



**Jan. 24, 1939.**

**R. K. HOHMANN**

**2,144,801**

SEWING MACHINE

Filed Dec. 29, 1936

5 Sheets-Sheet 2

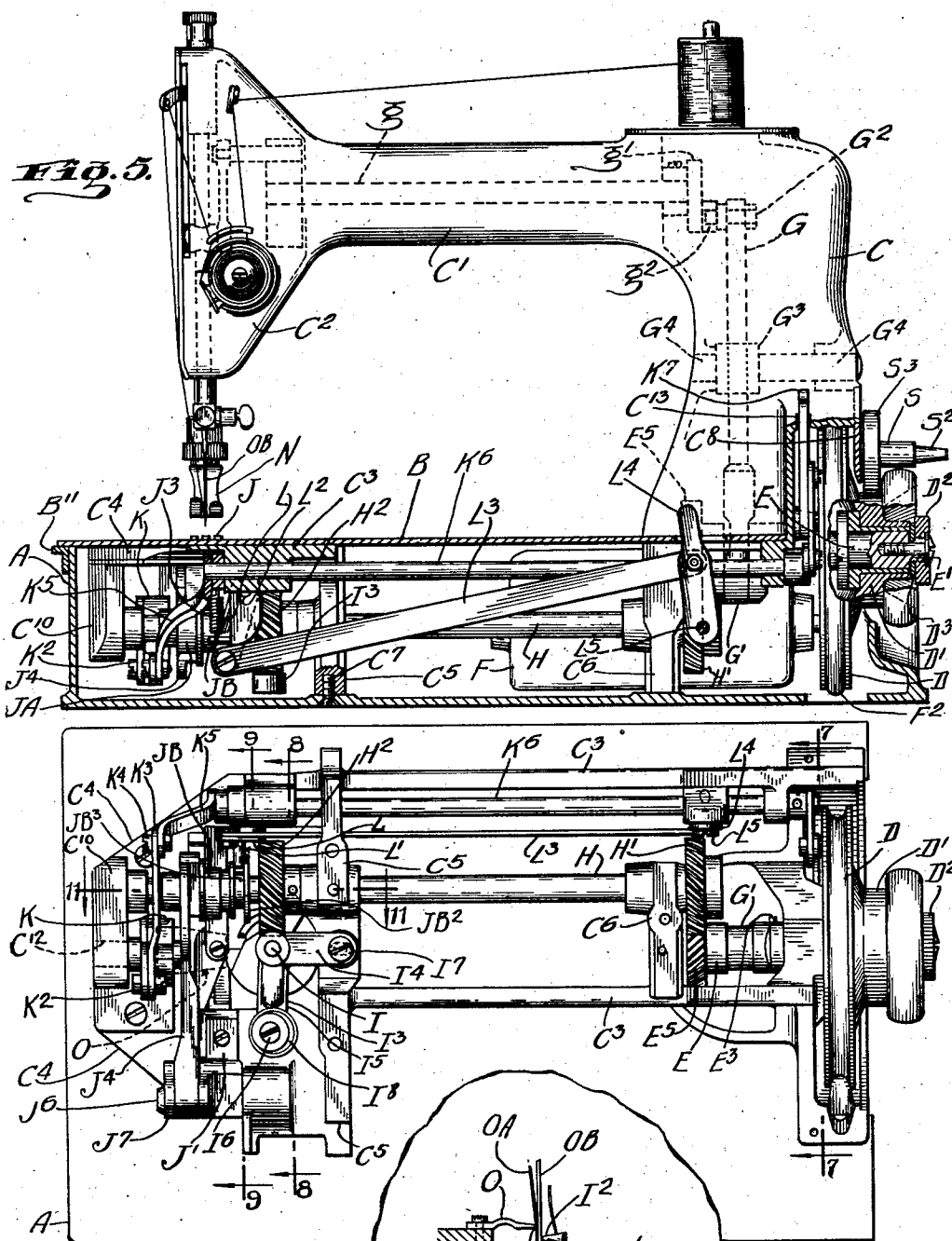


*Fig. 6.*

*Fig. 5<sup>a</sup>*

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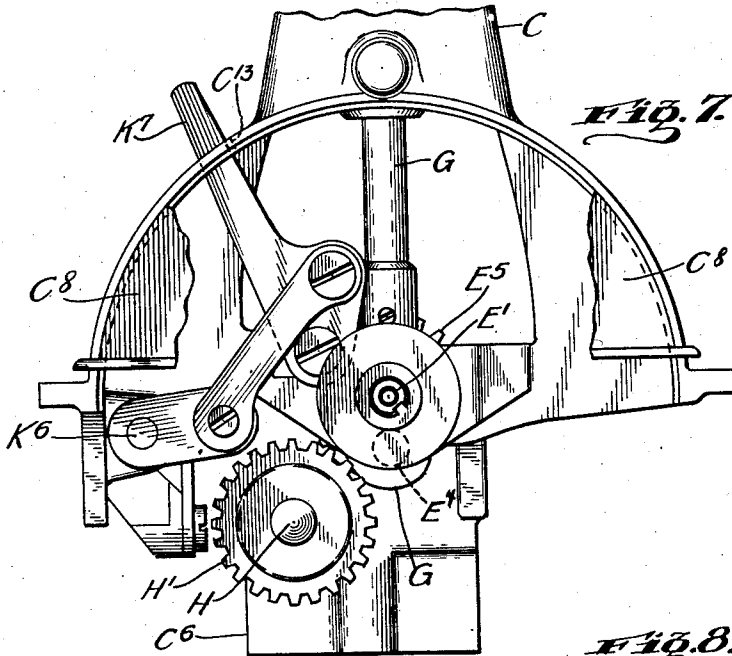


Fig. 7.

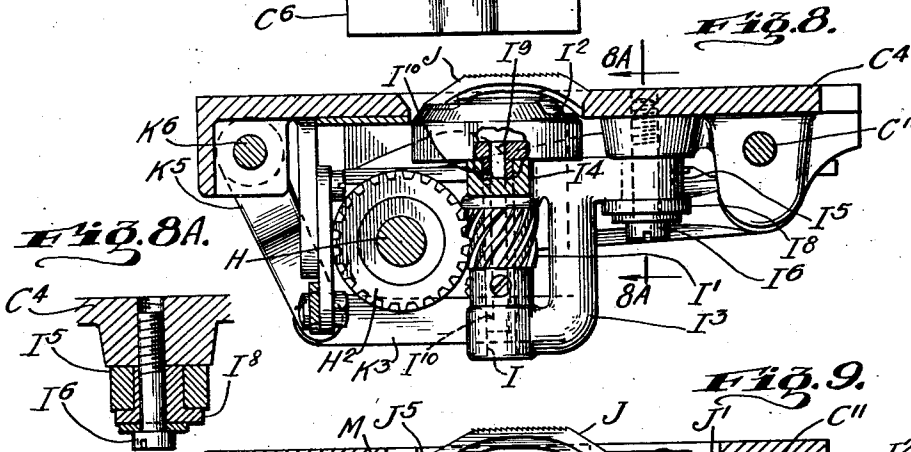


Fig. 8.

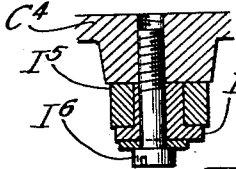


Fig. 8A.

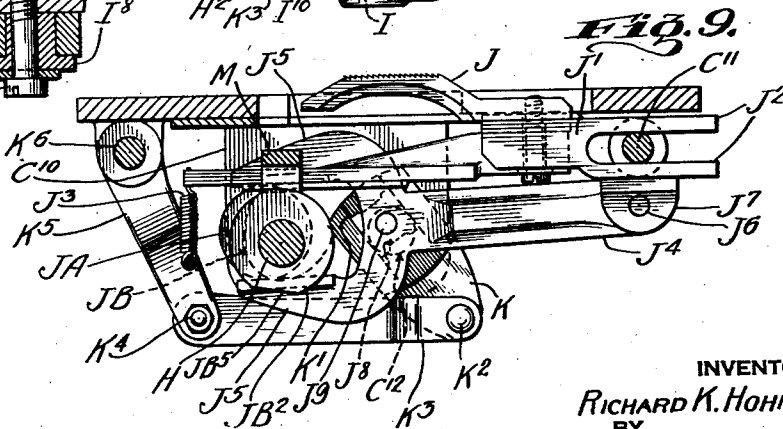


Fig. 9.

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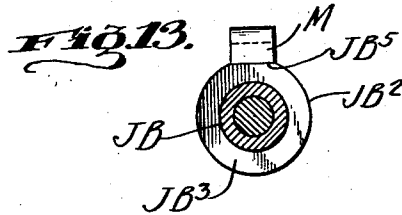
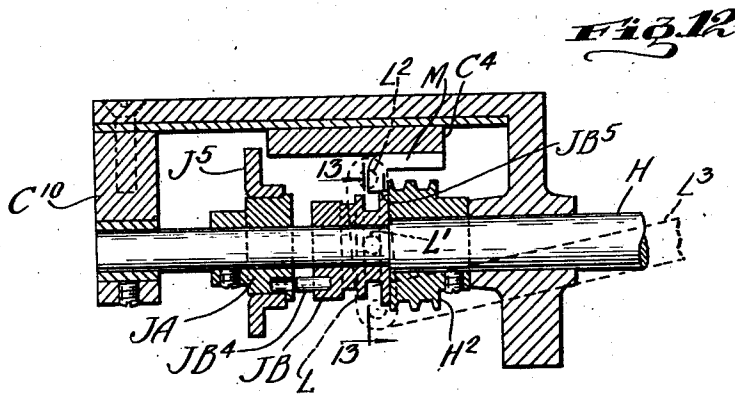
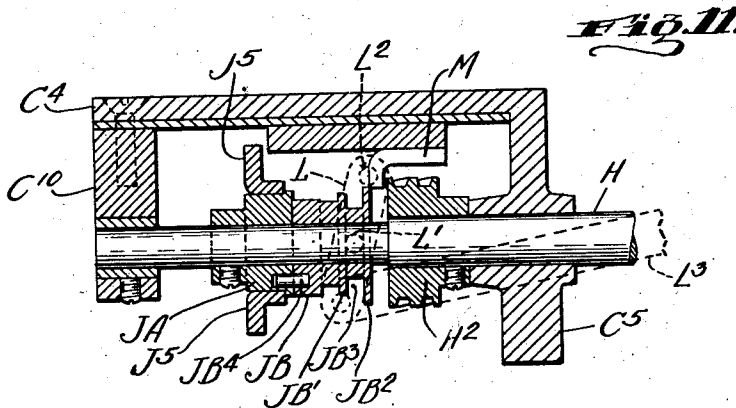
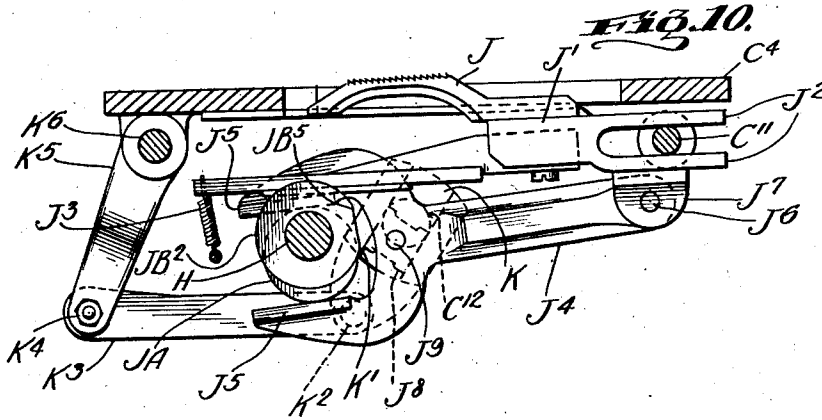
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**Fig. 14.**

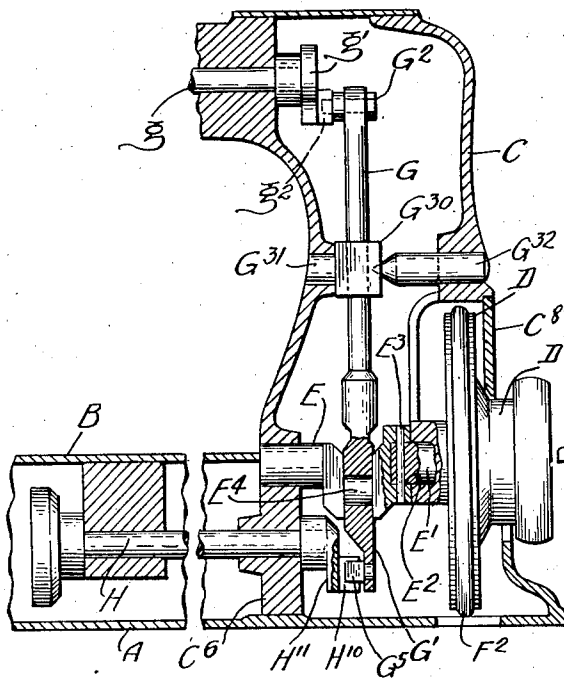


**Fig. 15.**

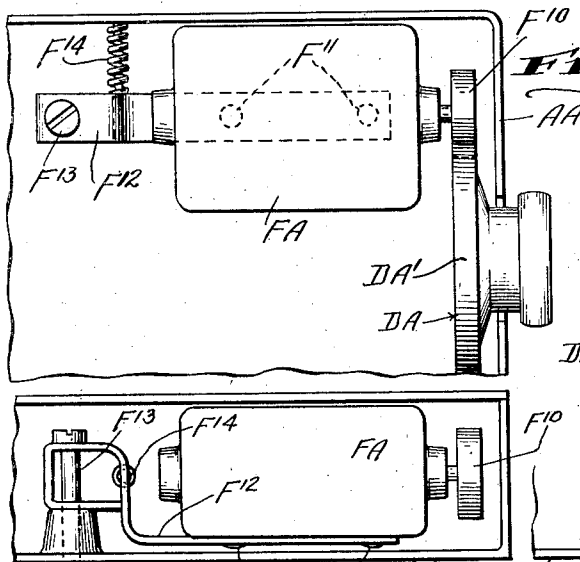
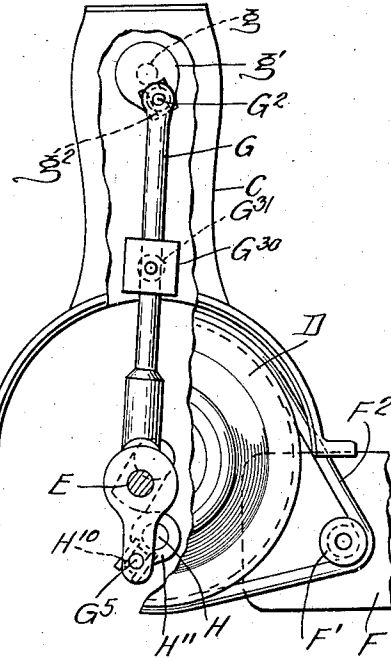
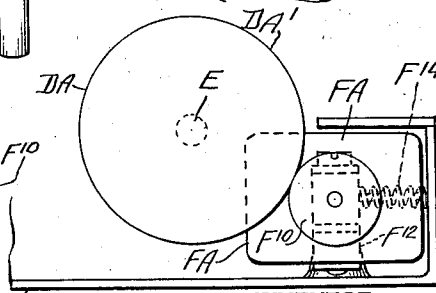


**Fig. 17.**

**Fig. 16.**

**Fig. 18.**



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## UNITED STATES PATENT OFFICE

2,144,801

## SEWING MACHINE

Richard K. Hohmann, Rosedale, N. Y.

Application December 29, 1936, Serial No. 118,038

11 Claims. (Cl. 112-220)

The general object of the present invention is to provide an improved sewing machine, and my improvements were primarily devised, and are of special utility, for use in a compact, lightweight, portable sewing machine for domestic use, although some features of my invention may be used with advantage in sewing machines of other types.

A specific object of the invention is to provide a sewing machine with power driving mechanism comprising a horizontal crank shaft mounted in or adjacent the lower end of the usual hollow standard, and driven through a belt or friction drive by a motor located in the base member of the machine wholly or mainly below the cloth plate level, and driving the needle bar shaft of the machine through a connecting rod member given oscillatory and longitudinally reciprocatory movements by the rotation of the crank shaft and driving the main underbed shaft of the machine through toothed gearing, or by means of a crank pin connection between the last mentioned shaft and a lower extension of the connecting rod through which a needle bar shaft is rotated.

With such driving mechanism, I am able to obtain quiet operation, and freedom from objectionable vibration, notwithstanding the mounting on the shaft of a pulley or friction drive disk large enough in diameter to permit of a one to one drive connection between the crank shaft and the main underbed shaft, with as high speed operation as is required or is customary or desirable in domestic sewing machines, and when driven by a small universal type electric motor having a very high armature shaft speed, such as is customarily and desirably employed for the operation of such portable domestic machines.

Another specific object of the invention is to provide simple and effective means whereby the direction of the work feed may be quickly and easily reversed for backstitch operations and whereby the feed mechanism may be rendered inoperative to adapt the machine for darning and other stitching operations in which no automatic work feed is needed or desired. A further specific object of the invention is to provide the machine with novel needle thread loop controlling means especially useful in darning, embroidery and other operations in which the feeding mechanism is inoperative, and the presser foot is ordinarily removed. A further specific object of the invention is to associate with the feed mechanism, novel and effective provisions for varying the stitch length not only in the normal stitching, but also in the backstitching operation. A further spe-

cific object of the invention is to provide a bed or clothplate extension providing a work supporting cloth plate or bed surface of ample size which may be readily detached and comprises separable parts adapted to be housed in a casing of the usual form and of the smallest size required for portable sewing machines of the most compact types now in commercial use.

Various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages, and specific objects other than those mentioned above, which are attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of the present invention.

Of the drawings:

Fig. 1 is a perspective view of the sewing machine with the removable cloth plate extension in place;

Fig. 2 is a partial section on the line 2-2 of Fig. 1;

Fig. 3 is a partial section on the line 3-3 of Fig. 1;

Fig. 4 is a perspective view of the cloth plate extension shown, inverted, and with its separable parts disconnected;

Fig. 5 is an elevation of the machine partly broken away and in section;

Fig. 5A is an elevation partly in section, illustrating the arrangement and action of a needle thread loop controller;

Fig. 6 is an inverted plan view of the under bed mechanism of the machine;

Fig. 7 is a rear end elevation of a lower portion of the sewing machine with a detachable drive mechanism cover plate removed;

Fig. 8 is a vertical section on the line 8-8 of Fig. 6;

Fig. 8A is a partial vertical section on the line 8A-8A of Fig. 8;

Fig. 9 is a vertical section on the line 9-9 of Fig. 6;

Fig. 10 is a section taken similarly to Fig. 9, but showing parts in different relative positions;

Fig. 11 is a partial section on the line 11-11 of Fig. 6;

Fig. 12 is a section taken similarly to Fig. 11, but showing parts in different relative positions;

Fig. 13 is a partial section on the line 13-13 of Fig. 12;

Fig. 14 is a vertical section of a portion of the machine, illustrating a modified driving connec-

tion between the main under bed shaft and the motor driven crank shaft;

Fig. 15 is an elevation taken at right angles to Fig. 14 with some removed parts broken away or in section;

Fig. 16 is a somewhat diagrammatic plan view of a lower portion of the machine illustrating a modified driving connection between the driving motor and the crank shaft of the machine; and

Fig. 17 is a partial vertical section; and

Fig. 18 is a partial end elevation of the friction drive arrangement used in Figs. 17 and 18.

As shown in the drawings, the sewing machine mechanism is partly received, in, and is wholly supported by a base member A. The latter is in the form of a flat cast metal box having a removable top plate part B, forming the cloth or bed-plate of the machine. The hollow standard C, arm C', and head C<sup>2</sup>, and other frame parts C<sup>3</sup>, C<sup>4</sup>, C<sup>5</sup>, and C<sup>6</sup>, are preferably all parts of a one piece metal frame casting, to which the bed plate B is secured by screws B'. The parts C<sup>3</sup>, C<sup>4</sup>, C<sup>5</sup>, and C<sup>6</sup> are all within the base member A, and covered by the plate B, which is notched to surround the lower portion of the standard C. The parts C<sup>5</sup> and C<sup>6</sup> are parallel, spaced apart foot or leg portions of the framework, which bear directly against the bottom wall of the base member A, and are detachably connected thereto, by screws C<sup>7</sup>. In respect to the arrangement of the base member and mechanism framework, there is no difference between the apparatus shown in Figs. 14 and 15, and that shown in any of the Figs. 1 to 13.

The lower portion of the hollow standard C is enlarged at its rear to provide a housing for the upper portion of a driving element, shown as a grooved pulley D in the constructions illustrated in Figs. 1 to 15, having an enlarged hub portion D' used in the bobbin winding operation, including a hand wheel for manual adjustments of the mechanism. The said housing is closed at its rear side by a removable arc shaped cover part C<sup>8</sup>, extending over the exposed hub portion D', and having horizontally extending foot portions detachably secured to the rear end wall of the base A by screws C<sup>9</sup>. The pulley D is mounted on a crank shaft E, and driven by an electric motor F, shown as located wholly within the base A beneath the bed plate B, and the armature shaft of which carries a pulley F' connected to and driving pulley D through a belt F<sup>2</sup>. To accommodate its bobbin winding use, the pulley D is preferably a so-called "loose" pulley, operatively secured to the crank shaft E only when clamped to the latter by an external clamping nut D<sup>2</sup>, threaded on the outer end portion E' of the crank shaft, E and engaging the pulley D through a friction washer D<sup>3</sup> splined on the shaft portion E'.

The crank shaft E is journaled in frame bearings and extends across the interior of the hollow standard C, with its axis preferably below the cloth plate level. To facilitate its assembly and re-assembly, the rear or outer end portion E' of the crank shaft is separable from the remainder or body portion of the crank shaft, extending as shown in Fig. 14, into a socket E<sup>2</sup> in said body portion, and normally connected to the latter by a key E<sup>3</sup>.

The rotation of the crank shaft E gives rotative movements to the needle bar shaft  $\alpha$ , which passes horizontally through the hollow arm C', through a crank or connecting rod or lever G. The latter has a lower hub portion G' surrounding the crank pin portion E<sup>4</sup> of the crank shaft

E, and is provided at its upper end with a transverse pin G<sup>2</sup> received in a radial slot  $g^2$  in a crank arm  $g'$ , secured to the adjacent end of the shaft  $g$ . The rod G passes through and is slidingly received in a passage formed in a fulcrum or guide block G<sup>3</sup> having horizontal trunnion portions G<sup>4</sup> journaled in the standard C. The means through which the shaft  $g$  actuates the needle bar, and the thread tension and take up means may be of any usual or suitable form and hence need not be further referred to herein.

In the form of the invention shown in Figs. 1, 5, 6 and 7, the rotative movements of the crank shaft gives corresponding movements to the main underbed shaft H, through toothed gears E<sup>5</sup> and H' carried by the crank shaft and underbed shaft respectively, which advantageously and as shown, are spiral gears, with a one to one gear ratio. The shaft H is journaled in aligned bearings in the frame parts C<sup>5</sup> and C<sup>6</sup>, and in a bearing block C<sup>10</sup> secured to the underside of the frame portion C<sup>4</sup>.

Secured to the shaft H, adjacent the front end of the machine, is a spiral gear H<sup>2</sup>, which meshes with a spiral gear I' carried by a short vertical hook shaft I. The latter carries the hook I<sup>2</sup> at its upper end, and is mounted in a bearing member or bracket part I<sup>3</sup>. The latter has two arms I<sup>4</sup> and I<sup>5</sup>, one generally parallel with, and the other transverse to, the shaft H, which are adjustably clamped against the underside of the frame part C<sup>4</sup> by clamping bolts I<sup>6</sup> and I<sup>7</sup>. The clamping bolt I<sup>6</sup> for the arm I<sup>5</sup> extending transversely to the shaft H passes through a hole in a bushing I<sup>8</sup>, which may be rotated, for adjustment purpose, in the hole in the arm I<sup>5</sup> receiving it, and has its hole receiving the clamping bolt I<sup>6</sup> eccentric with respect to the periphery of the bushing. In consequence, by loosening the clamping bolts, and angularly adjusting the bushing I<sup>8</sup>, the hook shaft may be bodily adjusted toward the axis of the shaft H, as required to take up for wear of the gears H<sup>2</sup> and I'. The bolt I<sup>7</sup> passes through an opening in the arm I<sup>4</sup> elongated in the direction of the latter, so that when the clamping bolts are eased off, the hook shaft may be bodily adjusted in the direction of the length of the shaft H to thereby properly position the hook relative to the path of movement of the needle. To permit of easy lubrication of the two bearings in the support I<sup>3</sup> for the hook shaft, one above and the other below the gear I', the hook shaft is formed with an axial oil channel I<sup>9</sup> closed at its lower end, but open to the bobbin chamber of the hook at its upper end, and formed with a lateral oil outlet I<sup>10</sup> for each bearing. Those bearings may thus be readily lubricated, when the bobbin is removed from the hook, by dropping oil into the bobbin chamber.

In front of the gear H<sup>2</sup>, the shaft H carries two work feed cams JA and JB. The cam JA is rigidly, though preferably adjustably, secured to the shaft H, but the cam JB, while normally in the fixed relation to the shaft H shown in Fig. 11, may be adjusted as and for the purpose herein-after described, into the position shown in the Fig. 12 in which it does not share in the rotative movement of the shaft H. In the normal running position illustrated in Fig. 11, the rotation of the cams JA and JB give feed movements to a feed dog J through mechanism comprising a feed bar J', to which the feed dog J is rigidly secured. The feed bar J', which is generally horizontal, is formed at its rear end with upper and lower bifurcations J<sup>2</sup>, which straddle a stationary

guide pin C<sup>11</sup>, forming a guide for the rear end of the feed bar in the longitudinal movements of the latter, and forming a pivot for the feed bar in its oscillatory up and down movements. It is given its up and down oscillatory movements, in the normal stitching operation, by the cam JB, against which the underside of the front end portion of the bar is normally held by a spring J<sup>3</sup>. The feed bar J' is given its longitudinal movements by a fork lever J<sup>4</sup>, formed with upper and lower bifurcations J<sup>5</sup> at its front end, which straddle the cam JA. At its rear end, the fork lever is pivotally connected to the feed bar J' by means of a pivot pin J<sup>6</sup> carried by depending ear extensions J<sup>7</sup> from the lower bifurcation J<sup>5</sup> of the feed bar J'.

The oscillatory up and down movements given to the bifurcations J<sup>5</sup> of the fork lever J<sup>4</sup> by the cam JA normally give that lever, and thereby the feed dog J reciprocatory movements in the generally horizontal direction of the feed bar J', as a result of the interaction of a block J<sup>8</sup> carried by a pivot pin J<sup>9</sup>, projecting laterally from the fork lever J<sup>4</sup>, with a guide member K, formed with a guide slot K' receiving the block J<sup>8</sup>. The member K is pivotally mounted on a horizontal stub shaft or post C<sup>12</sup> parallel to the shaft H and anchored in the frame part C<sup>10</sup>. The part K has an arm connected by a pivot K<sup>2</sup> to one end of a link K<sup>3</sup>, having its other end pivotally connected by pivot pin K<sup>4</sup> to an arm K<sup>5</sup> carried by a rock shaft K<sup>6</sup>. The latter is beneath the bedplate B, and parallel to the shaft H, and is journaled in bearings carried by the front frame part C<sup>3</sup> at its underside. The rear end of the shaft K<sup>6</sup> extends into the housing chamber for the pulley D, and has an operating arm K<sup>7</sup> link connected to it, as shown in Figs. 5 and 7. The arm K<sup>7</sup> projects through a slot C<sup>13</sup> formed in the upper front side portion of the housing wall, and elongated to permit of a substantial angular adjustment of the shaft K<sup>6</sup> by manipulation of the outer end of the arm K<sup>7</sup>.

The angular adjustment which may thus be given to the shaft K<sup>6</sup> is sufficient to adjust the angle of the inclination member K between positions respectively shown in Figs. 9 and 10. As shown in Fig. 9, the slot K' in the member K is inclined upwardly from the horizontal and forwardly from the vertical plane through the axis of the shaft H. In the position shown in Fig. 10, the slot K' is inclined upwardly from the horizontal and away from the vertical plane passing through the axis of the shaft H. As seen in Figs. 9 and 10, the shaft H and thereby the cams JA and JB turn counterclockwise. The two cams are so relatively disposed that during the portion of each revolution of the shaft H in which the cam JB holds the feed dog J in the elevated position shown alike in Figs. 9 and 10, the cam JA gives a down movement to the bifurcation J<sup>5</sup> of the fork lever J<sup>4</sup>. In consequence, the block J<sup>8</sup> carried by the fork lever, then moves down in the slot K', and gives the feed dog J a rearward movement and thus effects the normal feed movement of the work away from the operator, who is in front of the machine, as the latter appears in Figs. 1 and 5. With the member K adjusted into the position shown in Fig. 10, the feeding movement of the feed dog is toward the operator.

When the arm K<sup>7</sup> is adjusted to make the direction of the slot K' vertical, the feed dog will have no feeding movement. The extent of feeding movement, and consequently the length

of each stitch formed, will progressively diminish to zero as the member K is progressively adjusted from either of its positions shown in Figs. 9 and 10, to the intermediate no feed position in which the slot K' is vertical. The arm or finger K<sup>7</sup> thus forms a readily accessible and easily operable actuating member of mechanism by which the direction of feed may be reversed, and by which the length of the stitch formed with either direction of feed may be varied as desired. As shown, the wall of the pulley housing in which the slot C<sup>13</sup> is formed, is provided with scale marks C<sup>14</sup>, which in conjunction with the index formed by the arm K<sup>7</sup>, furnish an easily read indication of the direction of feed and length of stitch formed with any existing adjustment of the arm K<sup>7</sup>.

The cam JB is adjustable longitudinally of the shaft H. To this end the cam JB has a hub extension provided with circumferential collars JB' and JB<sup>2</sup> spaced apart to provide a circumferential groove JB<sup>3</sup> entered by a pin L' carried by a lever L. The latter is pivoted at L<sup>2</sup> to the supporting framework of the mechanism, and is pivotally connected intermediate its ends, to one end of a link L<sup>3</sup> beneath the clothplate, and having its other end pivotally connected to an operating lever L<sup>4</sup>. The latter is pivotally connected to the framework by a pivoted pin L<sup>5</sup> and extends up through a slot formed in the clothplate B adjacent the standard C. By oscillating the lever L<sup>4</sup>, the cam member JB, under certain conditions, can thus be adjusted longitudinally of the shaft H, between its normal operative position shown in Fig. 11, and its inoperative position shown in Fig. 12.

In its operative position, the cam JB is connected to the shaft H to rotate with the latter, by means of a pin JB<sup>4</sup> parallel to, and laterally displaced from the shaft H, and anchored in the cam JB and projecting from the face of the latter adjacent the cam JA. In the position of cam JB shown in Fig. 11, the pin JB<sup>4</sup> extends into a socket formed for the purpose in the cam JA, which is rigidly secured to the shaft H. When the cam JB is displaced from the cam JA as shown in Fig. 12, the pin JB<sup>4</sup> is completely withdrawn from its socket in the cam JA, and the cam JB is out of driving engagement with the shaft H.

Means are provided which prevent the cam JB from being adjusted from the position shown in Fig. 11 into that shown in Fig. 12, except when the angular position of the cam JB is such that the feed bar J' bears against a low portion of the cam JB, so that the feed dog J is then wholly below the top surface of the clothplate or bed of the machine. In consequence, with the cam JB in the position shown in Fig. 12, the rotation of the shaft H through cam JA gives movement to the feed dog J in the general horizontal direction of the feed bar J', but such feed dog movements will be idle, because the feed dog is below its work engaging level. The said means compelling the feed dog to be below the work engaging level, when the cam JB is in the position of Fig. 12, comprises a part M carried by the frame part C<sup>4</sup> at the underside of the latter. The latter is at the right hand side of the cam JB when the latter is in the position shown in that Fig. 11. The collar JB<sup>2</sup> is of sufficient radial extent to engage the part M, and prevent movement of cam JB into the position shown in Fig. 12, except when the angular position of the cam JB is such as to bring a flattened edge portion

JB<sup>5</sup> of the collar JB<sup>2</sup> into parallelism with the underside of the member M, as shown by Figures 12 and 13.

The purpose of holding the feed dog J below its working level, effected by the adjustment of the cam JB into the position shown in Fig. 12, is to facilitate operations, such as darning operations, in which the work is preferably not subject to automatic feed action, but is free for manual adjustment by the operator. When such an operation is being carried out, the usual pressure foot N is ordinarily removed temporarily. With the presser foot removed, as the needle starts up, and the needle thread is slackened, so that in normal operation it forms a loop in position for engagement by the thread engaging point of the hook I<sup>2</sup>, there is a tendency for the work to lift with the needle. In consequence, there would be occasional failure of the needle thread to form a loop in position for engagement by the hook, but for a special corrective device O (Fig. 5A), which I provide. The device O is a thread engaging finger or loop controller secured to the frame opposite part C<sup>4</sup>, and having a horizontal edge O', closely adjacent the needle path, at the side of the latter from the hook and slightly below the underside of the feed dog J, when the latter is in its depressed condition. As indicated in Fig. 5A, the edge O' of the part O, by engaging the portion of the needle thread OA adjacent, but above the eye in the needle OB and at the side of the needle remote from the hook I<sup>2</sup>, forces the thread to move through the eye of the needle, as the latter starts its upstroke, and thus insures the formation of the proper thread loop OA' at the hook side of the needle for engagement by the hook point, notwithstanding the tendency of the work to lift with the needle when the pressure foot is elevated.

A disadvantage has been experienced in the use of compact portable sewing machines, because of the small horizontal area of the clothplate or bed over which the material sewed moves, and by which it is supported. The small area of that bed is an inherent characteristic of such machines because of their relatively small dimensions. To avoid this objection I have devised a clothplate extension preferably comprising separable parts PA and PB, which when connected together, collectively form a U shaped plate, which is adapted to be secured to the base A with its inner leg and yoke edges, in direct abutting relation with the sides and front end of the clothplate B. To detachably secure the clothplate extension in position as shown in Fig. 1, I provide means shown as sliding bolt parts Q connected to the leg portions of the cloth extension by headed pins Q' passing through slots in the bolt parts and arranged to permit movement of the bolt parts toward and away from the base member A. The latter as shown, is formed with openings B<sup>10</sup> in its opposite vertical sides into which the bolt parts Q extend as shown in Fig. 3. When the clothplate is thus in its operative position, a tongue part R' projecting from the yoke portion of the clothplate extension extends under an angle piece B<sup>11</sup> provided for the purpose on the vertical end wall of the base member A. When the bolts Q are retracted, the clothplate extension may be moved horizontally away from the standard C, to withdraw the tongue R' from under the angle member B<sup>11</sup>. With the bolts Q extending into the openings B<sup>10</sup> in the sides of the base member as shown in Fig. 3, the clothplate extension is effectively secured in place.

The clothplate extension is formed of readily separable parts PA and PB, to permit of the ready disposal of the clothplate extension, when not in use, in the ordinary small case or cabinet customarily provided to receive the entire sewing machine mechanism. The parts PA and PB, when assembled, meet edge to edge at or adjacent the vertical longitudinal central plane of the sewing machine, and are then rigidly connected by means of a plate member R which carries the tongue part R', and is rigidly and permanently secured to the clothplate extension part PA, and then underlaps, and is detachably connected to the part PB. The detachable connection between the parts PB and R advantageously comprise headed pins P' carried by the part PB, keyhole slots R<sup>2</sup> in the plate R, the pins P' having heads too large to pass through the narrow portions of the slots R<sup>2</sup>, but small enough to pass through the round portions of the slots.

In lieu of driving the shaft H through toothed gearing as shown in Figs. 5, 6, and 7, I may make use of the arrangement shown in Figs. 14 and 15, in which the crank or connecting rod G is extended at its lower end and carries a transverse pin G<sup>5</sup> working in a radial slot H<sup>10</sup> formed in a crank arm H<sup>11</sup> carried by the adjacent end of the main underbed shaft H. The use of such a crank rod connection between the crank shaft and the shaft H and needle bar shaft g is conducive to quiet operation, and precludes any such serious interference with proper operation as results, when the driving shaft is connected to the driven shaft by gearing, and the mechanism is improperly lubricated and wears. A further specific advantage of the drive for the main underbed shaft H, illustrated in Figs. 14 and 15, arises from the fact that the angular velocity of the shaft H is not uniformly proportional to the angular velocity of the drive shaft E. This makes it possible by suitable relative disposition of the loop engaging point of the hook and crank arm H<sup>11</sup>, to slow down the angular movement of the hook through its needle thread loop engaging position, which, as those skilled in the art understand, is of practical importance.

In lieu of the belt and pulley connection between the crank shaft E and the driving motor employed in the arrangements hereinbefore described in detail, other motor drive connections of the shaft E may be employed. Thus, for example, a friction drive may be employed as illustrated in Figs. 16, 17, and 18, wherein the driven element DA, which may be mounted on the shaft E exactly as is the previously described pulley D, differs from the latter, in that it has no belt groove, but in lieu thereof is provided with a cylindrical edge surface DA'. In operation, the edge DA' is engaged and the member DA is rotated by a friction driving disk F<sup>10</sup> secured to the armature shaft of the motor FA which may be exactly like the previously described motor F, but is secured by screws F<sup>11</sup>, to a supporting arm F<sup>12</sup>. The latter is pivoted to the base member AA by a pivot F<sup>13</sup>, which may have its lower end threaded and screwed into the bottom wall of the base member. A spring F<sup>14</sup> acting between the lever support F<sup>12</sup> and the adjacent rim portion of the base member AA, creates the proper driving pressure between the peripheral edge of the disk F<sup>10</sup> and the surface DA'. The base member AA may be identical with the base member A, though as shown, the base member AA is not formed with the bottom wall slot provided in the base member A, as shown in Figs. 5 and 14, to provide ready ac-

cess to the belt, permitting the latter to be mounted in or displaced from the groove in the pulley member D, without requiring the sewing machine housing to be opened up. The motors F and FA may each be provided with an energizing and controlling arrangement, including a treadle switch, such as is customarily employed in connection with portable sewing machines.

The convenient bobbin winding provisions shown in Fig. 1, comprise an arm S pivotally connected to the cover member C<sup>8</sup> at the outer side of the latter by a pivot S', which is parallel to the shaft E, and may have its end threaded and screwed into a threaded aperture in the member C<sup>8</sup>. The arm S has journaled in it, a shaft S<sup>2</sup>, parallel to and laterally displaced from the pivot S'. At its inner end, the shaft S<sup>2</sup> carries a friction disc S<sup>3</sup> adapted to engage the peripheral surface of the neck portion of the hub portion D' of the pulley D, connecting the outer handwheel portion of the latter to its pulley portion. The outer end of the shaft S<sup>2</sup> is shaped to extend into, and frictionally engage the wall of, the usual axial passage formed in the bobbin, so that the latter is rotated when the arm S is turned to bring the pulley S<sup>3</sup> into engagement with the neck portion of the pulley member D. Advantageously, the pivot shaft S' may be in such frictional engagement that the arm S has to maintain the latter either in or out of position for operative engagement of the disk S<sup>3</sup> with the neck of the pulley D, without interfering with the ready adjustment of the arm between its operative and inoperative positions. As will be apparent, the friction drive member DA of Figs. 16, 17, and 18, is adapted to engage and drive the bobbin winding pulley S<sup>3</sup> of such a bobbin winding arrangement as is shown in Fig. 1.

While novel features of my improved sewing machine may be used with advantage in sewing machines which are not primarily intended for domestic use, and which are not portable, it will be apparent to those skilled in the art that my improvements are especially well adapted for use, and to contribute to the operative characteristics desirable, in small light weight portable sewing machines intended primarily for domestic use. In particular, it is to be here noted that the provisions made for rendering the feed mechanism inoperative during a stitching operation in which the normal feed connection is undesirable, and the provisions made for reversing the direction of the feed and for varying the length of the stitches formed, are desirable, not only because of their relative simplicity and effectiveness, but also because the entire feeding mechanism may be compactly and conveniently arranged in the available underbed space of the machine except for the operating members L<sup>4</sup> and K<sup>7</sup>, which project from the sewing machine structure at points conveniently located for engagement by the operator. The workbed extension disclosed but not claimed herein is claimed in my divisional application Serial No. 134,728 filed April 3, 1937, and the work feed mechanism including the provisions for varying the stitch length disclosed but not claimed herein is claimed in my divisional application Serial No. 134,729 filed April 3, 1937.

While in accordance with the provisions of the statutes, I have illustrated and described the best forms of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the apparatus disclosed, without departing from the spirit of my invention as set forth in the appended claims, and that

certain features of my invention may sometimes be used with advantage, without a corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a sewing machine, the combination with a frame including portions above and below the bed level of the machine, of parallel underbed and needle bar actuating shafts journaled in said frame respectively below and above said level, a third shaft parallel to the first mentioned shafts and journaled in said frame adjacent said lever and above the level of said underbed shaft, means through which rotation of said third shaft effects rotation of each of the other shafts, and power means including an enclosed circular driving element carried by said third shaft for rotating the latter, and extending downward below the level of the underbed shaft into proximity with the bottom of the frame and having a radius substantially greater than the distance between the axes of said third and underbed shafts.

2. In a sewing machine, the combination with a frame including portions above and below the bed level of the machine, of parallel underbed and needle bar actuating shafts journaled in said frame respectively below and above said level, a third shaft parallel to the first mentioned shafts, and journaled in said frame adjacent said level and including a crank portion, means including a crank rod connection between said crank portion and said actuating shaft and a gear connection between said third and underbed shafts through which the rotation of said third shaft effects rotation of each of the first mentioned shafts, and power means including a driving element carried by said third shaft for rotating the latter.

3. In a sewing machine, the combination with a frame including portions above and below the bed level of the machine, of parallel underbed and needle bar actuating shafts journaled in said frame respectively below and above said level, a third shaft parallel to the first mentioned shafts, and journaled in said frame adjacent said level and including a crank portion, means including a crank rod connection between said crank portion and each of the first mentioned shafts through which the rotation of said third shaft effects rotation of each of the first mentioned shafts, and power means including a driving element carried by said third shaft for rotating the latter.

4. In a sewing machine, the combination with a frame including portions above and below the bed level of the machine, of parallel underbed and needle bar actuating shafts journaled in said frame respectively below and above said level, a third shaft parallel to the first mentioned shafts, and journaled in said frame adjacent said level and including a crank portion, means including a vertically disposed crank rod in an intermediate portion of which said crank portion is journaled, and a crank connection between each of the first mentioned shafts and the corresponding end of said rod through which the rotation of said third shaft effects rotation of each of the first mentioned shafts, and power means including a driving element carried by said third shaft for rotating the latter.

5. In a sewing machine, the combination with a frame including portions below and above the bed level of the machine, of parallel underbed and needle actuating shafts journaled in said frame respectively below and above said level,

a third shaft parallel to the first mentioned shafts, and journaled in said frame adjacent said level and including a crank portion, and means through which the rotation of said third shaft effects rotation of each of the first mentioned shafts, said means comprising an upwardly extending crank rod connected to said crank portion, a crank connection between the upper end of said rod and said actuating shaft, and a guide member journaled in said frame to turn about a horizontal axis parallel to said shafts and between said third and actuating shafts and cooperating with said rod for guided longitudinal movements of the latter relative to said member.

6. In a sewing machine, the combination with a frame including portions below and above the machine body level, of parallel underbed and needle actuating shafts journaled in said frame respectively below and above said level, a third shaft parallel to the first mentioned shaft and journaled in said frame adjacent said level, means through which rotation of said third shaft effects rotation of each of the other shafts, power means including a driving element mounted on said third shaft, means for detachably coupling said element to said third shaft, and bobbin winding means adapted to be actuated by said driving element when the latter is not connected to said third shaft.

7. In a sewing machine, the combination with a frame including a portion beneath the bed level of the machine, of a horizontal shaft journaled in said frame portion, a spiral gear carried by said shaft, a vertical hook shaft a spiral gear carried by said hook shaft and in mesh with the first mentioned gear, a support for said hook shaft, and means for adjustably connecting said support to said frame portion comprising an eccentric angularly adjustable about a vertical axis in a plane transverse to the first mentioned shaft to adjust said support toward and away from said shaft and a clamping screw and slot connection between said support and frame portion, for adjustment of said support in a direction parallel to the length of said shaft.

8. In a sewing machine, the combination with a horizontal hook driving shaft, of a gear carried by said shaft, a vertical hook shaft, a gear carried by said shaft and in mesh with the first mentioned gear, means providing separate, spaced apart bearings for said hook shaft, one above and one below the gear carried by the hook shaft, the latter being formed with an axial oil passage ex-

tending from a level below the top of the lower bearing up to, and open at the upper end of the hook shaft, and having a separate lateral branch opening to each of said bearings.

9. In a rotary hook sewing machine adapted for operation on work manually movable over and not held against the bed of the sewing machine, the combination with the reciprocating sewing machine needle and an underbed rotary hook at one side of the path of needle movement, of an underbed thread controller in close proximity to said path and at the opposite side thereof from said hook and adapted to engage the needle thread and oppose upward movement of the latter, as the needle moves up from its lowermost position to thereby insure movement of the needle thread through the eye of the needle and the formation of a thread loop at the hook side of said path.

10. The combination with a portable sewing machine hollow stationary structure comprising a base member, standard and arm, of a main underbed shaft, a horizontal driving shaft journaled in said structure in proximity to the bed level of the machine and above the level of the first mentioned shaft, a driving motor having a horizontal shaft and located in the base member with the last mentioned shaft laterally displaced from the first mentioned shaft and a driving connection between said shafts within said hollow structure, and comprising a wheel mounted on said third shaft and extending away from the bed level upwardly for a distance which is a major fraction of the radial extent of the wheel, and extending downwardly into proximity with the level of the bottom of said base.

11. In a sewing machine, the combination with a frame including portions above and below the bed level of the machine, parallel underbed and needle bar actuating shafts journaled in said frame respectively below and above said level, said needle bar actuating shaft including a crank portion, a third shaft parallel to the first mentioned shafts and journaled in said frame adjacent said level and including a crank portion; means, including a link connection between said crank portions and a torque transmitting connection between said third and underbed shafts, through which rotation of said third shaft effects rotation of each of the other shafts, and power means including a driving element carried by said third shaft for rotating the latter.

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