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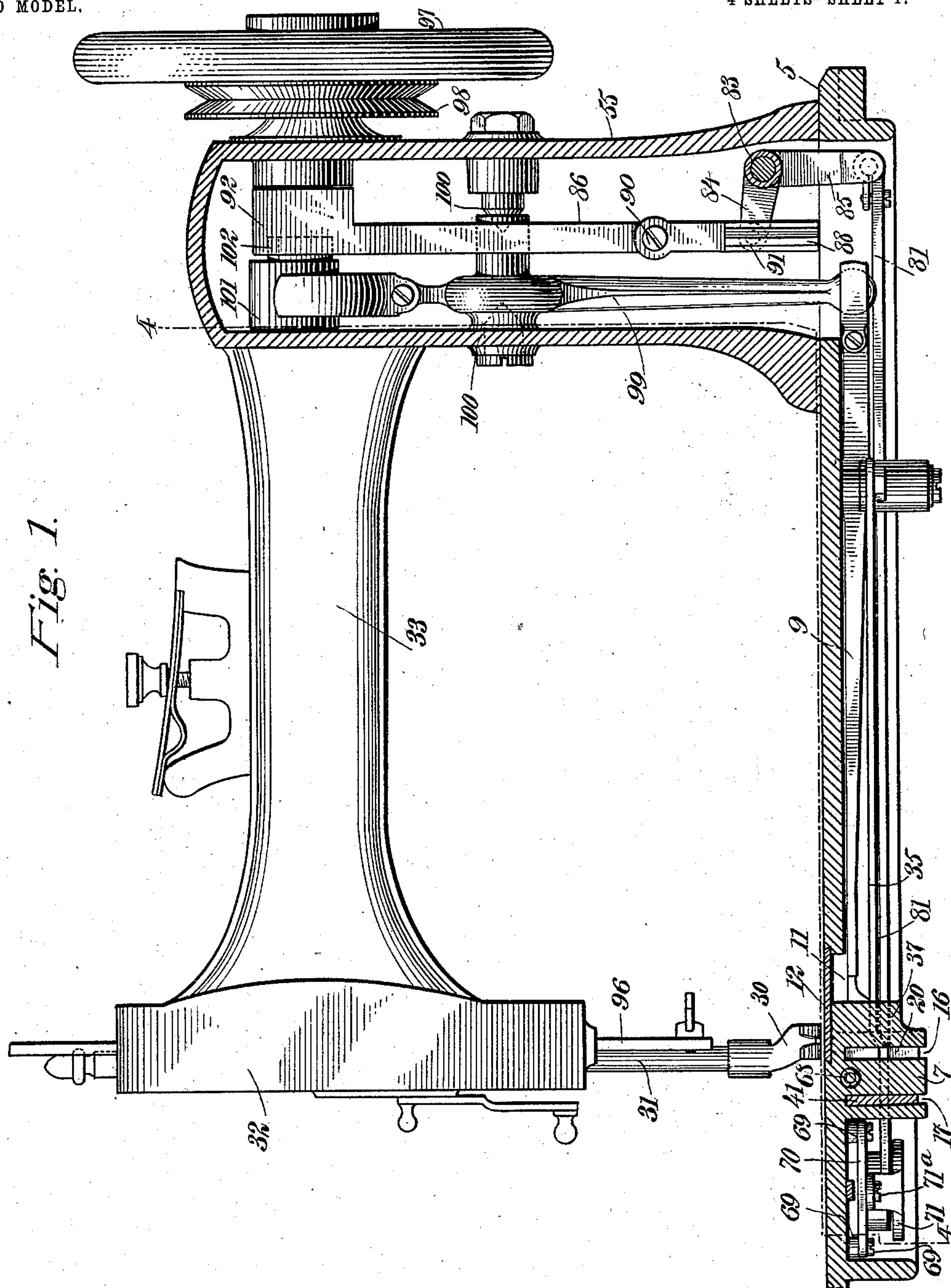
PATENTED DEC. 29, 1903.

W. A. SMITH.  
FEEDING MECHANISM FOR SEWING MACHINES.

APPLICATION FILED OCT. 24, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



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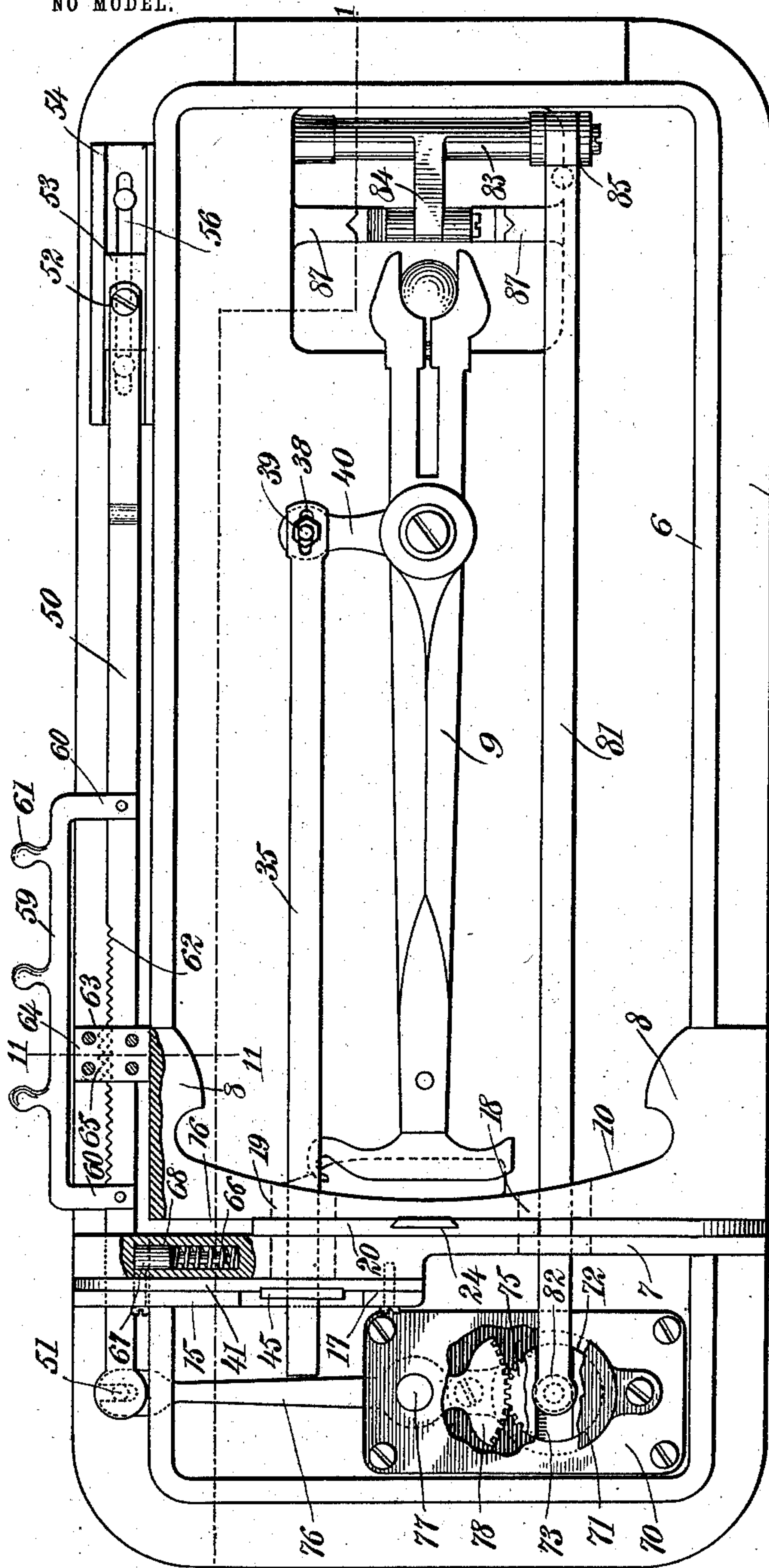


Fig. 2.

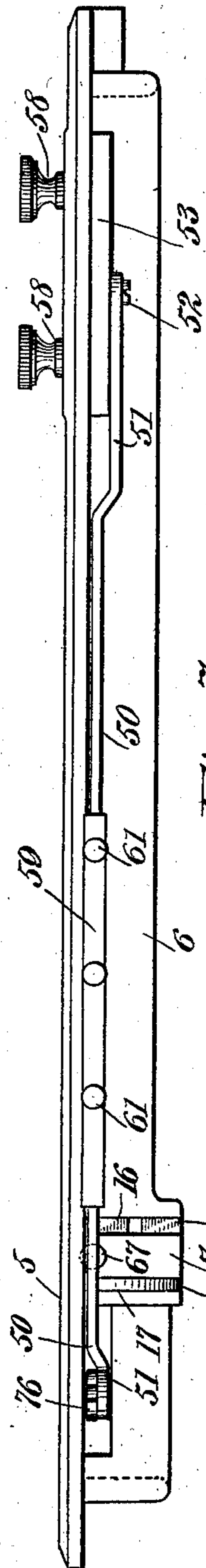


Fig. 3.

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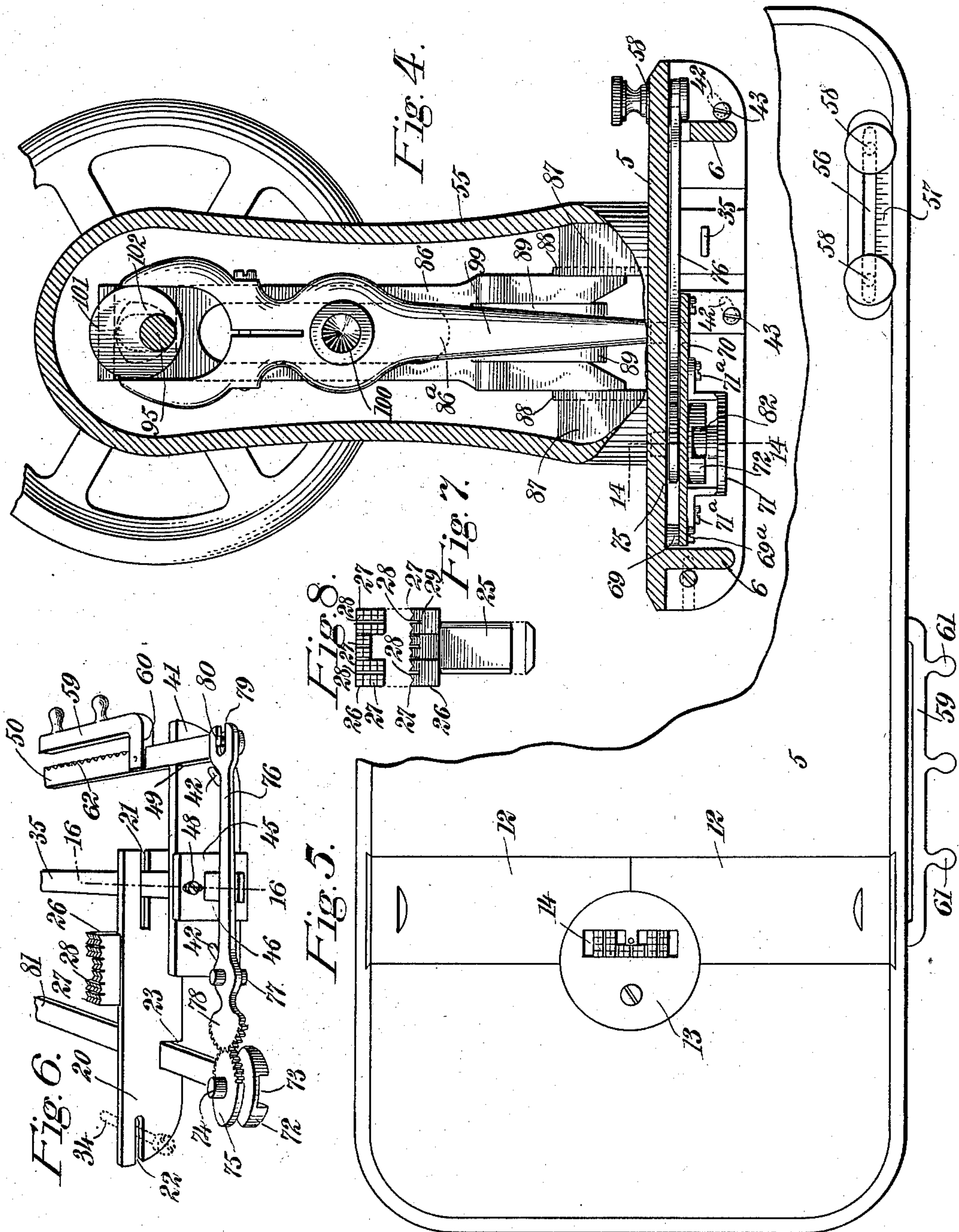
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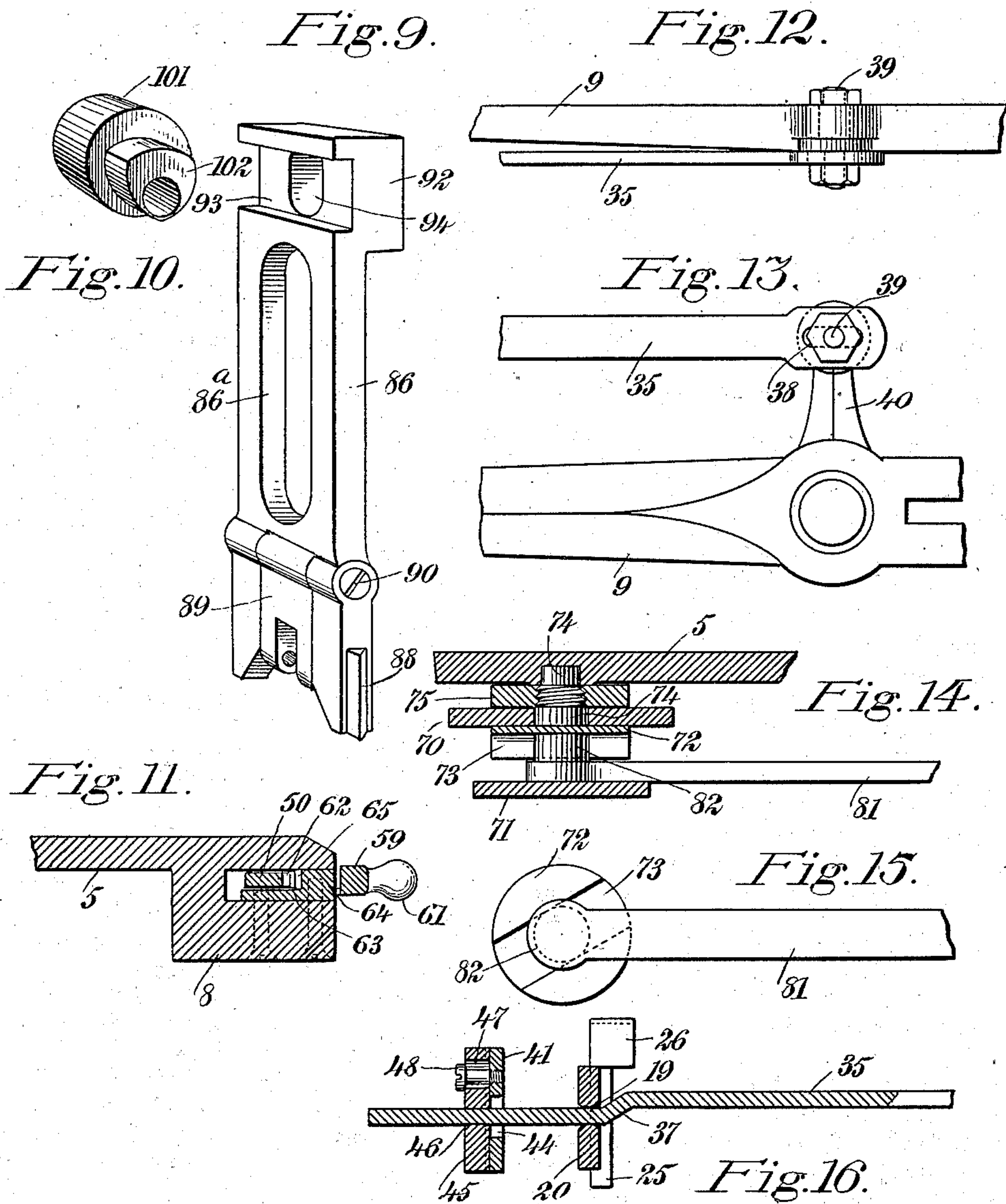
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# UNITED STATES PATENT OFFICE.

WILLIS AUSTIN SMITH, OF NEW YORK, N. Y.

## FEEDING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 748,431, dated December 29, 1903.

Application filed October 24, 1902. Serial No. 128,568. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIS AUSTIN SMITH, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Feed Mechanism for Sewing-Machines, of which the following is a full, clear, and exact description.

My invention relates to feed mechanisms for sewing-machines, the same being adapted for use on that class of machines which lay the thread in parallel stitches or to make stitches in which sharp angles are required—as, for example, in producing embroidery-work, quilting, or in garment-making, sewing around pockets, or in the performance of other work, although the improvements may be used advantageously on sewing-machines adapted to general work.

A salient feature of the invention is a reversible feed mechanism which is under the direct and easy control of the operator and is effective to feed the work in either a forward or backward direction at the will of the operator, such reversibility of the feed mechanism being obtainable instantly and without stopping the machine and slackening its speed, thus obviating the common practice of stopping the machine, lifting the presser-foot, and turning or shifting the work.

Another prominent feature of the invention resides in means associated with the reversible feed mechanism to regulate the length of the stitch without stopping the machine, to the end that stitches of any desired length may be laid or the stitch may be increased or decreased constantly and gradually or instantly or irregularly at the will of the operator.

Broadly stated, the invention is a four-motion reversible feed comprising a feed-dog which is preferably of peculiar form, a feed-bar, a driving-rod to reciprocate the dog and feed-bar in one direction, another driving-rod to raise and lower the dog and feed-bar and operable in unison with the sewing mechanism and the first-named driving-rod, means to determine the plane of movement of said first-named driving-rod, and adjusting devices controllable at will to shift said means in order to regulate the direction of

movement and the length of movement of the first-named driving-rod.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical sectional elevation taken in the irregular plane indicated by the dotted line 1 1 of Fig. 2. Fig. 2 is an inverted or bottom plan view of the machine, showing certain of the operating mechanisms, a part of the machine being broken away and in section to illustrate the details of construction. Fig. 3 is a side elevation looking at the edge portion of the bed-plate. Fig. 4 is a vertical sectional elevation through the post and the arm, taken in the plane of the dotted line 4 4 of Fig. 1. Fig. 5 is a top plan view of the bed-plate, partly broken away, illustrating certain details of construction. Fig. 6 is a detail perspective view of some of the parts comprising the improved feed mechanism. Fig. 7 is an enlarged detail view of the feed-dog. Fig. 8 is a plan view of said feed-dog. Fig. 9 is a detail perspective view of the vertically-reciprocating bar that actuates one rod of the feed mechanism. Fig. 10 is a detail perspective view of the combined eccentric and cam for actuating the shuttle-bar and one driving-rod of the feed mechanism. Fig. 11 is a detail cross-section in the plane of the dotted line 11 11 of Fig. 2. Figs. 12 and 13 are detail views, in side elevation and in plan, respectively, of a part of the shuttle-lever and one driving-rod for the feed mechanism. Fig. 14 is a detail cross-section on the line 14 14 of Fig. 4. Fig. 15 is a detail bottom plan view of the shiftable cam and one driving-rod of the feed mechanism, and Fig. 16 is a detail cross-section on the line 16 16 of Fig. 6.

5 designates the bed-plate of a sewing-machine, the same being flat on its upper surface, as shown by Figs. 1, 3, 4, and 5. On the under side of this bed-plate is provided an integral flange 6, which extends almost continuously around the same and at a suitable distance from the edge thereof. The bed-plate and its depending flange are formed to produce a transverse bridge 7, having the shape shown more particularly by Fig. 2, said bridge being integral with the bed-plate and



extending across the under side of the latter at the line where the feed and sewing mechanisms are applied to the machine. The transverse bridge is enlarged at its end portions, as indicated at 8, and one face of the bridge is curved on a radius struck from the center of oscillation of the shuttle-bar 9, said curved face of the bridge being indicated at 10 in Fig. 2 and forming a race for the shuttle. The bed-plate 5 immediately over the shuttle-race is provided with the usual slot 11 and with guideways adapted to receive the shuttle-race slides 12, and adjacent to the slot 11 the bed-plate is provided with a countersunk needle-plate 13, the latter having a slot 14 to accommodate the dog of the feed mechanism to be presently described. (See Fig. 5.)

The transverse bridge 7 is enlarged or widened at the front portion of the machine, as indicated at 15, and this bridge is formed with a longitudinal slot 16, a shorter longitudinal slot 17, a transverse slot 18, and another transverse slot, 19, said slots 18 19 being indicated by dotted lines in Fig. 2 and the slot 18 extending through the longitudinal slot 16, while the other slot, 19, intersects with both of the longitudinal slots 16 17, as will be understood by reference to Fig. 2.

20 designates a feed-bar, which is fitted slidably in the longitudinal slot 16 of the bridge and is capable of a combined reciprocatory and pivotal movement therein. This feed-bar is provided at its front end with a short longitudinal slot 21, at its rear end with a similar slot 22, and in its lower edge with a notch or recess 23, the latter being situated at a point between the short slots 21 22. In one face or side of this feed-bar 20 is formed a vertical dovetailed recess 24, the latter being situated between the slot 21 and the recess 23, and in this recess is received the dovetailed shank 25 of the feed-dog 26, the latter being shown more clearly by Figs. 7 and 8. The shank 25 of the feed-dog is attached to the feed-bar 20 by sliding it into the dovetailed recess 24 until the lower edge of the feed-dog rests upon the top edge of the feed-bar, the position of these parts being indicated more clearly by Fig. 6, while the dovetailed recess 24 is shown in the plan view, Fig. 2.

In my improved reversible feed mechanism I employ a feed-dog having a working face of peculiar construction, the same being represented more clearly by Figs. 5, 6, and 7 of the drawings. The upper active face of this feed-dog is formed with a plurality of teeth or serrations 27 28, the same being grouped in pairs and the adjacent pairs of teeth being separated by slots or depressions 29. The teeth 27 are all inclined in one direction, while the teeth 28 are inclined in an opposite direction, and as the reversely-inclined teeth are disposed in pairs it will be seen that the active face of the feed-dog is formed with a series of grooves, one side of

each groove being bounded by a tooth 27, while the other side of the groove is bounded by the tooth 28 of the pair. The sharp edges of the teeth 27 28 terminate in the same horizontal plane, and the peculiar construction and arrangement of the teeth enable the dog to feed the material in one direction or the other, according to the direction in which the feed-bar 20 and the dog are driven by the other parts of the improved feed mechanism. The feed-dog 26 plays freely in the slot 14 of the needle-plate and, with this dog, cooperates the presser-foot 30, which is carried by the presser-foot bar 31, mounted in the head 32 of the arm 33. (See Fig. 1.)

The feed-bar 20 is movably held at its rear end in the slot 16 of the transverse bridge by a screw or pin 34, which is fastened in the bridge 7 and passes through the slot 22 at the rear end of said feed-bar, said pin 34 permitting the feed-bar to have slidable and pivotal movement with respect thereto. The front end of the feed-bar is upheld in the slot 16 by the driving-bar 35, the latter passing loosely through the slot 19 of the bridge and the slot 21 of said feed-bar. This driving-bar 35 operates to impart a vertical movement to the feed-bar 20 and the dog 26, and said bar 35 ranges longitudinally of the bed-plate on the under side thereof and parallel to the shuttle-bar 9. The driving-bar 35 is peculiarly fashioned to impart the lifting movement to the feed-bar and the feed-dog, and in one embodiment of the invention I provide this driving-bar with an offset or crook 37, the latter forming a cam-surface which is arranged to play loosely through the slot 19 and to impinge or ride against the slotted edge 21 of the feed-bar. The cam-surface 37 of the driving-bar 35 is shown more clearly by Figs. 1 and 16, and when the driving-bar 35 is moved in one direction the cam-surface 37 thereon operates on the feed-bar 20 to lift the latter on the axis afforded by the pivot 34, thus raising the dog 26; but as said bar 35 is moved in the opposite direction the cam-surface 37 is withdrawn from engagement with the bar 20 and the latter is lowered, so as to partly withdraw the feed-dog 26 below the plane of the needle-plate 13. This driving-bar 35 is supported at one end by means which will be hereinafter described, and the other end of the bar is provided with a short longitudinal slot 38, through which passes a pivot-pin 39, that is clamped or secured firmly to said slotted end of the driving-bar. This pivot-pin 39 is mounted loosely in a short offstanding arm 40, which is made in one piece with the shuttle-bar 9, and when this shuttle-bar is driven the arm 40 is rocked back and forth to impart reciprocating movement to the driving-bar 35, thus making said driving-bar impart the rising-and-falling movement to the feed-bar and the dog carried thereby. The provision of the slot 38 in the driving-bar 35 allows a limited adjustment of this driving-bar with relation to the



pivot 39, thus regulating the position of the cam-surface 37 with respect to the slotted end 21 of the feed-bar 20.

41 designates an adjusting-plate which is fitted snugly in the longitudinal slot 17 of the bridge 7. This plate 41 is arranged in the bridge to extend to the front edge of the bed-plate, and it lies parallel to the front portion of the feed-bar 20. (See Fig. 2.) The plate 41 is adjustable in the slot of the bridge to have a limited rising-and-falling movement therein; but normally this adjusting-plate remains in a stationary position when the feed mechanism is in motion, the said plate 41 serving as the guide and the support for the free end of the driving-bar 35. The plate 41 is provided with inclined slots 42, through which are passed suitable screws 43, that are secured in the bridge 7, said screws serving to hold the plate 41 in position to rise and fall when the plate is adjusted by the regulating-bar, to be hereinafter described. The plate 41 is provided with a slot 44, which alines or registers with the slot 21 in the feed-bar 20, and against this slotted part of the guide-plate is secured an adjustable plate 45. This adjustable plate is provided with a wide slot 46, which registers with the slot 44, and the plate 45 is furthermore provided with a short slot 47, through which passes a screw 48, that is secured in the plate 41. The screw fastens the plate 45 adjustably to the plate 41, so that it may be raised or lowered thereon, and in the slot 46 of the plate 45 is received the end of the driving-bar 35, whereby said plate 45 may be raised or lowered on the plate 41 to regulate the elevation of the driving-bar 35. From this description it will be understood that the free end of the driving-bar 35 passes through the slot 21 of the feed-bar, the slot 44 of the plate 41, and the slot 46 of the plate 45, and that the plates 41 45 cooperate in limiting the driving-bar 35 to movement in a rectilinear path, thus making it possible for the cam-surface 37 of said bar 35 to impart the desired rising-and-falling motion to the feed-bar and the dog.

The guide-plate 41 is provided in its top edge and near the front end with a notch or recess 49, in which is loosely fitted the adjusting-bar 50. This adjusting-bar is arranged in a horizontal position below the bed-plate 5, at the front edge thereof, said bar extending longitudinally of the bed-plate and having its end portions bent or deflected downwardly, as at 51 in Fig. 3. The bar is capable of a limited endwise and pivotal movement, and the rear bent end 51 of said bar is pivotally attached at 52 to a dovetailed slidable block 53. (See Figs. 2 and 3.) The block 53 is snugly received in a dovetailed guideway 54, which is provided on the under side of the bed-plate 5 at a point adjacent to the upright post 55 of the arm 33, and this bed-plate is provided with a longitudinal slot 56. (See Figs. 2 and 5.) This slot opens

through the under side of the bed-plate, so as to communicate with the guideway 54, and the bed-plate is provided with a graduated scale 57 adjacent to one edge of said slot 56. The dovetailed slide 53 is movable freely in an endwise direction in the guideway 54, and the position of this slide 53 may be regulated within certain limits by the employment of the stop-screws 58, the latter passing through the slot 56 and having suitable thumb-nuts on the upper side of the bed-plate.

It will be seen that the adjusting-bar 50 is adapted to move pivotally on the slide 53 and that it is capable of an endwise movement with said slide when the latter is shifted in the guideway, such endwise adjustment of the bar and the slide being regulated by the stop-screws 58. The bar 50 is provided with a suitable finger-plate 59, having short arms 60, which are fastened to the bar, and this finger-plate is preferably provided with a series of knobs 61. The finger-plate extends downwardly from and is disposed parallel to the adjusting-bar, so that its knobs 61 will extend beyond the front edge of the bed-plate and be within convenient reach of the operator's hand. The bar 50 is adapted to be locked fixedly in position when the feed mechanism is in motion, and as one means for locking this bar in any desired position I employ a series of teeth or serrations 62 on one edge of the bar. A locking-plate 63 is secured firmly to an enlarged portion 8 of the bridge by suitable screws, and this plate is provided with a lip 64, having a serrated edge 65, the latter being in opposing relation to the serrations 62 of the adjustable bar. The toothed edge of the bar is normally held in engagement with the corresponding edge of the locking-plate by a retractor, which is shown in the form of a spring 66, arranged to act against a plunger 67, which is housed in a recess 68, provided in an end portion of the bridge 7, as shown by Fig. 2. The spring normally impels the plunger 67 into engagement with the back edge of the adjusting-bar 50, so that the serrated edge of the bar is held in engagement with the locking-plate; but when it is desired to adjust the bar 50 it is necessary to press inwardly on the finger-plate 59 to withdraw the serrated edge 62 from the plate 63 and compress the spring 66, thus turning the bar 50 on its pivot 52, after which the bar and the slide 53 may be moved endwise.

The end portion of the bar 50, which passes through the notch 49 of the guide-plate 41, is pivotally connected with a reversing device of the feed mechanism, and the swinging adjustment of this bar 50 on the pivot 52 imparts the desired rising-and-falling movement to the guide-plate in a way to lower the bar 35 and the feed-bar 20, with its dog 26, before the bar 50 is moved enwise to adjust the reversing-lever, whereby the feed-dog is adapted to be withdrawn from the work quickly and before the feed mechanism is reversed



to change the direction of movement of the feed-dog.

70 designates a pivot-bearing plate which is arranged in a horizontal position on the under side of the bed-plate, near one end thereof, said plate resting against the depending lugs 69, which are integral with the bed-plate, and the bearing-plate being secured by screws 69<sup>a</sup> to the lugs, as indicated more clearly by Figs. 1 and 4. Depending from this bearing-plate is a bracket 71, having the angular form shown by Fig. 4, said bracket being secured to the under side of the bearing-plate 70 by the screws 71<sup>a</sup>.

72 designates a shiftable cam which is in the form of a disk, as shown by Fig. 2, said cam being provided in its under surface with a straight transverse groove 73 and also provided with an upstanding stud 74, which is mounted in the bearing-plate 70 to turn freely therein, whereby the cam is disposed below the bearing-plate and pivotally connected thereto. The stud 74 of the cam extends above the bearing-plate, and on this extended portion of the stud is rigidly secured a gear-segment 75, the latter being shown by Fig. 6 as provided with teeth extending only part way around its circumference.

The reversing-lever of the feed mechanism is indicated at 76, the same being arranged in a horizontal position, as shown by Fig. 2, and provided with a fulcrum-stud 77, that is loosely supported in the pivot-bearing plate 70. One end of this lever is enlarged to form a gear-segment 78, which meshes directly with the gear-segment 75, thus providing means for turning the cam 72 on its axis. The other end of this reversing-lever 76 is extended or prolonged through a suitable opening in the front side of the depending rib 6, and this end of the lever is provided with a short slot 79, which loosely receives the stud 80 on one end of the adjusting-bar 50, said adjusting-bar being thus shiftable and loosely connected with the reversing-lever.

81 designates a driving-rod arranged to impart the back-and-forth motion to the feed-bar 20 and the dog 26. This bar lies below the bed-plate and parallel to the shuttle-bar 9. Said driving-bar extends loosely through the slot 18 of the bridge, and at one end of the bar it is provided with a stud, which carries a friction-roller 82. The end of the bar which is equipped with the friction-roller is adapted to ride upon the bottom portion of the bracket 71, so that it will be supported by the wall of the slot 18 and by the bracket, and this friction-roller 82 is fitted to move freely in the slot 73 of the reversing-cam 70. The driving-rod 81 extends rearwardly below the hollow post 55 of the machine-arm, and in the lower portion of this post is mounted a tubular rocking shaft 83. Said shaft is arranged in a horizontal position, and it is provided with two arms 84 85, the first-named arm, 84, being arranged at the middle portion of the shaft, while the other arm, 85, is at one

end of the shaft. (See Figs. 1 and 2.) The depending arm 85 of the rock-shaft is loosely connected to the rear end of the driving-bar 81, so as to impart endwise movement to the latter. The shaft 83 and its arms 84 85 provide a bell-crank connection between the driving-rod 81 and a vertically-movable bar 86, the latter being disposed in a vertical position within the hollow post 55. The post 55 is provided at its lower portion with vertical guideways 87, which are preferably integral with said post, and the vertical bar 86 is provided with flanges 88, which are fashioned to fit snugly in the guideways 87, thus slidably confining the lower portion of the vertical bar 86 to vertical movement within the post. Said bar 86 is, furthermore, slotted or bifurcated at its lower guided portion and in this bifurcation is loosely fitted one end of a link 89, the same being pivotally connected at 90 to the bar 86, while the other end of the link is pivoted at 91 to the arm 84 of the bell-crank of the rock-shaft. The upper part of the bar 86 is enlarged to form a head 92, in which is produced a recess 93 and a transverse slot 94, said slot permitting the driving-shaft 95 to pass through the upper part of the bar 86, whereby said upper end of the bar is slidably confined by the shaft. This driving-shaft extends through the arm 33 in the ordinary way for the purpose of being operatively connected with a needle-bar 96 and at one end of the shaft is secured the fly-wheel 97 and the grooved pulley 98, these parts being ordinary in the art.

The shuttle-bar 9 may be driven by any suitable devices from the driving-shaft 95, but, as shown, I employ a vertical lever 99, which is fulcrumed at 100 in the post 55, the lower end of said lever being operatively connected with the shuttle-bar 9, as shown by Figs. 1 and 2. The vertical bar 86 is provided with a longitudinal slot 86<sup>a</sup>, (indicated by dotted lines in Fig. 4,) and through this slot passes the pivotal support of the shuttle-driving lever 99. The bar 86 and the lever 99 are driven by a combined cam and eccentric, (indicated at 101 102,) said parts being made of a single piece of metal and secured to the shaft to rotate therewith and to engage, respectively, with the lever 99 and the recessed part 93 of the vertical bar 86. The cam 102 is preferably shaped as shown more clearly by Fig. 10, and said cam is adapted to actuate the bar 86, the bell-crank, and the driving-rod 81 for the purpose of reciprocating the feed-bar 20 and the dog 26 in harmony with the rising-and-falling motion given thereto by the driving-bar 35, and also in unison with the sewing mechanism actuated by the shuttle-bar 9 and the needle-bar 96.

The direction in which the feed mechanism is operated is determined by the position of the cam 72 and the direction of operation of the driving-bar 81; but after the cam shall have been adjusted to the desired position it is held stationary by the lever 76 and the ad-



justing-bar 50, which is held in locked engagement with the plate 63 by the spring 66. With the cam 72 in the position shown by Fig. 2 the groove 73 is in line with the plane of motion of the driving-bar 81, and this bar is free to reciprocate without influencing the feed-bar 20 and the dog 26. To make the feed-bar and the dog reciprocate in one direction, the bar 50 is manipulated by hand to free it from engagement with the locking-plate, and this operation lowers the guide-plate 41, so as to depress the dog 26, and then the adjusting-bar is moved endwise in one direction with the slide 53, whereby the lever 76 is turned on its fulcrum and the gear 78 acts through the gear 75 to turn the cam 72 one way in order to move the groove 73 to an inclined position relative to the path of the bar 81, after which the bar 50 is again locked in engagement with the plate 63. When the bar 81 is driven by the vertical movement of the bar 86, it is deflected by the cam-groove 73 in a lateral direction, the roller 82 riding in said cam-groove. The back-and-forth lateral motion of the bar 81 takes place simultaneously with its endwise reciprocation, and said bar 81 thereby imparts the desired movement to the feed-bar 20, because said bar 81 passes through and engages snugly with the notch 23 in said feed-bar. The feed-bar 20 and its dog 26 are capable of four motions under the action of the driving-bars 35 and 81, and these bars are actuated by the reciprocating bar 86 and the shuttle-bar 9, so as to give the desired rising-and-falling and back-and-forth movements to the feed-bar. The rising motion is first given to the bar 20 and dog 26 by the cam-surface on the bar 35. The bar 81 then becomes effective in moving the feed bar and dog in one direction. The bar 35 then withdraws its cam-surface from the feed-bar and allows the feed-dog to fall, and finally the bar 81 is reversed to return the bar 20 and the dog to the former position, after which the operations are repeated indefinitely. The extent or degree of lateral deflection of the bar 81 is determined by the degree of adjustment imparted to the grooved cam 72, and the amount of lateral deflection of said driving-bar 81 determines the length of the stitch. If the grooved cam 72 is turned at a slight angle to the path of the bar 81, it is evident that a short stitch will be produced; but if the grooved cam is turned so as to make its groove lie at an abrupt angle to the path of the driving-bar the latter will be correspondingly and increasingly deflected from its path and the stitch will be increased. To reverse the motion of the feed mechanism without stopping the machine or slackening its speed, the bar 50 is shifted endwise in an opposite direction, and the lever 76 is thereby turned in order to partially turn the cam 72 to a position where its groove will be inclined in an opposite direction to the path of the driving-bar 81, and under either adjustment of this cam 72 the length of the stitch may be regulated by shift-

ing the cam to a more or less inclined position. It will therefore be understood that the cam and the driving-bar 81 may not only be adjusted to reverse the direction of operation of the feed mechanism, but the position of this cam also regulates the length of the stitch under either adjustment, so as to control the stitch when the feed mechanism operates in a forward or back direction.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a feed-dog, means for imparting four-way motion to said feed-bar, shifting devices for reversing the operation of the feed-bar by changing the position of the means which impart the back-and-forth motion thereto, and means controllable by said shifting devices for lowering the feed-bar and feed-dog prior to the reversal of the direction of motion of the feed-bar.

2. A reversible feed mechanism for sewing-machines having a feed-bar, a feed-dog movable with said bar, means for imparting four-way motion to said feed-bar and including a driving-bar and a shiftable cam with which said driving-bar is slidably engaged, an adjusting-plate, another driving-bar engaged slidably with said adjusting-plate, and means controllable at will and connected operatively with the adjusting-plate and with the shiftable cam for successively withdrawing the feed-dog from the plane of feed of the work and for reversing said cam, whereby the direction of movement of the feed-dog may be reversed.

3. A reversible feed mechanism for sewing-machines, comprising a feed-bar having a feed-dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, a shiftable cam having a groove, another driving-bar slidably fitted to said grooved cam and engaging with said feed-bar, means for lowering the feed-bar and feed-dog, and controlling devices connected with said cam and with said lowering devices for actuating the latter prior to changing the position of the cam.

4. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, a shiftable cam having a transverse guideway, another driving-bar slidably fitted to said guideway of the cam and engaging with said feed-bar, means for imparting reciprocating movement to said driving-bars, an adjusting-plate capable of a rising-and-falling movement and connected with said first driving-bar, and means controllable at will for lowering the adjusting-plate and for shifting the relation of said cam to said second driving-bar, whereby the feed-bar and dog may be lowered by the adjusting-plate previous to the reversal of the cam.

5. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a



feed-dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, another driving-bar connected with the feed-bar, a cam having a transverse guideway in which the second driving-bar is slidably fitted, a rising-and-falling adjusting-plate with which the first driving-bar is slidably engaged, and a controlling-bar connected operatively with the adjusting-plate and with said cam for lowering the adjusting-plate, the first driving-bar and the feed-bar prior to the reversal of the cam.

6. A reversible feed mechanism for sewing-machines, comprising a feed-bar having a feed-dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, another driving-bar slidably connected with the feed-bar to move the latter back and forth, a cam having a guideway in which the second driving-bar is slidably confined, a lever geared to said cam to axially turn the same, a rising-and-falling adjusting-plate with which the first driving-bar is slidably engaged, and an adjusting-bar connected with the adjusting-plate and with said lever for lowering the adjusting-plate prior to the reversal of the cam.

7. A reversible feed mechanism for sewing-machines, comprising a feed-bar having a feed-dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, a pivoted cam having a guideway and a gear member, a second driving-bar slidably connected to the feed-bar and to the guideway of said cam, an adjusting-plate having slidable engagement with the first driving-bar, an adjusting-bar having operative connection with said cam and with the adjusting-plate, and means for locking said adjusting-bar in predetermined variable positions.

8. A reversible feed mechanism for sewing-machines, comprising a feed-bar having a feed-dog, a driving-bar for imparting rising-and-falling motion to said feed-bar, an adjusting-plate with which said driving-bar is slidably engaged, a shiftable cam, another driving-bar slidably engaged with the feed-bar and the cam, an adjusting-bar having operative connection with said adjusting-plate and said cam to change the positions of the plate and the cam, a locking device engaging with said adjusting-bar, and means for normally holding said adjusting-bar in fixed engagement with said locking device.

9. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a dog, two driving-bars connected with said feed-bar for imparting four-way motion thereto, a shiftable cam to which one driving-bar is slidably fitted, an adjusting-plate having the other driving-bar engaged slidably therewith, a slidable adjusting-bar connected to said adjusting-plate, operative connections between said adjusting-bar and the shiftable cam, and means for locking said adjusting-bar in predetermined variable positions.

10. A reversible feed mechanism for sewing-

machines, comprising a feed-bar carrying a dog, two driving-bars fitted to said feed-bar for imparting four-way motion thereto, a cam with which one of the driving-bars is slidably engaged, a slotted adjusting-plate with which the other driving-bar is slidably engaged, an adjusting-bar capable of a pivotal and slidable motion and connected with said adjusting-plate to shift the latter and thereby raise or lower the said plate and the feed-dog, and connections between the adjusting-bar and the cam for reversing the latter subsequent to lowering the adjusting-plate.

11. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a feed-dog, a driving-bar having a cam-surface arranged to engage with said feed-bar and impart rising-and-falling motion thereto, a shiftable guide-plate in which said driving-bar is slidably fitted, means for imparting back-and-forth motion to said feed-bar, and adjusting devices connected with said means and with said guide-plate to first lower the feed-dog and thereafter change the direction of operation of the means which imparts the back-and-forth motion to the feed-bar.

12. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a feed-dog, an adjusting-plate mounted for rising-and-falling movement in a path parallel to said feed-bar, a driving-bar having a cam-surface and engaging slidably with the feed-bar and the adjusting-plate, a cam, another driving-bar connected with the feed-bar and slidably fitted to said cam, an adjusting-bar connected with the movable adjusting-plate, and connections between the adjusting-bar and said cam to change the position thereof relative to the path of one driving-bar.

13. A reversible feed mechanism for sewing machines, comprising a feed-bar having a feed-dog, an adjusting-plate, a guide-plate adjustably mounted for rising-and-falling movement on the adjusting-plate, a cam-formed driving-bar engaging with said feed-bar and with the adjustable guide-plate, whereby the elevation of the driving-bar may be determined, a shiftable cam, a driving-bar engaging with the feed-bar and said cam, and adjusting devices having operative connections with the adjusting-plate and said cam for lowering the adjusting-plate and the feed-dog prior to reversal of the cam.

14. A reversible feed mechanism for sewing-machines, comprising a feed-bar carrying a dog, a shiftable cam, a driving-bar slidably engaging with said feed-bar and with said cam, a vertical bar limited to slidable movement in a vertical path, a driving-shaft having a cam for imparting motion to said vertical bar, a bell-crank connected pivotally at one end to said vertical bar and having a pivotal connection at its other end with said driving-bar, means for adjusting the position of said shiftable cam, and means for



imparting rising-and-falling motion to said feed-bar.

15. A reversible feed mechanism for sewing-machines, comprising a bed-plate, a block fitted slidably thereto, means on the bed-plate for limiting the slidable adjustment of said block, an adjusting-bar pivoted to the block and capable of a pivotal and endwise movement relative to the bed-plate, cooperating devices on the bed-plate and the adjusting-bar for locking the latter against movement in either of a series of adjusted positions, a feed-bar having a dog, means for imparting four-way motion to said feed-bar and including a driving-bar and a shiftable cam, with which cam the driving-bar is slidably engaged, and devices connecting the adjusting-bar operatively with the feed-bar and with the shiftable cam and effective on the slidable adjustment of the adjusting-bar in withdrawing the feed-dog from the path of the work and reversing the position of the cam.

16. A reversible feed mechanism for sewing-machines, having a bed-plate provided with a transverse bridge having longitudinal slots, a feed-bar slidably confined in one slot and carrying a feed-dog, an adjusting-plate fitted in the other slot to have up-and-down movement therein, a shiftable cam, a driving-bar connected with the feed-bar and slidably fitted to said cam, another driving-bar guided by said adjusting-plate and having a cam-surface to ride against the feed-bar, and an adjusting-bar operatively connected with the adjusting-plate and said shiftable cam.

17. In a sewing-machine, the combination of a hollow arm, a bed-plate, vertical guideways, a reciprocatory bar slidably fitted to said guideways and limited to vertical movement thereby in said arm, means for imparting movement to said bar, a feed-dog, means to impart rising-and-falling motion to said dog, a shiftable cam, a driving-bar connected to the cam and the dog, and a rocking lever connected to said reciprocatory bar and the driving-bar.

18. In a sewing-machine, the combination with a driving-shaft, of an eccentric having a cam connected therewith, a shuttle-driving lever actuated by said eccentric and adapted to drive a shuttle-bar, a vertically-reciprocating bar guided for slidable movement in a vertical path and driven by said cam, a driving-bar, a bell-crank connecting the vertical reciprocating bar with said driving-bar, a feed-dog, a shiftable cam connected with the driving-bar, and means connecting the feed-dog and the driving-bar.

19. In a sewing-machine, the combination with a bed-plate, of a pivot bearing-plate fixed thereto, a normally stationary cam piv-

oted to said bearing-plate, a bracket fixed to the bearing-plate, a driving-bar supported by the bracket and slidably engaging with said cam, means for axially turning the cam and reversing the relation thereof to said driving-bar, a feed-dog actuated by said driving-bar, and means for imparting rising-and-falling motion to said feed-dog.

20. In a sewing-machine, the combination of a shuttle-bar having an arm, a feed-bar carrying a dog, a driving-bar connected adjustably and pivotally to said arm of the shuttle-bar for actuation thereby and having its other end portion engaged slidably with the feed-bar for imparting rising-and-falling motion thereto, an adjusting-plate limited to rising-and-falling movement and having said driving-bar connected slidably thereto, a shiftable cam, another driving-bar slidably engaged with said cam, and the feed-bar for imparting back-and-forth motion to said feed-bar in unison with the rising-and-falling motion imparted thereto by the first-named driving-bar, and means operable at will for shifting the adjusting-plate and reversing the cam sequentially.

21. In a sewing-machine, the combination with a feed-bar carrying a feed-dog, and means for imparting four-way motion to said feed-dog and including a shiftable cam and a driving-bar which is engaged slidably with the feed-bar and the cam, of an adjusting-plate limited to rising-and-falling movement relative to the feed-bar, another driving-bar having slidable engagement with said adjusting-plate, and means controllable at will and connected operatively with the shiftable cam and the adjusting-plate for lowering the latter and subsequently reversing the cam.

22. In a sewing-machine, the combination with a feed-bar carrying a feed-dog, and means for imparting four-way motion to said feed-bar and including a shiftable cam and a driving-bar having slidable engagement with said cam, of an adjusting-plate limited to rising-and-falling motion relative to the feed-bar, another driving-bar having slidable engagement with the adjusting-plate, an endwise shiftable and pivotal adjusting-bar engaging slidably with the adjusting-plate, means connecting said adjusting-bar with the cam for reversing the latter, and means for locking the adjusting-bar in either of a series of adjusted positions.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIS AUSTIN SMITH.

Witnesses:

JNO. M. RITTER,  
H. T. BERNHERD.