No. 814,026. PATENTED MAR. 6, 1906.

C. A. DEARBORN.

FEED MECHANISM FOR SEWING MACHINES.

APPLICATION FILED SEPT. 29, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

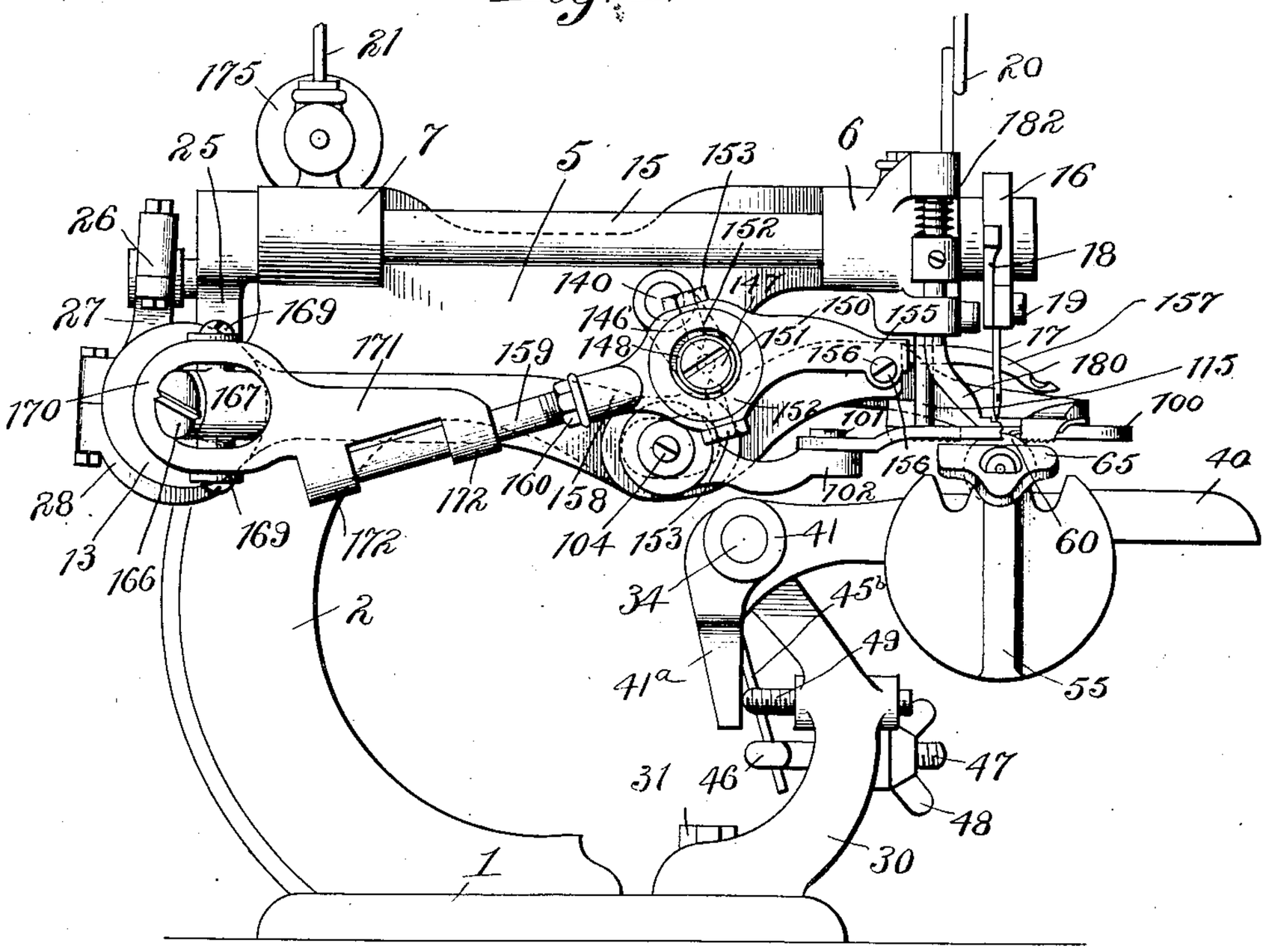

Fig. 3.

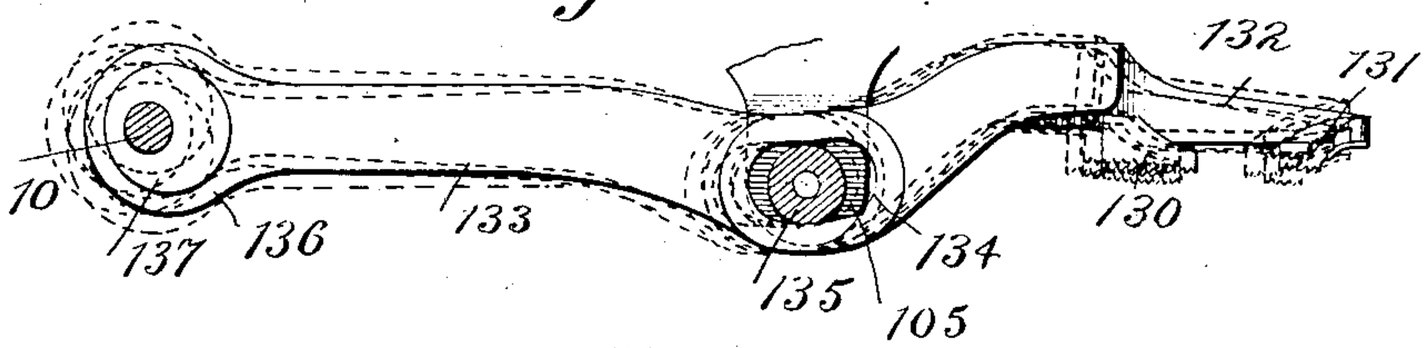

Fig. 5.

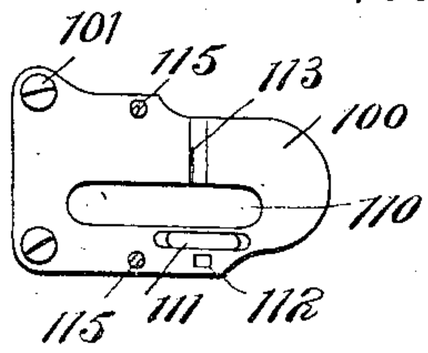

Fig. 3a.

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2 SHEETS—SHEET 2.

Fig. 2.

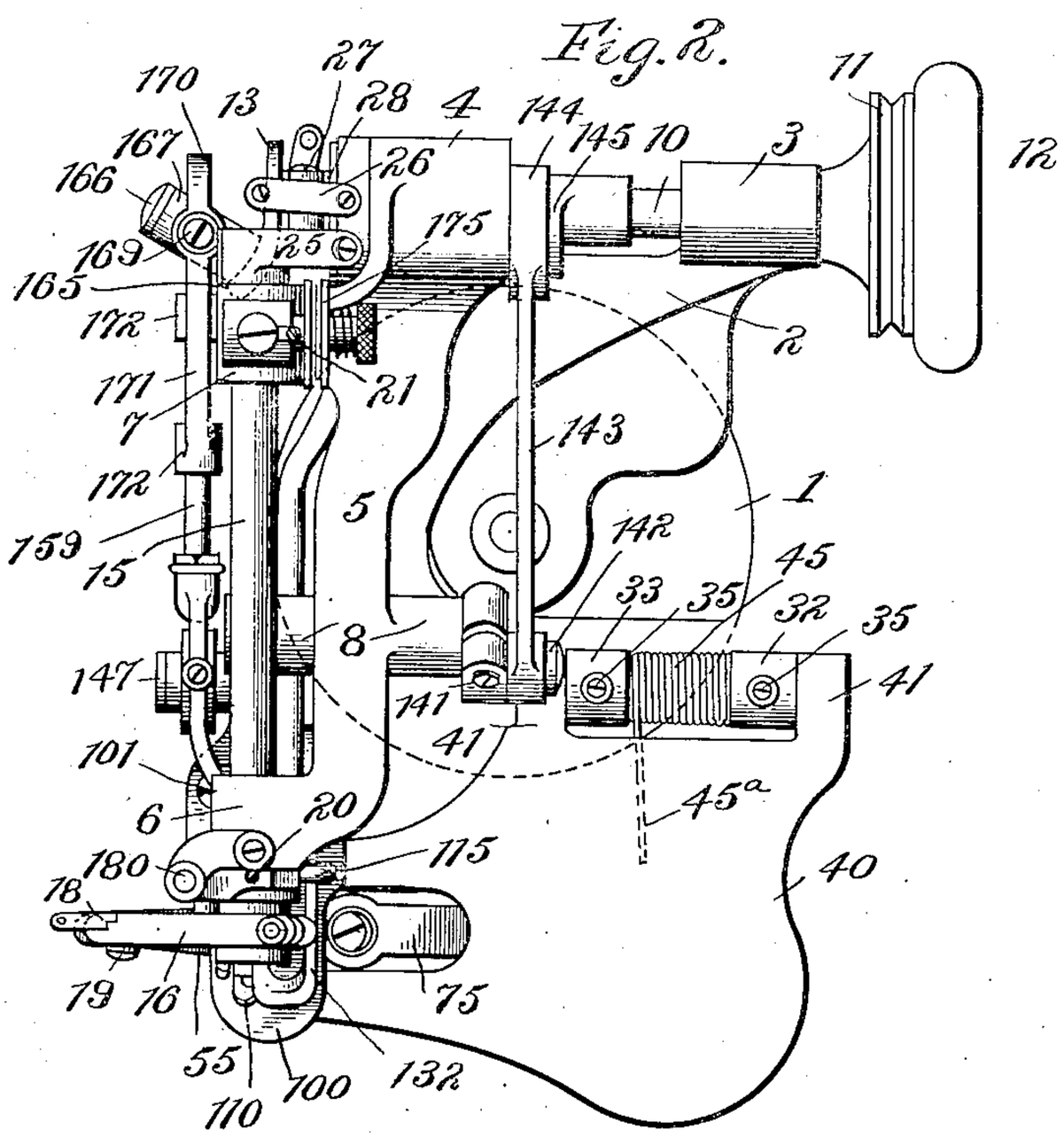
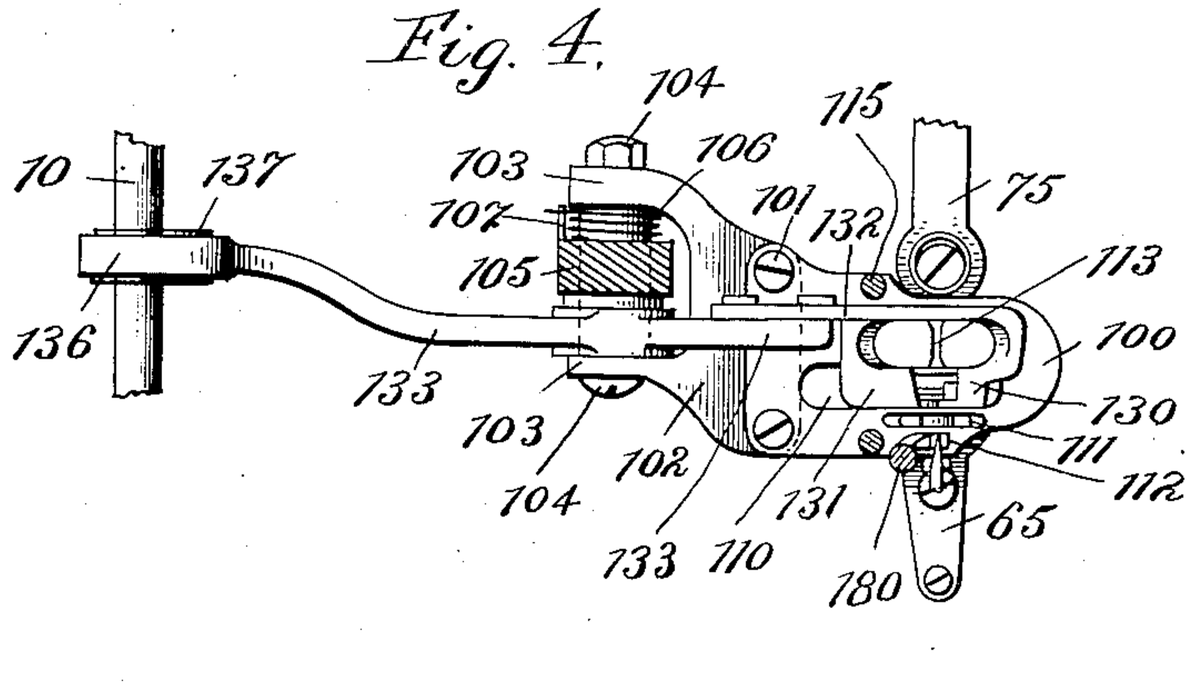


Fig. 4.



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FEED MECHANISM FOR SEWING-MACHINES.

No. 814,026. Specification of Letters Patent. Patented March 6, 1906.

Original application filed July 21, 1904, Serial No. 217,474. Divided and this application filed September 29, 1904. Serial No. 226,547.

To all whom it may concern:

Be it known that I, CHARLES A. DEARBORN, a citizen of the United States, and a resident of New York, in the borough of Manhattan and county and State of New York, have invented certain new and useful Improvements in Feed Mechanism for Sewing-Machines, of which the following is a specification.

The present application is a division of my original application, Serial No. 217,474, filed July 21, 1904, for improvements in sewing-machines, and the invention covered by the present case relates to improvements in feeding mechanism which are applicable to sewing-machines in general, but are particularly designed for overseaming blindstitch sewing-machines, such as illustrated in Patents No. 639,669, dated December 19, 1899; No. 679,553, dated July 30, 1901; No. 705,325, dated July 22, 1902, and No. 705,326, dated July 22, 1902, heretofore granted to me.

In machines covered by my above-named patents the feeding mechanism is in the form of intermittently-actuated rotating feed-rolls mounted upon a spring-sustained work support or frame and engaging the work from beneath and holding it up against a rigid presser-foot in proper position for the action of the stitch-forming mechanism. In one of the old forms of my machine I have also employed an auxiliary reciprocating feed mechanism engaging the work from above to coöperate with and supplement the action of the under-roller feed mechanism referred to. These old forms of feeding mechanism are extremely complicated and expensive to manufacture and the location of the operating parts necessarily presents objectionable obstructions above the plane of the work-support which interfere with the convenient manipulation of the work. The improved feeding mechanism overcomes these objections, as hereinafter explained.

The old form of underfeed roller mechanism is done away with in the improved machine, and in place of such feeding mechanism I employ in the new machine an effective reciprocating underfeed device preferably in the form of a two-part serrated feed-dog, the two parts being arranged end to end parallel with the line of feed, with a small space separating them to allow for the operation of the needle. This two-part feed-dog is mounted upon a reciprocatory arm or bar, actuated at its rear end by an eccentric upon the main driving-shaft of the machine and supported between its ends by a pin or stud which passes through an elongated journal-opening having a peculiar cam-shaped wall so arranged that, in combination with the actuating-eccentric, it will cause the feed-dog to have an effective horizontal feeding-stroke in engagement with the work and a return movement disengaged from the work. The omission of the complicated underfeed mechanism of the old machine and the employment of the simple reciprocatory feed-dog, which is supported from the machine-arm above the plane of feed, greatly simplify the machine and materially increase the scope of its work.

In order that my invention may be fully understood, I will first describe the same with reference to the accompanying drawings and afterward point out the novelty with more particularity in the annexed claims.

In said drawings, Figure 1 is a side elevation of a sewing-machine embodying improved feeding mechanism. Fig. 2 is a plan view of the same. Fig. 3 is a detail side elevation, partly in section, of the feeding mechanism, shifted positions of the latter being shown in dotted lines. Fig. 3ª is a diagrammatic representation of the movement of the feed-dog. Fig. 4 is a detail sectional plan view of the same. Fig. 5 is a detail plan view of the presser-foot.

The main frame of the machine is formed of a single casting comprising a rigid central base 1, the upwardly-extending rear arm 2, terminating in the sleeves or shaft-bearings 3 4, and a forwardly-extending arm 5, having the needle-shaft bearings 6 7 and the looper rock-shaft bearing 8.

10 is the main driving-shaft of the machine, journaled in the sleeves or bearings 3 4 of the rear arm 2 and having keyed to one end a driving-pulley 11 and fly-wheel 12 and at its opposite end a crank-disk 13, hereinafter referred to.

15 is the forwardly-extending needle rock-shaft, journaled in the bearings 6 and 7 and having rigidly mounted upon its forward end a needle-carrying rock-arm 16, in which is mounted a curved needle 17.

18 is the usual thread-guide and needle-clamp, mounted upon the rock-arm 16 by means of the set-screw 19.

20 and 21 are ordinary thread-guides.

Secured to the rear end of the needle rock-shaft 15 is a rock-arm 25, having universal-joint connection 26 with a link 27, which encircles an eccentric 28, mounted upon the main power-shaft 10 just inside of the crank-disk 13. The link 27 and the eccentric 28 are formed with spheroidal engaging surfaces to allow free lateral play of the link in the transmission of the rotary motion of the main shaft 10 into the oscillatory motion of the needle-shaft 15. By this needle-operating mechanism (which is the same as in the prior patents) the needle is given a reciprocatory motion in an arc transverse to the path of the work which is passed through the machine by the mechanisms now to be described.

Projecting up from the forward edge of the base 1 is an auxiliary arm 30, which is rigidly and adjustably secured to the base by means of set screws or bolts 31. The auxiliary arm 30 is formed at its upper end with two sleeves 32 and 33, in which is mounted a pivot-shaft 34, projecting a little beyond each of the sleeves 32 and 33. Set-screws 35 pass through the sleeves 32 and 33 and engage the pivot-shaft 34 for holding it rigidly in position.

40 is a horizontal forwardly-extending spring-sustained work-supporting frame. This frame 40 has the rearwardly-presented integral journal-sleeves 41, which are journaled upon the projecting ends of the pivot-shaft 34 and rest snugly against the frame-sleeves 32 and 33, by which the work-support 40 is accurately held in position, said support being allowed to move vertically upon its pivot. Surrounding the pivot-shaft 34 between the sleeves 32 and 33 is a torsion-spring 45, one end 45^a of which is extended beneath the work-supporting plate 40 to hold said plate upward with a yielding pressure, while the other end 45^b of said spring is extended down behind the auxiliary frame-arm 30 and is engaged by a hook 46, formed on the rear end of a threaded rod 47, which passes freely through an opening formed in the arm 30 and is engaged at its forward threaded end by a butterfly-nut 48, by which the tension of the spring 45 can be increased or decreased at will. The work-support 40 is also formed with an integral downwardly-projecting arm 41^a, extending below the left-hand bearing 41 in position to engage an adjustable stop in the form of a screw 49, which is threaded through an integral lug of the auxiliary arm 30. By adjusting the screw-stop 49 the limit of the normally raised position of the work-supporting plate 40 under the action of the spring 45 can be adjusted to a nicety. The work-supporting plate 40 is extended to the left into a work-supporting horn 55 of approximately cylindrical shape, which horn 55 is cut out upon its upper face to receive the ridge-forming disk 60 and the independently-yielding work-supporting plates 65 and 75.

The specific structure of the ridge-forming disk and the independently-yielding work-supporting plates form no part of my present application and will not be further described here. These parts are fully described and claimed in my above-named original application, Serial No. 217,474, above referred to, of which the present case is a division.

100 is the presser-foot, removably secured by screws 101 to the forward web portion of a yoke 102, which is formed with rearwardly-presented lugs 103, which are pivoted upon set-screws 104, mounted in the downwardly-projecting lug 105, formed integral with the machine-arm 5.

106 is a torsional spring coiled around a reduced portion or hub of the lug 105 and engaging at one end a pin 107, projecting from lug 105, and at its other end beneath the rocking yoke 102, thereby giving the presser-foot a spring tendency to rise away from the work-supporting plate just described.

The presser-foot is formed with a main longitudinal slot 110, through which the ridge of the work is pressed by the work-supporting plates and ridge-forming disk for the operation of the feed and needle, and an auxiliary longitudinal groove 111 to allow for the movement of the looper in moving rearwardly to deliver the loop to the needle. The presser-foot plate also has a small perforation 112 to allow for the depression of the needle-guide 180 when the needle penetrates the goods and also to receive the lower end of the needle-guide and allow for the elevation of the presser-foot during the feeding stroke.

113 is the transverse needle-groove, cut in the upper face of the presser-foot.

115 is the yoke of the presser-foot, by which it is operated.

The spring 106 acting upon the pivotally-mounted presser-foot normally tends to raise the presser-foot away from the work-support. To force the presser-foot down against the work on the supporting-plates and disk and to actuate the needle-guide 180, I provide suitable operating and controlling devices, which are fully explained in my original application, Serial No. 217,474, but which are not described in the present case, because they form no part of the invention claimed herein. The operating means for the presser-foot allow the presser-foot to be raised just prior to the feeding stroke of the feeding mechanism.

In place of the under-roller feed mechanism heretofore employed in my machine I have arranged an effective reciprocating feeding device which engages the work upon its upper face. This device will now be described.

I employ a two-part feed-dog 130 131, each part of which is formed with two parallel rows of serrations or teeth on its under surface and arranged to engage the work in front and in rear of the path of the needle. This two-part feed-dog is preferably formed integral with and projects laterally from a supporting-arm 132, which is secured by means of screws to the forward end of a longitudinally-movable rocking arm or bar 133. This arm or bar 133 is formed between its ends with an elongated slot or opening 134, inclined slightly from the horizontal, the upper wall of the slot having a slight downward projection midway between the ends and curved or cam surfaces extending from said projection to the ends of the slot. An antifriction-roller 135 is supported upon one of the set-screws 104 from the machine-frame lug 105 and engages in the inclined elongated slot or opening 134 for supporting the arm or bar 133 with the feed-dog in operative position. The rear end or bar 133 is formed with a yoke 136, which embraces an eccentric 137, keyed to the main driving-shaft 10 of the machine, by which the feed mechanism is operated. This eccentric will cause the arm or bar 133 to reciprocate forwardly and backwardly and rock slightly upon its pivot-roller 135 to raise and lower the feed-dog, as indicated in dotted lines in Fig. 3. The inclined slot 134 moving over the antifriction-roller 135 during the reciprocation of arm or bar 133 serves to counteract the lifting of the dog on its feeding stroke and increasing the lifting action on its return stroke. The movement of the feed-dog under the action of the eccentric as modified by the cam-faces of the inclined slot and roller-support will be a feeding stroke in a straight line in a horizontal plane and a return stroke in an arc, as indicated diagrammatically in Fig. 3[a]. The two rows of teeth upon the feed-dog 130 and 131 engage the work in slot 110 of the presser-foot directly above the independently-yielding work-supporting plates 65 and 75, above referred to.

It will be observed that the presser-foot and operating mechanism and the feed-dog and operating mechanism are mounted upon the machine-arm 5 above the work-supporting frame and as compactly as possible in or adjacent to the vertical plane of the line of feed, so that the feed-frame is entirely free and unobstructed. This arrangement, together with the omission of the complicated underfeed mechanism of the old forms of my machine, greatly increase the scope of the improved machine and facilitates the convenient and rapid manipulation of the work which is produced. This simplicity and compactness of the structure, by which the cost of manufacture is reduced and the quality and quantity of work increased, is one of the most important features of my present invention.

Freely journaled in the bearing 8 of the machine-arm 5 is a rock-shaft 140, carrying at its inner end a depending rock-arm 141, to the lower end of which is pivoted at 142 the forward end of the link 143, which is formed at its rear end with a yoke 144, embracing an eccentric 145, keyed to the main shaft 10. At the outer end of the rock-shaft 140 is keyed the depending rock-arm 146, upon which the looper is journaled and by which the looper is operated. The rock-arm 146 carries at its lower end an outwardly-projecting journal-stud 147, which preferably has a threaded inner end to provide a convenient means for attaching it to the rock-arm. Freely journaled upon the stud 147 is a journal-sleeve 148, which is confined upon the stud between the rock-arm 146 and the head of the stud.

150 is the main body portion of the looper-rod. This body portion 150 is formed with a central circular opening 151, which loosely surrounds the bearing-sleeve 148. The looper-rod body is pivotally mounted upon said sleeve by means of the diametrically opposite cone-pointed center screws 152, which are threaded through the lower and upper walls of the central portion of the looper-rod body 150 and are seated in diametrically opposite cone-shaped recesses formed in the journal-sleeve 148. These center screws 152 are preferably provided at their outer ends with small lock-nuts 153 for securing them in the desired adjusted position in engagement with the sleeve 148. By reason of the pivotal connection between the looper-rod body 150 and the journal-sleeve 148 it will be observed that the looper can be rocked upon its pivots in an approximately horizontal plane in addition to its vertical oscillatory movements upon the journal-stud 147, as just described. The looper-rod body portion 150 is also formed with an inwardly-curved forwardly-projecting arm 155, formed at its front end with a socket which receives the shank of the looper proper, 157, the looper being secured in the socket by means of set-screw 156 passing through suitably-threaded ears of the under split portion of the socket. The looper-rod-body portion 150 is also formed with a rearwardly-presented socket-arm 158, into the socket of which is threaded the forward end of the tail-rod 159. A locking-nut 160 is also threaded upon said tail-rod 159 to clamp it in position upon the body portion.

As above explained, a crank-disk 13 is mounted upon the end of the driving-shaft 10. This crank-disk 13 has projecting from it at an angle of about forty-five degrees an arm 165, which supports a crank-pin 166, extending at right angles from the arm 165. Journaled upon the crank-pin 166 is a sleeve

167, having diametrically opposite cone-shaped bearing-sockets in which are seated the cone-pointed center screws 169, which are threaded through the side walls of the loop or yoke 170 for pivotally connecting said yoke with the journal-sleeve 167. The loop or yoke 170 has formed integral with it and extending forwardly from it adjacent to its lower edge a bracket-arm 171, formed with the integral journal-sockets 172, in which the guiding tail-rod of the looper is freely journaled, so as to reciprocate longitudinally and oscillate therein. The integral yoke 170, bracket-arm 171, and bearing-sockets 172 constitute what I term a "floating bearing" for imparting the lateral and a part of the vertical movements to the looper proper, said floating bearing being operated by the universal-joint connection and crank-pin above referred to.

175 is the usual thread-tension device.

The stitch-forming mechanism just described forms no part of my present invention, but is the subject of a copending divisional application filed of even date herewith, Serial No. 226,548.

The operation of the improved machine may be briefly described, as follows: The machine is primarily intended to accomplish what is known as "overseaming blind-stitching work," which style of stitching is most commonly employed in seaming the lower edges of trousers-legs, skirts, and other garments of tubular form. The operation of the machine as a whole will be clearly understood from my above-named patents and from my above-named original application, Serial No. 217,474. I will here refer only briefly to the action of the feed mechanism: While the looper is moving across the line of stitching from right to left to present the loop to the needle, the presser-foot is raised from the work-supporting plates and the feed-dog is given its feeding stroke, the material being freed from the pressure of the presser-foot during the time that the feed-dog is making its active stroke. Immediately after the completion of the working stroke of the feed-dog the presser-foot is again clamped securely upon the material to hold it firmly while the needle penetrates the work. After the looper has delivered the loop to the needle it is moved from the left-hand side of the line of stitching over to the right-hand side of the line of stitching in readiness for another forward stroke, as explained, and during this same time the feed-dog is making its return stroke out of engagement with the work in readiness for another feeding stroke.

The simplicity of the feed device is an important feature of my present machine, the construction being such that the equivalent of the four-part feed-motion is accomplished from a single eccentric, the roller and inclined slot-support of the feed-bar counteracting the vertical movement of the feed-dog on its feeding stroke to maintain it in effective engagement with the material and the same support exaggerating the raising of the feed-dog away from the material on the return inactive stroke.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a sewing-machine, the combination of the machine-frame, suitable stitch-forming mechanism, a work-support, a longitudinally-reciprocating rocking arm or bar carrying a feed-dog which operates above the work-support, a pin-and-slot connection between said arm or bar and the machine-frame, and operating means for said arm or bar adapted to cause said feed-dog to make a feeding stroke in an approximately straight line in the plane of feed, and a return stroke in an arc above the plane of feed, substantially as set forth.

2. In a sewing-machine, the combination of the machine-frame, suitable stitch-forming mechanism, a work-support, a longitudinally-reciprocating rocking arm or bar formed with a longitudinal slot between its ends, a pivot upon the machine-frame engaging in the slot of said arm or bar, a feed-dog mounted upon one end of said arm or bar and presented downwardly therefrom above the work-support, and an eccentric operating device adapted to cause said feed-dog to make a feeding stroke in an approximately straight line in the plane of feed and a return stroke in an arc above the plane of feed, substantially as set forth.

3. In a sewing-machine, the combination with suitable stitch-forming mechanism, means for supporting the work which is to be operated upon, a longitudinally-reciprocating rocking arm or bar formed with a slot, inclined with reference to the longitudinal axis of the arm or bar, a pivot projecting from the machine-frame and engaging said inclined slot for supporting said arm or bar, an eccentric engaging said arm or bar for actuating it, and a feed-dog mounted upon said arm or bar and presented downwardly therefrom above the work-support, substantially as set forth.

4. In a sewing-machine, the combination with suitable stitch-forming mechanism, means for supporting the work which is to be operated upon, a longitudinally-reciprocating rocking arm or bar formed with a slot between its ends, the said slot being inclined with reference to the longitudinal axis of the arm or bar, a stud projecting from the machine-arm, an antifriction-roller journaled upon said stud and engaging said inclined slot and supporting the feed arm or bar in approximately horizontal position, a feed-dog mounted upon and projecting beneath the

forward end of said arm or bar, and an eccentric engaging the rear end of said arm or bar for actuating it, substantially as set forth.

5. In a sewing-machine, the combination with suitable stitch-forming mechanism, means for supporting the work which is to be operated upon, an approximately horizontal longitudinally-movable slotted rocking arm or bar, the upper wall of the slot in said arm or bar being formed with a central projection and curved surfaces extending therefrom to the ends of the slot, a feed-dog mounted upon and projecting beneath the forward end of said arm or bar, a stud projecting from the machine-arm, an antifriction-roller journaled upon said stud and engaging the upper wall of said slot and supporting the feed arm or bar, and an eccentric operating upon the rear end of said arm or bar, substantially as set forth.

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