P. DIEHL & H. EICHHORN.

MULTIPLE NEEDLE SEWING MACHINE.

APPLICATION FILED DEC. 3, 1910.

1,142,082.

Patented June 8, 1915.

2 SHEETS—SHEET 1.

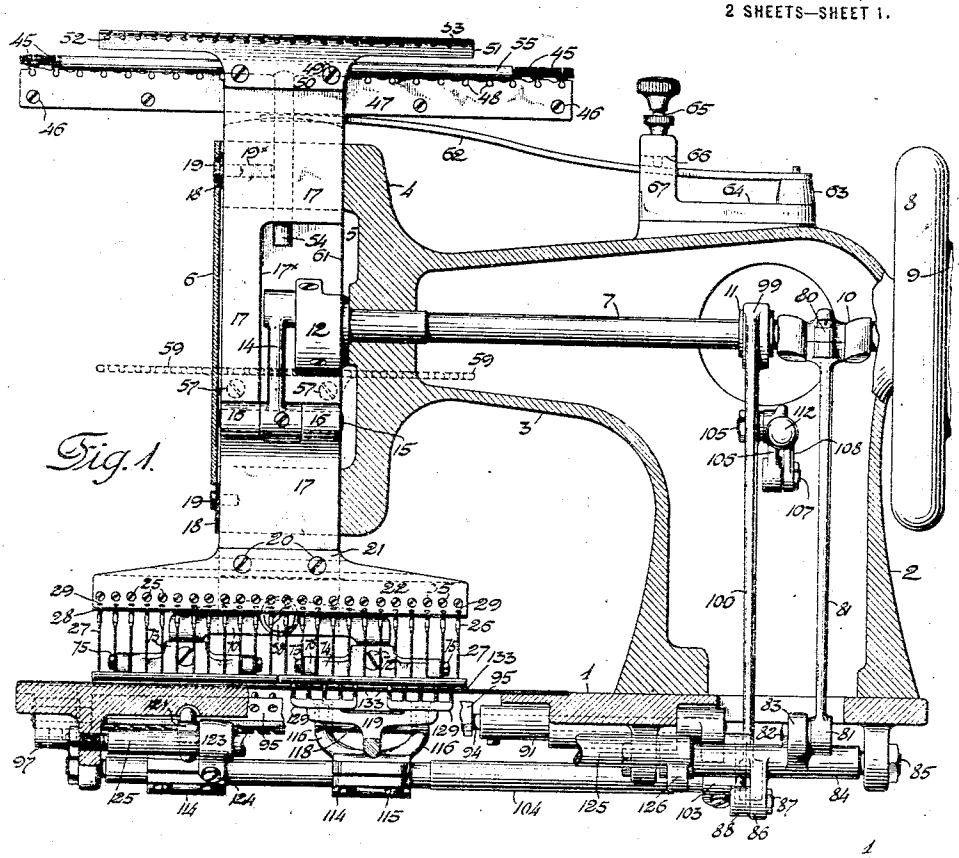


Fig. 1.

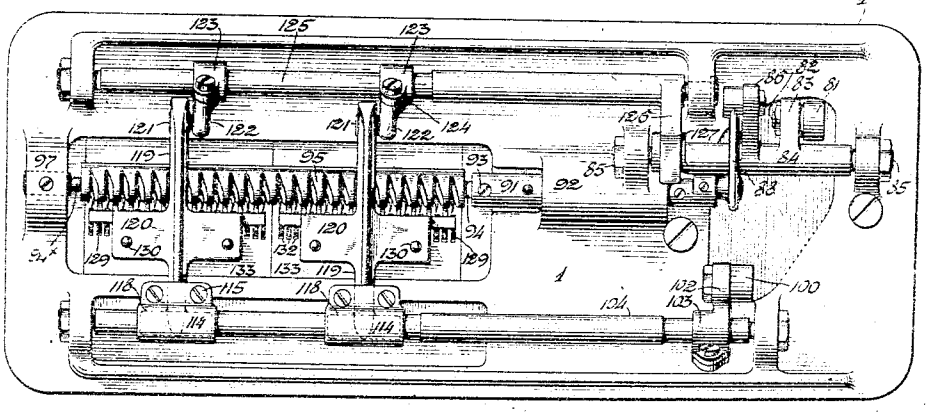


Fig. 2.

WITNESSES:

Geo. Tonnell

W. P. Stewart

INVENTORS

Philip Diehl and

Hermann Eichhorn

BY

Henry J. Miller

ATTORNEY

P. DIEHL & H. EICHHORN.

MULTIPLE NEEDLE SEWING MACHINE.

APPLICATION FILED DEC. 3, 1910.

1,142,082.

Patented June 8, 1915.

2 SHEETS—SHEET 2.

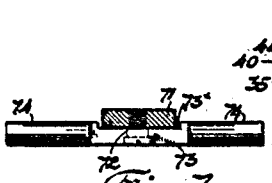


Fig. 7.

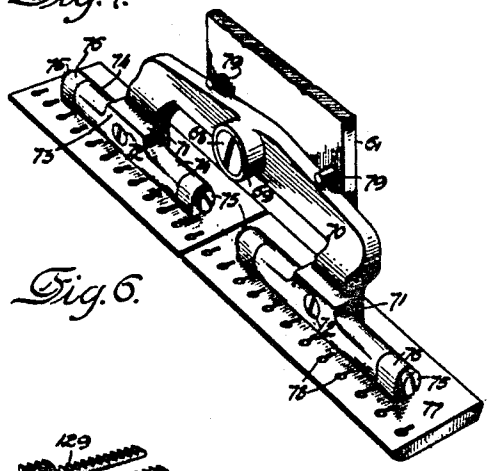


Fig. 6.

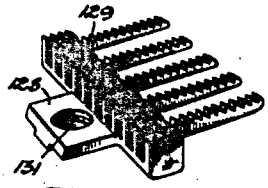


Fig. 8.

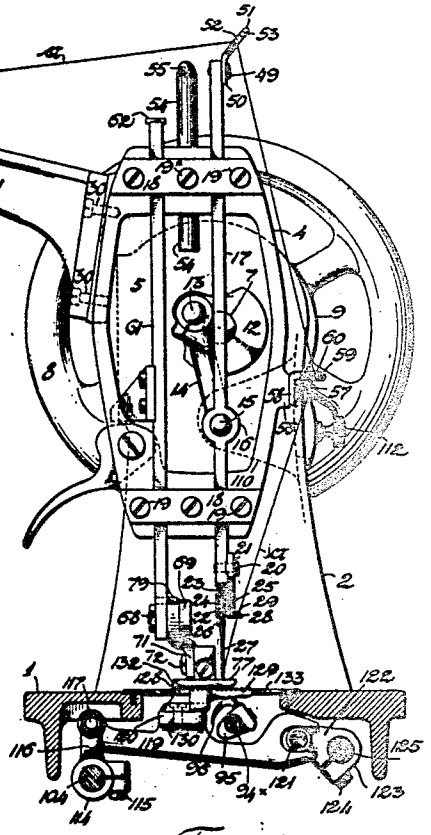


Fig. 3.

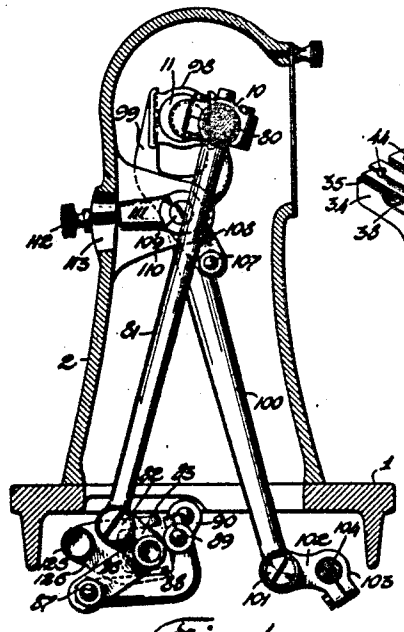


Fig. 4.

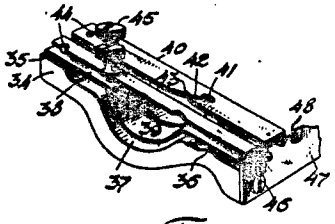


Fig. 5.

WITNESSES:

Geza Terra.

W. P. Stewart

INVENTORS

Philip Diehl and

Hermann Eichhorn

BY

Henry J. Miller

ATTORNEY

UNITED STATES PATENT OFFICE.

PHILIP DIEHL AND HERMANN EICHHORN, OF ELIZABETH, NEW JERSEY, ASSIGNORS TO THE SINGER MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

MULTIPLE-NEEDLE SEWING-MACHINE.

1,142,082. Specification of Letters Patent. Patented June 8, 1915.

Application filed December 3, 1910. Serial No. 595,356.

To all whom it may concern:

Be it known that we, PHILIP DIEHL and HERMANN EICHHORN, citizens of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Multiple-Needle Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improvement in sewing machines for producing simultaneously a large number of parallel seams; and it has for its object to provide a construction of the operative parts having the requisite strength and stiffness, and to insure uniform action of the stitch-forming and feeding mechanisms upon the work and the convenience of contr . of the needle-thread in threading up the machine.

In its preferred form, the present invention constitutes an improvement in the machine forming the subject of the United States patent to P. Diehl and W. R. Houghton, No. 579,223, dated March 23, 1897, certain of the parts being strengthened and otherwise modified to insure effectiveness of operation with the employment of a large number of needles and coöperating loop-takers. The machine is constructed with the usual rotary driving shaft journaled in the bracket-arm and carrying upon its forward end a crank-pin embraced by one end of a pitman whose opposite end embraces a pivotal pin fitted to alined and spaced bearing bosses of a needle-bar in the form of a flat plate fitted within the head of the bracket-arm substantially in the plane of the driving shaft and having at one edge an opening to receive the crank-and-pitman connection with the main-shaft, so as to receive centrally of its width the operative impulses of said actuating connection to avoid the binding or cramping of the edges of the needle bar in its bearings and consequent imposition of excessive resistance thereon and wear of such parts.

Suitable means are provided for m unting the needles upon the needle-bar, and a special form and arrangement of tension and take-up devices for the needle-threads is provided to insure effectiveness and compactness and to permit a comparatively direct lead of the threads from rear to front of the machine to aid in rethreading when threads intermediate the end needles are broken. The mechanism includes laterally adjustable feed-bars adapted to be shifted to suit the various groupings of the needles when unequally spaced, and presser-feet having double pivotal connections with the presser-bar to accommodate themselves to the work under various conditions and insure the proper grouping of the same throughout the width of fabric to be stitched to effect the uniform advance of the entire portion of the fabric within the range of action of the stitch-forming mechanism.

In the accompanying drawings, Figure 1 is a sectional elevation of a machine embodying the present improvements, Fig. 2 a bottom plan view of the same, Fig. 3 a front end view of the same with the bed-plate in section and the face-plate removed, and Fig. 4 a sectional elevation through the standard of the bracket-arm to show the actuating mechanisms for the loop-taker and the feeding devices. Fig. 5 is a perspective view showing upon a larger scale a portion of the needle-thread tension mechanism. Fig. 6 is a perspective view of the compound presser-foot and its connection with the presser-bar, and Fig. 7 a sectional plan view of a portion thereof. Fig. 8 is a perspective view of one of the feed-dogs.

The frame comprises the usual bed-plate 1 and the overhanging bracket-arm including the hollow standard 2 and laterally extending tubular arm 3 terminating in the hollow head 4 having the cavity 5 closed in its outer side by means of the face-plate 6. Journaled within and longitudinally of the bracket-arm is the rotary main-shaft 7 carrying upon its rearward end the balance-wheel 8 and belt-pulley 9 (a portion only of which is shown in Fig. 1) and having adjacent the same the loop-taker actuating crank 10 and feed-actuating eccentric 11. Fixed upon the forward end of the main-shaft, within the cavity 5, is the crank-head 12 carrying the lateral pin 13 embraced by one end of a pitman 14 whose eyed opposite end is entered

by the pivotal pin 15 journaled in the spaced and alined bearing bosses 16 formed in the needle-bar 17. The needle-bar is shown constructed in the form of a flat plate having parallel edges and journaled for reciprocation substantially in the plane of the main-shaft 7 in suitable alined bearing slots formed in and open at the forward extremity of the bracket-arm head 4 in which it is confined by the cross-bars 18 secured in position by the screws 19; and the needle-bar is cut out at its rearward edge to form a rectangular recess 17^x extending to or beyond the center of its width to embrace the described crank-and-pitman connection of the needle-bar with the actuating shaft 7. The bearing bosses 16 are disposed at the lower end of the recess 17^x.

To the lower end of the needle-bar is secured by means of fastening screws 20 the notched shank 21 of a cross-bar 22 having near the upper edge of its rearward face beneath the lower end of the needle-bar a longitudinal channel-way 23 intersected by a series of parallel needle-sockets 24 disposed in a line substantially parallel with the shaft 7 and leading from the lower edge, and in which are secured by means of the set-screws 25 the shanks 26 of the needles 27 whose upper ends are abutted against the upper wall of the channel-way 23. The cross-bar 22 is provided at the lower edge of its front face with a lateral lip 28 formed with thread-guiding apertures 29 through which the needle-threads are led to their respective needles. The devices just described afford a simple and effective construction of the needle-clamping means, which has the advantage of cheapness of construction and insures precision in the setting of the needles of the entire series.

To the back of the bracket-arm head 4 is secured by means of the screws 30 the foot of a bracket 31 affording a support 32 upon which is secured the boss 33 of the cross-bar 34 disposed substantially parallel with the main-shaft and having upon its upper face adjacent the opposite edges the raised marginal seats 35 and 36 and the intermediate depression 37. Supported by and having their end portions resting upon the marginal seats 35 and 36 are the parallel lower tension-plates 38 with the crooks 39 intermediate their ends entering the depressions 37 of the cross-bar 34.

Overlying and arranged correspondingly with the lower tension-plates is a series of parallel upper tension-plates 40 each formed intermediate its ends with a thread-guiding eye 41 entered by a slit 42 extending from one edge and having an upturned lip 43 to aid in directing the thread into the slit in threading. The thread-guiding eyes are disposed above the crooks 39 in the lower tension-plates and serve to direct the needle-threads from the usual spools intermediate the forward ends of the upper and lower tension-plates.

Near their rearward extremities, the overlying upper and lower tension-plates are formed with registering apertures entered by the stud-pins 44 projecting from the marginal seat 35 of the cross-bar 34, and said tension-plates are also provided with additional registering apertures entered by the threaded shanks of the clamp-screws 45 tapped into the cross-bar 34 intermediate the marginal seat 35 and the depression 37, whereby the pressure of the operative forward end portion of the upper tension-plates upon the lower tension-plates may be adjusted, and the tension-plates may be maintained in position.

To the front edge of the cross-bar 34 is secured by means of the screws 46, a plate 47 having at intervals in its upper edge corresponding in spacing apart with the thread-eyes 41 of the upper tension-plates, the guide-apertures 48 with openings at the upper sides to facilitate threading, these guide-apertures affording means, in conjunction with the guide-eyes 41 to insure the lead of the thread intermediate the upper and lower tension-plates.

The needle-bar 17 has secured to its upper end by means of the screws 49 the shank 50 of a forwardly inclined transverse take-up bar 51 having a series of thread-guiding eyes 52 connected by slits 53 leading to the upper edge of the guide-bar for admission of the needle-threads laterally into the eyes 52; and adjustably secured within a socket in the bracket-arm head adjacent and rearward of the needle-bar, by means of the set-screw 19^x, is the vertical post 54 carrying at its upper end the transverse thread-controlling rod 55 which is disposed intermediate the tension-carrying cross-bar 34 and the position assumed by the guide-bar 51 when the needle-bar is between its extreme positions.

Secured upon a suitable boss 56 upon the front of the bracket-arm head by means of fastening screws 57 is the foot 58 of a transverse guide-plate 59 formed with a series of thread apertures 60 spaced correspondingly with the apertures 52 of the take-up bar 51 and the apertures 29 of the needle-clamp bar 22. The needle-threads are led from their respective sources of supply through the apertures 41 of the upper tension-plates and beneath the upper and lower tension-plates, through the guide apertures 48 of the plate 47, thence above the thread-controlling rod 55 and through the thread-eyes 52 of the take-up bar 51 downwardly through the eyes 60 of the guide-plate 59, through the apertures 29 of the needle-clamp into the eyes of their respective needles.

In the positions of the parts represented

in Figs. 1 and 3, the needle-bar is approaching its extreme upper position, and the take-up bar 51 is performing its function as a take-up in engaging the needle-threads *a* intermediate the stationary thread-guiding members 47 and 59. As the needle-bar descends, the take-up member 51 continues to give slack until the threads are deposited upon the top of the controlling rod 55 which arrests the slack-giving action and causes the idle continuation of the descent of the take-up member 51 through whose guide-eyes the thread renders ineffectively as the needles descend and present their loops to the respective loopers which seize and distend the same for passage of the needles in the succeeding descent. The rise of the needle-bar to extreme position acts to set the preceding stitches by drawing up the needle-threads around the loopers by which they are detained beneath the throat-plate.

In stitching with a large number of needle-threads, in the present instance twenty-four, it frequently happens that through some defect in the thread or other abnormal condition, one of the threads will be broken occasionally. With the close spacing of the threads leading to the needles, it is very desirable that they should be led from the source of supply to their respective needles with the utmost directness, in order that in rethreading a needle intermediate the ends the course of an individual thread may not be confused with those of adjacent threads. This condition is entirely obviated according to the present improvement by so arranging the tension devices, the take-up member 51, and the various thread-eyes, that the lead of each of the threads is from rear to front of the machine and downwardly in front of the machine, so that a person stationed in front of and slightly above the machine may see at the same time the full length of each thread from the point where it enters the tension device to where it emerges from the needle-eye, the threads being maintained substantially parallel at the front and diverging uniformly toward the rear.

The presser-bar 61 consists of a flat plate similar to the needle-bar 17, and is similarly journaled in alined bearing slots formed in and open at the forward extremity of the bracket-arm head 4 rearwardly of, parallel with the needle-bar bearing slots and confined within its bearings by means of the bars 18. It is pressed downwardly toward the bed-plate by engagement with its upper end of the flat spring 62 whose rear end rests upon the stud 63 projecting from the bracket 64 secured upon the bracket-arm and pressed downwardly intermediate its ends by means of the screw 65 tapped through a lateral ear 66 in the arm 67 of said bracket.

Mounted upon the fulcrum screw-stud 68 tapped into the forward face of the presser-bar at its lower end is the hub 69 of a rocking cross-bar or rock-lever 70 having at its opposite ends the depending arms 71 into which are tapped the pivotal screw-studs 72 passing through the shanks of two rocking presser-feet, each of which shanks is formed with the oppositely extending bosses 74 embraced by and pivotally connected by means of the stud-screws 75 with the spaced ears 76 projecting from the top of the foot-plate 77 formed with the elongated needle apertures 78. Each of the presser-foot shanks 73 is formed in its rearward side with a channel 73× somewhat wider than the depending arm 71 of the rocking cross-bar 70, whose side walls afford stop-shoulders to limit the rocking movement of the presser-foot upon its pivotal stud 72; and the range of movement of the cross-bar 70 is correspondingly limited by means of the stop-pins 79 fixed upon and disposed near the opposite edges of the presser-bar and slightly above the lower edge of the cross-bar. As will be seen from the drawings, the fulcrum-studs 69 and 72, forming a double pivotal connection between the presser-bar and the presser-feet, are disposed in transverse relation to the presser-bar and to the needle-actuating shaft 7, whereby the presser-feet are adapted for bodily vertical movement and tilting movements relatively to the bed-plate, while the pivotal connections 75 transverse to said fulcrum-studs permit the tilting of the foot-plates upon axes parallel with the needle-actuating shaft relatively to their respective shanks.

The loop-taker actuating crank 10 is embraced by a strap 80 at the upper end of a connecting rod 81, eyed at its lower end to embrace the stud-screw 82 carried by an arm 83 of the rocking sleeve 84 journaled upon center-screws 85 below the bed-plate 1 and having a second arm 86 carrying a stud-screw 87 embraced by one end of a bent link 88 whose opposite end embraces a crank-pin 89 upon a lateral arm 90 fixed upon the looper rock-shaft 91 journaled in the bearing 92 depending from the bed-plate and formed in its forward end with a socket in which is secured by means of a set-screw 93 the reduced rearward end 94 of the looper-bar 95 carrying a series of hooked loopers 96 corresponding in number and spacing with the needles 27; the reduced opposite end 94× of the looper-bar being journaled in a suitable bearing 97 depending from the forward end of the bed-plate. As described in the said patent, the connections between the actuating crank 10 and the looper-bar impart rapid loop-seizing and loop-shedding movements to the looper with an intermediate dwell by means of which the needle-thread loops are detained beneath the work while the needles rise and again descend into said loops pre-

paratory to presenting loops for the succeeding stitches.

The feed-actuating eccentric 11 of the main-shaft has fitted thereon the slide-block 98 which is in turn embraced by the fork 99 at the upper end of the link-bar 100 whose lower end is eyed to embrace the stud-screw 101 carried by the lateral arm 102 having a split hub 103 clamped upon the rearward end of the feed-actuating rock-shaft 104 journaled upon bearing screws beneath the bed-plate.

The link-bar 100 carries adjacent its fork 99 the stud 105 embraced by one end of the link 106 whose opposite end is mounted upon the fulcrum-stud screw 107 carried by the depending arm 108 of an elbow-lever mounted by means of the screw-stud 109 upon the inwardly projecting ear 110 of the bracket-arm standard, said elbow-lever having a lateral arm 111 provided with the screw-pin 112 passing through the slot 113 in the standard 2 and by means of which the fulcrum-stud 107 may be shifted relatively to the link-bar 100 to vary rising and falling movements and consequently the amplitude of rocking movements of the rock-shaft 104. Mounted for longitudinal adjustment upon the reduced forward portion of the feed rock-shaft 104 are two feed-rockers each composed of a split hub 114 clamped thereon by means of screws 115 and provided with the divergent upwardly projecting arms 116 between which is pivotally mounted by means of bearing screws 117 the tubular boss 118 at one end of the feed-bar 119 provided intermediate its ends with the lateral wings 120 and forked at its opposite end to embrace the roller-stud 121 carried by the lateral arm 122 whose split hub 123 is adjustably clamped by means of the screw 124 upon the reduced forward portion of the feed-lift rock-shaft 125 having at its rearward end the lateral arm 126 forked to embrace the feed-lifting cam 127 upon the rocking sleeve 84 of the looper-actuating mechanism.

The upper faces of the wings 120 of the feed-bars 119 afford seats which are in practice grooved to receive the tongued lower faces of the shanks 128 of the feed-dogs 129 which are secured thereto by means of screws 130 entering apertures 131 in said shanks. The serrated work-engaging members of the feed-dog are adapted to pass upwardly through the usual apertures 132 in the throat-plate 133 shown in the drawings formed in several sections corresponding in number and arrangement with the feed-dogs of which two are mounted upon each feed-bar. By loosening the clamp-screws 115 and 124, the feed-rockers and lifting arms may be correspondingly shifted lengthwise of their respective rock-shafts so as to adjust the positions of the feed-bars correspondingly with any spacing or grouping of the needles which may be required for special work, thereby permitting the use of the same parts for different spacings of the stitch-forming members and saving the cost of construction of special parts for each individual fitting of the machine.

Having thus set forth the nature of the invention, what we claim herein is:—

1. In a multiple needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm, and a needle-actuating shaft sustained by and extending longitudinally of the bracket-arm, of a reciprocating needle-bar journaled both above and below said shaft in bearings of the bracket-arm disposed in a plane parallel with said shaft and having intermediate its ends an opening extending from one edge inwardly to substantially the center of its width and carrying alined and spaced bearing bosses extending inwardly from the edges, a pivotal pin entering said bearing bosses of the needle-bar, a crank-pin carried by said shaft, a pitman with one end embracing said crank-pin and the other end embracing the pivotal pin between said bearing bosses, a multiple needle-clamp fixed upon the lower end of the needle-bar and carrying a plurality of needles arranged in a line substantially parallel with said shaft, loop-taking mechanism beneath said bed-plate and adapted for coöperation with said needles, and loop-taker actuating means.

2. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm, and a rotary needle-actuating shaft sustained by and extending longitudinally of the bracket-arm and carrying a crank-pin at its forward end, of a reciprocating needle-bar journaled both above and below said shaft in bearings of the bracket-arm arranged substantially in the plane of said shaft and having intermediate its ends an opening embracing the path of movement of said crank-pin and carrying alined and spaced bearing bosses at one end of said opening, a pivotal pin entering said bearing bosses of the needle-bar, a pitman with one end embracing said crank-pin and the other end embracing said pivotal pin between said bearing bosses, a multiple needle-clamp fixed upon the lower end of the needle-bar and carrying a plurality of needles disposed in a line substantially parallel with said shaft, needles secured in said sockets loop taking mechanism beneath said bed-plate and adapted to coöperate with said needles in the production of stitches, and actuating means therefor.

3. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-

arm formed with a hollow head containing alined needle-bar bearing slots open at the forward extremity of the bracket-arm head, a face-plate for closing the cavity of the hollow bracket-arm head and a needle-actuating shaft sustained by and extending longitudinally of the bracket-arm and carrying at its forward end a crank-pin moving in a path within the hollow bracket-arm head, of a reciprocating needle-bar comprising a flat plate journaled within said bearing slots, means independent of the face-plate removably secured upon the outer end of the bracket-arm head for confining the needle-bar within said bearing slots, a crank-and-pitman connection between said shaft and the needle-bar, a multiple needle-clamp fixed upon the lower end of said needle-bar and carrying a plurality of needles disposed in a line substantially parallel with said shaft, loop-taking mechanism, and means for actuating the same.

4. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm formed with a hollow head containing parallel needle-bar and presser-bar bearing slots each open at the forward extremity of the bracket-arm head, and a needle-actuating shaft sustained by and extending longitudinally of the bracket-arm and carrying at its forward end a crank-pin moving in a path within the hollow bracket-arm head, of a reciprocating needle-bar comprising a flat plate journaled within said needle-bar bearing slots, a presser-bar also comprising a flat plate and journaled within the presser-bar bearing slots, means common to the needle-bar and presser-bar for confining the same within their respective bearing slots, said means being removably secured upon the bracket-arm head, a crank-and-pitman connection between said shaft and the needle-bar, a multiple needle-clamp fixed upon the lower end of said needle-bar and carrying a plurality of needles disposed in a line substantially parallel with said shaft, loop-taking mechanism, means for actuating the same, and a presser foot carried by said presser-bar.

5. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm, of a reciprocating needle-bar journaled in the bracket arm, needle-bar actuating means, a clamp detachably secured to said needle-bar and formed in one of its faces with a channel way and provided with means for holding a plurality of needles with their shanks abutting the upper wall of said channel way and for permitting changes in the number and spacing of the same, a presser-foot and supporting means therefor, a feed-actuating rock-shaft, a feed-lifting rock-shaft, actuating means for said rock-shafts, a feed-dog provided with a plurality of toothed surfaces, and adjustable connections between said feed-dog and the feed-actuating and feed-lifting rock-shafts whereby said feed-dog may be shifted sidewise to accommodate changes in the number and spacing of the needles.

6. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm, and a needle-actuating shaft sustained by and extending longitudinally of the bracket-arm, of a reciprocating needle-bar journaled both above and below said shaft in bearings of the bracket-arm disposed in a plane parallel with said shaft, a crank-and-pitman connection between said shaft and the needle-bar, a multiple needle-clamp fixed upon the lower end of said needle-bar, a plurality of needles mounted in said clamp in a line parallel with said main-shaft, a plurality of loop-takers coöperating with said needles beneath the bed-plate, loop-taker actuating means, a transverse take-up bar fixed upon the top of the needle-bar parallel with said shaft and having thread-eyes corresponding in number and arrangement with the needles, a bracket mounted upon the head of the bracket-arm rearward of the needle-bar and carrying a cross-bar arranged parallel with the take-up bar, a series of tension devices mounted upon said cross-bar in a row parallel with said take-up bar, a post sustained by the bracket-arm, and a transverse thread-controlling rod carried by said post parallel with and intermediate the tension-carrying cross-bar and the take-up bar when intermediate its extreme positions.

7. In a multiple-needle sewing machine, the combination with the frame comprising a bed-plate and an overhanging bracket-arm, and a needle-actuating shaft sustained by and extending longitudinally of the bracket-arm, of a reciprocating needle-bar journaled both above and below said shaft in bearings of the bracket-arm disposed in a plane parallel with said shaft, a crank-and-pitman connection between said shaft and the needle-bar, a multiple needle-clamp fixed upon the lower end of said needle-bar, a plurality of needles mounted in said clamp in a line parallel with said main-shaft, a plurality of loop-takers coöperating with said needles beneath the bed-plate, loop-taker actuating means, a transverse take-up bar fixed upon the top of the needle-bar parallel with said shaft and having thread-eyes corresponding in number and arrangement with the needles, a bracket mounted upon the head of the bracket-arm rearward of the needle-bar and carrying a cross-bar parallel with said take-up bar and provided upon its upper face with marginal seats extending along its opposite

edges, a series of lower tension-plates disposed crosswise of said take-up bar and resting upon its marginal seats, a series of parallel upper tension-plates arranged correspondingly with and resting upon the lower tension-plates and each formed intermediate its ends with a thread-guiding eye in register with its respective lower tension-plate, independently adjustable means for pressing said tension-plates together, a post sustained by the bracket-arm, and a transverse thread-controlling rod carried by said post parallel with the intermediate tension-carrying cross-bar and the take-up bar when intermediate its extreme positions.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

PHILIP DIEHL.
HERMANN EICHHORN.

Witnesses:
HENRY J. MILLER,
H. A. KORNEMANN, Jr.