mechanism, said figure showing a feed-lever, a feed-lever carrier or connection by means of which said feed-lever may be connected to the bed of a sewing-machine, a feed-dog carried at the working end of said feed-lever, and a feed-lever actuator in operative connection with the opposite end of said feed-lever, the actuator being cross-sectioned on dotted line *b b*, Fig. 6. In this figure the feed-dog is shown in full lines in its extreme "advanced" position, and the actuator is shown in its extreme "retracted" position, an opposite position of said parts being shown in dotted lines. Fig. 4 is a cross-sectional view of the feed-lever actuator, taken in dotted line *b b*, Fig. 6, and showing the actuating-eccentric and its eccentric-strap in the positions they occupy when the feed-dog is substantially at "mid-stroke." Fig. 5 is a horizontal cross-sectional view, similar to Fig. 4, of the feed-lever actuator, showing the parts thereof in the positions they occupy when the feed-dog is in its extreme retracted position. Fig. 6 is a front elevation, partially in section, of the feed mechanism as seen from below in Fig. 3, two opposite extreme positions of the feed-lever being shown in full and dotted lines, respectively. Fig. 7 is a cross-sectional view taken in line *c c*, Fig. 6, looking toward the right hand in said figure and showing the feed-lever-engaging side of the eccentric-strap of the feed-lever actuator in its "elevated" position, or in the position it occupies when the feed-dog is in its lowest position. Fig. 8 is a view similar to Fig. 7, showing the feed-lever-engaging side of the eccentric-strap in its "depressed" position, or in the position it occupies when the feed-dog is in its highest or effective position. Fig. 9 is a vertical longitudinal section of the feed-lever actuator and the regulator or adjusting device in connection therewith. This section is taken in a line corresponding with the dotted line *e e*, Fig. 12, which passes between the abutting end faces of the two parts of the eccentric-strap of the lever-actuator. Said figure shows the eccentric-shifting member of the regulator in its "lowest" position, or in position for securing the minimum eccentricity to the eccentric and for securing to the feed-lever the minimum throw thereof. This figure also shows, in full and dotted lines, a portion of the framework of a sewing-machine. Fig. 10 is a view, similar to Fig. 9, of the feed-lever actuator and the adjusting device therefor, said figure showing the eccentric-shifting member of the adjusting device in its "mid-position," or in position for effecting an increased throw of the eccentric and feed-lever as compared with the throw attained by said eccentric and feed-lever when the parts are in the positions shown in Fig. 9. Fig. 11 is a view similar to Figs. 9 and 10 of the feed-lever actuator and

adjusting device therefor and shows the eccentric-shifting member of the adjusting device in its "highest" position, or in position to secure the maximum throw to the eccentric and feed-lever. Figs. 12, 13, and 14 are cross-sectional views, similar to Fig. 5, of the feed-lever actuator, showing three different positions, respectively, of the parts thereof. Figs. 12, 13, and 14 correspond, in so far as the vertical position of the eccentric-shifting member of the adjusting device relatively to the eccentric is concerned, to Figs. 9, 10, and 11, although the lateral position of the eccentric-shifting member is different in Figs. 13 and 14 from the position of said members shown in Figs. 10 and 11, this change in the latter positions of the eccentric-shifting member being effected by the rotation of the feed-lever actuator. Figs. 15 and 16 are plan and side views, respectively, of the eccentric-shifting member of the feed-lever actuator. Fig. 17 is an isometrical perspective view of the eccentric-strap for the eccentric shown in Figs. 15 and 16; and Fig. 18 is a cross-sectional view, taken in dotted line *d d*, Fig. 9, looking toward the right hand in said figure and showing the adjusting member for the eccentric-shifting member of the feed-lever actuator.

Like characters designate like parts in all the figures of the drawings.

In the drawings only so much of a sewing-machine is shown as is deemed necessary for clearly illustrating the application and mode of operation of my present improvements.

Briefly, the sewing-machine illustrated in the drawings comprises a framework, (shown in dotted lines, Fig. 1, and designated by F,) which framework may be of any suitable construction for carrying the working parts of the machine; a vertically-reciprocating needle-bar N, carrying a needle N'; a horizontal needle-bar-actuating shaft D, journaled in suitable bearings in the framework and operatively connected with the needle-bar; a revoluble shuttle or loop-taker S, peripherally supported at an inclination to the path of movement of and below the needle-bar, preferably by means of peripherally-disposed track-rolls 27', carried by suitable studs or carriers connected with a bracket constituting the framework of the machine, a horizontally-disposed shuttle-actuating shaft D'; a revoluble driver H, carried by said shaft in position and adapted for engaging and rotating the shuttle; an intermediate shaft D^2, operatively connecting the needle-bar-actuating shaft D and shuttle-actuating shaft D'; a train of gears E, operatively connecting the intermediate shaft D^2 and needle-bar-actuating shaft D; a train of gears E', connecting the intermediate shaft D^2 and shuttle-actuating shaft D', and feeding mechanism supported intermediate to the needle-bar-actuating shaft D and shuttle-actuating shaft D^2 and operatively connected with the intermediate shaft D^2.

The construction and organization of all the parts of the sewing-machine, with the exception of the sewing-machine feed and its actuating and regulating devices, may, in a general way, be substantially the same as like parts shown and described in my prior application, Serial No. 531,931, filed December 15, 1894, to which reference may be had.

It will be obvious that my improved feed mechanism, which is the principal constituent of my present invention, is applicable to various types of sewing-machines, and that, therefore, the invention is not limited to a machine of the kind illustrated.

In the preferred form thereof herein shown and described the feed mechanism, *per se*, comprises a feed-lever, (designated in a general way by L,) which is preferably pivotally supported approximately midway of its length for elliptical movement at opposite ends thereof and held as against rotative movement about its longitudinal axis; a feed-dog carried at the outer or "feed" end of said feed-lever; a feed-lever actuator (designated in a general way by L') embodying an adjustably-supported eccentric having an eccentric-strap in operative connection with one end of the feed-lever and the shaft D^2 for said eccentric, and a feed-adjusting device (designated in a general way by R') comprising an eccentric-adjusting member or wedge W in engagement with the eccentric of the actuator and adapted for changing the eccentricity of said eccentric, and a wedge-operating device (designated in a general way by G) in engagement with and adapted for shifting the wedge or eccentric-adjusting member W to increase or decrease the effective throw of the eccentric and for holding said wedge in its shifted position.

The feed-lever L, which may be, in a general way, of any suitable construction, is shown having a so-called "two-way" pivotal connection near the middle portion thereof with some part of a sewing-machine frame, as shown in full and dotted lines at U, Figs. 1, 3, and 6 of the drawings. The pivotal connection is herein shown in the nature of a "feed-lever carrier" (designated by U) having a horizontal pivotal connection with some part of the sewing-machine frame F and having a vertical pivotal connection with the feed-lever L, as will be readily understood by reference to said Figs. 3 and 6.

The feed-dog 2, which may be of any suitable general conformation, is shown pivotally mounted on the screw or stud *x* at the forward or working end (herein shown as the left-hand end) of the feed-lever L and as provided with an enlarged hole or opening *y* near its rear end to receive the shoulder of a screw *y'*, inserted in the feed-lever, whereby a slight play or movement of the dog is permitted, and said feed-dog is shown having means in connection therewith and in connection with the feed-lever for maintaining the feed-dog during operation in substantial par-

allelism with the line of its longitudinal movement. This means, in the form thereof herein shown, consists of a link 2′ in parallel disposition relative to the longitudinal axis of the feed-lever and pivotally connected at one end to the feed-dog and pivotally connected at the opposite end thereof to the feed-lever carrier, as most clearly shown in Figs. 3 and 6 of the drawings.

The feed-lever actuator L′, which constitutes an important factor in my present invention, comprises a driver or rotative eccentric-actuating shaft D^2, a variable eccentric 3, carried upon a wedge-like eccentric-adjusting member W, carried upon the shaft or eccentric-actuator D^2 and shiftable longitudinally of the axis of movement of said shaft and eccentric, said eccentric having a peripheral obliquely-disposed strap-receiving groove or guideway 3′, and an annular eccentric-strap 4, carried on the obliquely-disposed guideway and having a perimetrically-disposed extension having a universal connection with the feed-lever L.

As a means for adjusting the eccentric 3 transversely of the driving-shaft D^2, to thereby change the effective throw of said eccentric, I have provided in connection with the eccentric 3 an eccentric carrying and adjusting member or wedge W, which in the form thereof herein shown is in the nature of a sleeve shiftably mounted for longitudinal adjustment upon the driving-shaft D^2, and having at the lower end thereof an obliquely or eccentrically disposed wedge portion 6, extending into a bore 7, which is formed through the eccentric 3 in the plane of and obliquely to the axis of rotation of said eccentric, as will be readily understood by reference to Figs. 9 to 14, inclusive, of the drawings, and as a means for shifting the wedge to change the eccentricity of said eccentric I have provided a so-called "wedge-operating" device or "eccentric-shifting-member-adjusting" device G in operative connection with and adapted for shifting said wedge W or eccentric-shifting member longitudinally and for holding said wedge or member W in its shifted position, as hereinafter more fully described.

As a means for securing the eccentric 3 as against longitudinal movement relative to the shaft D^2 said eccentric is shown in Fig. 9 supported between a bevel-gear d^2, which is shown fixed to the lower end of the shaft D^2, and a journal-bearing 7′, surrounding the middle portion of the eccentric-adjusting member W.

In practice the eccentric 3 will have at the under side thereof, a slide 8, to fit a corresponding slideway (not shown) in the upper face of the gear d^2, and the eccentric-adjusting member W will usually be loosely mounted upon the shaft D^2, as shown in the drawings, (see Figs. 9, 10, and 11,) it being held against rotation relatively to the shaft D^2 and rotating with said shaft by reason of the oblique disposition of the wedge portion 6 of the eccentric-adjusting member relatively to the eccentric 3, which, as before stated, will have a sliding engagement with the gear d^2.

It will be evident that owing to this oblique disposition of the wedge relatively to the axis of rotation of the eccentric 3 and the shaft D^2 the shaft D^2 cannot rotate without carrying the eccentric 3 and the eccentric-adjusting member W with it.

The wedge-operating device for adjusting and locking the eccentric-adjusting member or wedge W, in the preferred form thereof herein shown and described, is in the nature of a stud 9, journaled for rotary movement in a bearing 10, (see Fig. 9,) formed in the frame F, and said stud has an eccentrically-disposed crank-pin 11 at the inner end thereof, which engages in a peripheral groove 13 in a collar 14, fixed to the upper end of the eccentric-adjusting member W, said collar being preferably fixed to said member W by means of a set-screw 15, as shown in said Fig. 9. This wedge operating and holding device will usually be removably secured in the bearing 10 by means of a sliding bolt or pin 16, shiftably carried in a transverse opening 17, formed into the stud 9, and normally projecting beyond the outer face of said stud and entering an annular groove 18, formed in the inner face of the bearing 10.

The sliding bolt 16 is normally held in engagement with the walls of the annular groove 18 by means of a bolt-shifting screw or member 20, having a conically-tapered inner end, and which has a screw-threaded bearing in a longitudinal screw-threaded opening formed in the outer end of the stud 9 and intersecting the recess in which the sliding bolt is seated, said bolt-shifting screw having a peripheral bearing at its inner end against the inner end of the sliding bolt and being adapted for longitudinal adjustment to release the sliding bolt 16 from or force the same into engagement with the walls of the annular groove 18, said screw 20 being provided at the outer end thereof with a knurled head by which the same may be turned to effect the requisite adjustment thereof.

It will be obvious that any form of bolt-shifting member may be employed to actuate the sliding bolt of the wedge-operating device G to lock the same in operative position in the journal-bearing 10.

By the construction and organization of wedge-operating device as herein described the same may be quickly assembled and disassembled relatively to the eccentric-adjusting wedge W.

The eccentric-strap 4, which is carried on the guideway of the eccentric and surrounds the same, and which is shown made in two parts bolted together in the usual manner, has a perimetrically-disposed extension 25, in the side face of which is formed a ball-receiving socket adapted for receiving a ball 27 upon the inner end of the feed-lever L.

As a means for assembling the ball-and-

socket connection, comprising the ball-socket 26 and ball 27, the socket 26 is open and conically flared at that side of the extension next adjacent the feed-lever, as most clearly shown in Figs. 4, 5, 12, 13, 14, and 17, and one side wall of said socket is transversely bored and screw-threaded, as shown at 29, to receive a screw 30, the inner end of which is cupped or concaved, as shown in dotted lines in Fig. 12, to correspond with the curvilinear adjacent face of the ball 27 on the feed-lever L, said cupped-shaped end of the screw forming a bearing for one side of said ball and holding the same in place in socket 26 and facilitating the take-up of wear. By this construction and organization of ball-and-socket connection the feed-lever may be quickly disconnected from the eccentric-strap by releasing the screw 30 from the engagement of ball 27 of said lever and partially rotating the eccentric-strap to draw the same away from the end of the feed-lever.

By comparison of the several figures of the drawings it will be seen that the eccentric-strap at each point of connection with the feed-lever will during the rotation of the eccentric have a continuous circuitous movement in an elliptical path, which will cause the inner and outer ends of the feed-lever, owing to the pivotal support of said feed-lever at the middle portion thereof, to describe an ellipse, the major and minor axes of which may be varied in length by adjusting the eccentric 3 transversely of the shaft D^2 to increase or decrease the effective throw or eccentricity thereof. This change in the eccentricity of the eccentric may, as hereinbefore stated, be quickly effected by shifting the eccentric-adjusting wedge or member W longitudinally of the shaft D^2 and longitudinally of the axis of rotation of the eccentric through the medium of the wedge-operating device G.

By reference to Figs. 3 and 7 of the drawings it will be seen that the feed-lever L has, as before stated, a universal connection—to wit, a ball-and-socket connection—with the eccentric-strap at one side only of and remote from the axis of movement of said eccentric, and by reason of this "one-side" connection and by reason of the peculiar circuitous movement of the eccentric-strap, due to the peculiar organization of the eccentric and the eccentric-strap, as before described, a truly elliptical movement is imparted to the outer ends of the feed-lever without imparting rotative movements to the feed-lever about its longitudinal axis.

By employing an eccentric having an obliquely-disposed eccentric-strap and connecting the feed-lever by a universal connection, as described, to the eccentric-strap at one side only of the axis of rotation of the eccentric I secure a continuous uniform elliptical movement to the end of the feed-lever, and consequently a corresponding movement to the feed-dog at the working end of said feed-lever. The ball-and-socket connection, while preventing lost motion between the eccentric-strap and feed-lever, permits a free movement of this end of said feed-lever in an elliptical path, due to the motion imparted to the eccentric-strap by the eccentric.

From a practical operation of my improved feed mechanism in connection with a sewing-machine it has been fully demonstrated that a feed-lever having a uniform continuous feed movement in an unbroken elliptical path, as herein described, has material advantages over the ordinary "four-way" feed mechanism, in that the feed-dog carried by the feed-lever engages the fabric with a gradually-increasing pressure during the first stages of the advancing movements thereof and releases the cloth with a gradually-decreasing pressure during the latter stages of said advancing movement, which effects a uniform feed movement of the fabric without, as in some cases, so tightly impinging the fabric between the presser-foot and feed-dog on the inauguration of the feed movement thereof as to cause the fabric to buckle or feed unevenly.

Furthermore, by the use of a feed-lever actuator embodying an eccentric and an eccentric-strap relatively organized and connected to the feed-lever in the manner shown and described I not only secure a different movement to the feed-lever than is secured to the feed-lever of any ordinary feed mechanism employing a two-way cam or cams for effecting the feed movement of the feed-lever, but also secure a smooth, unabrupt, and practically noiseless movement to the feed-lever, in contradistinction to the abrupt noisy movements of the feed-lever of any ordinary feed mechanism.

No claim is herein made to the combinations of shafts and gearing for actuating the needle-bar and the shuttle, as such subject-matter is covered in my application filed December 15, 1894, Serial No. 531,931.

Having thus described my invention, I claim—

1. The combination with a feed-lever, and with a feed-dog pivotally mounted on said feed-lever; of an actuator for imparting movements to said feed-lever; and vibratory means for holding the feed-dog in parallelism with the plane of the longitudinal movement of said dog.

2. The combination with a feed-lever, and with a feed-dog pivotally mounted on said lever; of rotative mechanism constructed and arranged to impart an elliptical movement to the feed end of said lever; and a vibratory device for holding the feed-dog in parallelism with the plane of the longitudinal movement of said dog.

3. A feed mechanism of the class specified, comprising a suitably-supported lever; a feed-dog carried by said lever; a rotative actuating-eccentric universally connected with one end of said lever, and adapted to impart

an elliptical movement to both ends thereof; and vibratory means for holding the feed-dog in parallelism with the plane of the longitudinal motion of said dog.

4. The combination with a sewing-machine feed-lever, and means for imparting thereto elliptical movements; of a feed-dog directly carried by said lever; and means having a movement conforming to the motion of the lever, for maintaining the feed-dog in substantial parallelism with the line of its longitudinal movement.

5. The combination with a sewing-machine feed-lever, and means for imparting thereto elliptical movements; of a feed-dog pivoted to said lever, and directly carried thereby; and a link having a movement conforming to the motion of the lever, for maintaining the feed-dog in substantial parallelism with the line of its longitudinal motion.

6. The combination with a sewing-machine feed-lever, and means for actuating the same; of a feed-dog pivotally mounted on the free end of said lever, and provided with an opening back of its pivotal point; a device passing through said opening, and permitting a slight play of the dog thereon; and means for maintaining the feed-dog in substantial parallelism with the line of its longitudinal motion.

7. The combination with a sewing-machine feed-lever; an eccentric universally connected to said lever, and serving to impart to the same elliptical movements; of a feed-dog pivotally mounted on the free end of the lever; and a link connecting said dog with the feed-lever carrier, and serving to maintain said dog in substantial parallelism with the line of its longitudinal movement.

8. The herein-described feed mechanism for sewing-machines; it consisting of a feed-lever supported, approximately midway of its length, for vertical and horizontal oscillations; a feed-actuating shaft; an eccentric carried by said shaft, and adapted for adjustment, transversely of said shaft; an eccentric-strap revolubly carried by said eccentric, in a plane oblique to the axis thereof; a universal connection between said eccentric-strap and feed-lever; an eccentric-shifting member shiftably carried upon the feed-actuating shaft, and in operative connection with the eccentric, and adapted for shifting said eccentric, transversely of said shaft; and an adjusting device in operative connection with said eccentric-shifting member, and adapted for shifting said member longitudinally of the shaft, to effect a change in the effective throw of the eccentric, substantially as described, and for the purpose set forth.

9. In a sewing-machine feed mechanism, a feed-lever supported near its middle portion for elliptical movement at the feed end thereof, and held as against rotative movement about its longitudinal axis; combined with a rotative actuator comprising a shiftable eccentric having an obliquely-disposed eccentric-strap surrounding the periphery thereof, and so connected with one end of the feed-lever as to impart, during the rotation of the eccentric, an elliptical movement to the feed end of said feed-lever, without rotating said feed-lever upon its longitudinal axis; a driver for rotating said eccentric; and an adjusting device in operative connection with, and adapted for shifting, said eccentric transversely of the driver, to increase or decrease the eccentricity thereof, and effect a change in the range of elliptical movement of the feed end of the feed-lever.

10. The herein-described feed mechanism for sewing-machines, it comprising a feed-lever pivotally supported near its middle portion for elliptical movement at the feed end thereof, and held against rotative movement about its longitudinal axis; a variable eccentric; an annular eccentric-strap movably carried on the periphery of said eccentric in a plane oblique to the plane of rotation of the eccentric; a universal connection between the feed-lever and eccentric-strap located at one side only of the axis of movement of said eccentric, and adapted for transmitting an elliptical movement to the end of the feed-lever; and adjusting means for effecting a change in the effective throw of said eccentric.

11. In a sewing-machine feed mechanism, a feed-lever supported midway of its length for elliptical movement at the ends thereof, and held as against rotative movement about its longitudinal axis; combined with continuous rotary-motion feed-lever-actuating mechanism, for imparting an elliptical movement to the ends of the feed-lever, and comprising an actuating-shaft; an eccentric rotative with, and shiftable transversely of, said shaft; an eccentric-adjusting wedge interposed between the eccentric and actuating-shaft; an eccentric-strap peripherally carried by, and at an inclination to the path of movement of, said eccentric; a ball-and-socket connection between the eccentric-strap and feed-lever; and means for adjusting the eccentric-adjusting wedge longitudinally of the actuating-shaft, to effect a change in the effective throw of the eccentric, whereby a change in the range of elliptical movement of the ends of the feed-lever is attained.

12. The combination with a feed-lever carrier pivotally supported in a bearing, of a feed-lever pivotally supported for oscillation remote from the outer end of said carrier; a feed-dog pivotally carried for oscillatory reciprocation at one end of said feed-lever; a link in parallel disposition relatively to the feed-lever, and connecting the feed-dog and feed-lever carrier, and adapted for holding the feed-dog in parallelism with the line of its longitudinal movement; and an actuator in operative connection with the opposite end of said feed-lever, and adapted for imparting vertical and horizontal oscillations to said feed-lever.

13. The combination with a feed-lever piv-

otally supported for oscillation by a carrier pivotally carried for oscillations in a bearing, of a feed-dog pivotally carried at one end of the feed-lever; a link in parallelism with the feed-lever and pivotally connected at one end thereof to the carrier and at its opposite end to the feed-dog, and adapted for maintaining the feed-dog in parallelism with the line of its longitudinal movement; actuating means for imparting vertical and horizontal oscillations to the feed-lever and connected link; and a regulating device for changing the effective throw of said feed-lever.

14. In a sewing-machine the combination with a reciprocatory needle-bar and its horizontally-disposed actuating-shaft and with a revoluble shuttle and its horizontally-disposed actuating-shaft, of a feed mechanism comprising a vertically-disposed shaft in operative connection with the two aforesaid horizontally-disposed shafts; a feed-lever-actuating device carried by the vertical shaft; a feed-lever fulcrumed near the middle portion thereof for vertical and horizontal oscillations, and having one end thereof in operative engagement with the said device; a feed-dog pivotally carried at the opposite end of said feed-lever; and a link pivotally supported at one end in alinement with the fulcrum of the feed-lever and pivotally connected at the opposite end with the feed-dog and adapted for maintaining the feed-dog in parallelism with the line of its longitudinal movement.

15. In a sewing-machine the combination with a suitable frame having a bed-plate, of a feed-lever carrier pivotally carried in a horizontal bearing below, and in connection with, the bed of the machine; a feed-lever pivotally supported for horizontal oscillation remote from the extreme outer end of said carrier; a feed-dog pivotally carried for horizontal oscillation at one end of said feed-lever and operatively connected with the extreme outer end of said carrier by means of a link in parallel disposition relatively to the feed-lever; a feed-lever-actuating device in operative connection with the opposite end of the feed-lever and adapted for imparting horizontal and vertical oscillations to said feed-lever; and means in connection with; and adapted for actuating, said device.

16. In a sewing-machine the combination with a suitable frame having a bed-plate, of a feed-lever carrier pivotally mounted in a horizontal bearing below, and in connection with, the bed of the machine; a feed-lever pivotally supported for horizontal oscillation remote from the extreme outer end of said carrier; a feed-dog pivotally carried at one end of said feed-lever and operatively connected with the extreme outer end of said carrier by means of a link in parallel disposition relatively to the feed-lever; a feed-lever-actuating device shiftably carried by a driving-shaft and in operative connection with the opposite end of the feed-lever and adapted for imparting vertical and horizontal oscillations to said feed-lever; a driving-shaft in operative connection with said device; and means for regulating the effective movement of said lever, to increase or decrease the throw of the lever.

17. In a sewing-machine the combination, with the framework thereof, of a feed-lever supported for vertical and horizontal oscillations; a feed-dog pivotally carried by said feed-lever; an actuating-shaft; a feed-lever-actuating device carried by, and shiftable transversely of, said shaft; a sliding wedge in engagement with said feed-lever-actuating device and adapted for shifting the same transversely of said shaft, to change the throw thereof; and a regulating device comprising a stud journaled for rotation in the frame and having an eccentrically-disposed pin at one end thereof in engagement with the sliding wedge; and a bolt carried by the stud in movable engagement with an annular groove formed in the bearing in which the stud is seated.

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